PHYSICS
PAST PAPERS

PHYSICS PAPER 1 1995

1. Name the instrument that would be most suitable for measuring the thickest of one sheet of this question paper. (1 mk)

   Figure 1 shows a worker ready to lift a load wheelbarrow

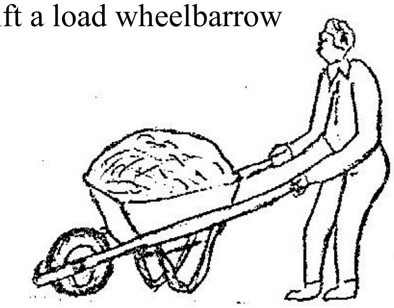


Fig 1

   Use the figure to answer questions 2 and 3

2. Indicate and label on the diagram three forces acting on the wheelbarrow when the person is just about to lift the handlebars (2 mks)

3. Suppose the handle bars of the wheelbarrow in question 2 were extended, which force(s) would change and how? (2 mks)

   Figure 2 shows a liquid being siphoned from one beaker to another. Refer to this diagram where answering questions 4, 5 and 6

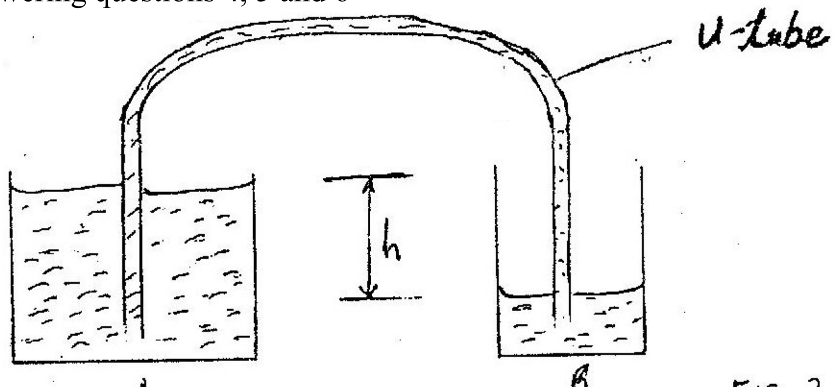


Fig. 2

4. Indicate on the diagram the direction of flow of the liquid (1 mk)

5. Show that the force driving the liquid through the U – tube is proportional to the height, h (3 mks)

6. State what would happen to the flow if the system in figure 2 were put in vacuum (1 mk)

7. State the assumption made when calculating the size of a molecule in the thin oil film experiment (1mk)

8. One property of a liquid that is considered while construction a liquid – in – glass thermometer is that the liquid expands more than the glass for the same temperature change. State any other two properties of the liquids that are considered (2 mks)

9. What property of light is suggested by the formation of shadows? (1 mk)

10. In the set up shown in figure 3, water near the top of the boiling tube boils while at the bottom it remains cold.

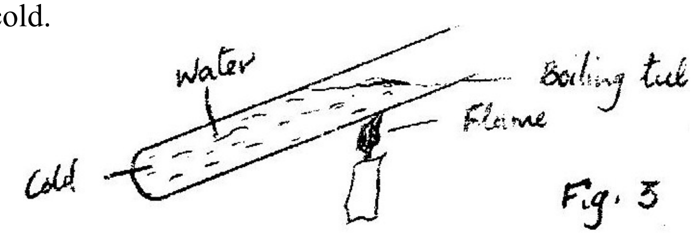


Fig. 3

Give a reason for the observation (1mk)

11. You are provided with a charged electroscope, an insulator and a conductor. Describe how you would use these apparatus to distinguish in the insulator from the conductor (2 mks)

12. State two advantages of an alkaline battery over a lead acid battery (2 mks)

13. The diagram in figure 4 shows two glass tubes of different diameters dipped in water

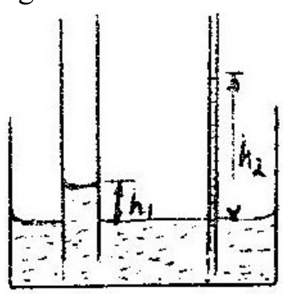


Fig. 4

Explain why h_2 is greater than h_1 (3 mks)

14. The force on a conductor carrying a current in a magnetic field can be varied by changing, among others, the magnitude of the current and the magnetic field strength. Name two other factors that can be changed to vary the force. (2 mks)

15. Give a reason why attraction in magnesium is not regarded as a reliable method of testing for polarity. (1 mk)

16. State two ways by which the frequency of a note produced by a given guitar wire may be increased

17. The diagram in figure 5 shows a beam negligible weight balanced by constant forces P and Q.

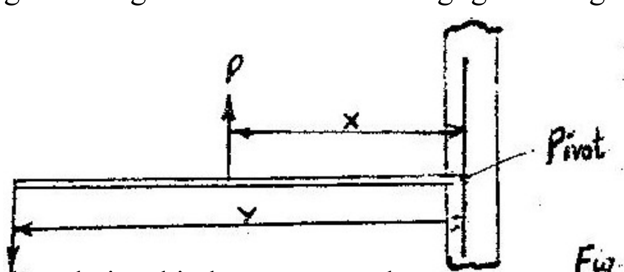


Fig. 5

Derive the relationship between x and y (2 mks)

18. Light travels through glass of refractive index 1.5 with a speed v. Calculate the value of v (speed of light in air = 3.0×10^8 m/s) (3 mks)

19. In an experiment using a ripple tank the frequency, f, of the electric pulse generator was reduced to one third of its value. How does the new wavelength compare with the initial wavelength? Explain your answer. (3 mks)

20. A ray of light incident on the surface of a glass prism is observed to behave as represented in the diagram in figure 6

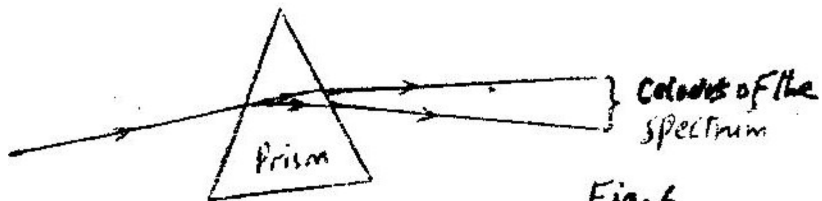


Fig. 6

Explain this observation (3 mks)

21. State Newton's first law of motion (1mk)

22. Distinguish between heat capacity and specific heat capacity of a body (1 mk)

23. Figure 7 represents a tube through which a liquid is flowing in the flowing in the diagram shown by the arrow

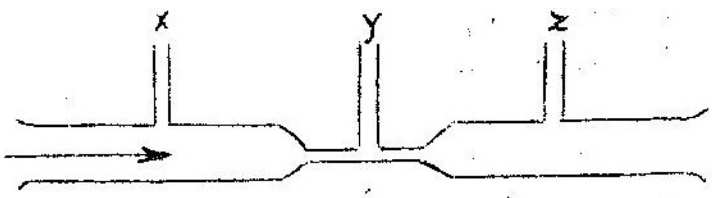


Fig 7

Show on the diagram the relative positions of the levels of the liquid in section marked x, y and z

24. Figure 8 represents two parallel plates of a capacitor separated by a distance d. Each plate has an area of A square units

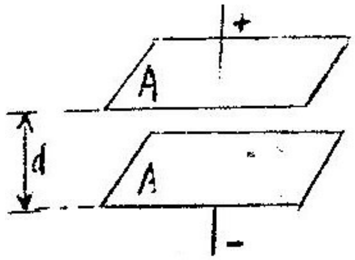


Fig. 8

Suggest two adjustments that can be made so as to reduce the effective capacitance

25. Name the property of light that shows that it is a transverse wave

26. The table below shows the type of radiation, detection methods and uses of electromagnetic radiations. Complete the table.

Type of radiation	Detector	Uses
Ultra violet	Photographic paper fluorescence material	----------------------
---------------------	Phototransistor blackened thermometer	Warmth sensation
Radio waves	-----------------------------	Communication

27. An electron in an excited atom falls from energy levels E2 to energy level E1. Write an equation relating the energy change to the frequency f, of the radiation emitted. Explain why new symbols used. (2 mks)

28. Name the metal used to shields X – rays operators from the radiation. Give a reason why it is used. (2 mks)

In an experiment on photo- electricity using metal X, the graph shown in figure 9 was obtained. Use the graph to answer questions 29 and 30.

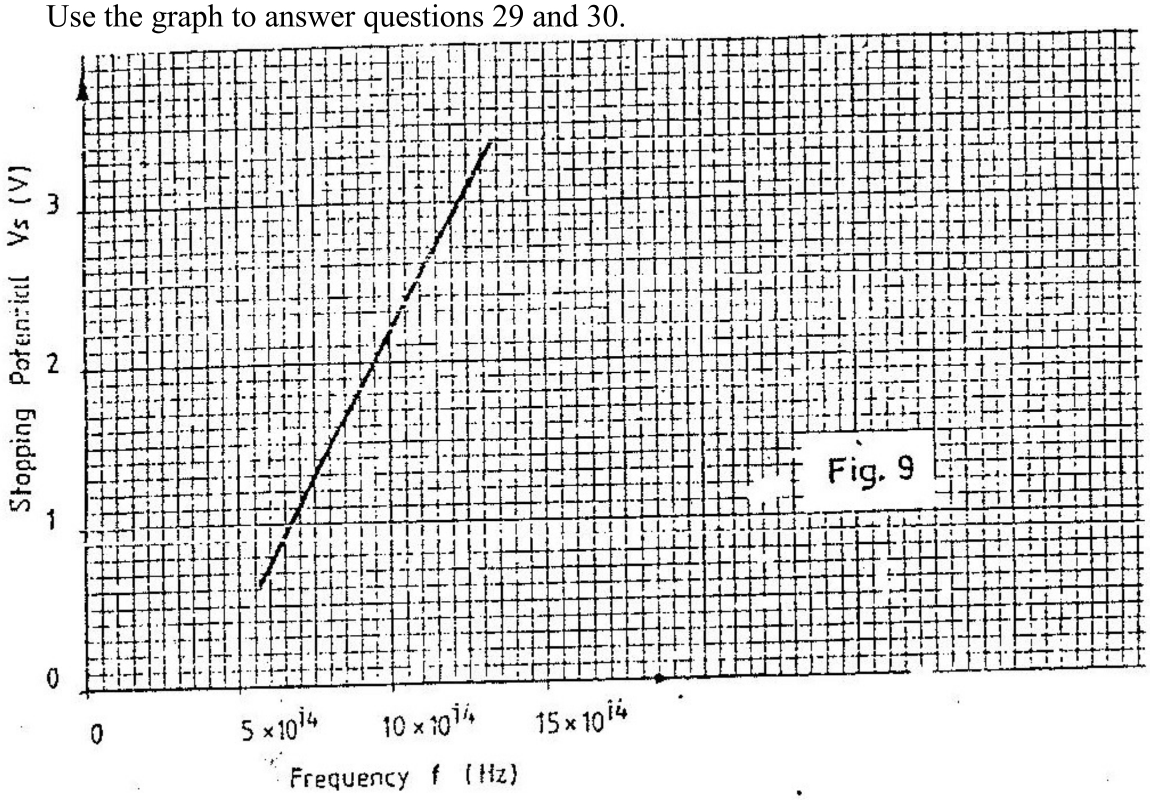


Fig. 9

29. Determine the minimum frequency f_0 below which no photoelectric emission occurs (2 mks)

30. Sketch on the same axes, a graph for a metal, Y hose work function is higher than metal X (1mk)

31. State a characteristic of sound, which is determined by overtone (1 mk)

32. A radioactive carbon 14 decay to Nitrogen by beta emission as below

$$ {}^{14}_{6}C \longrightarrow {}^{x}_{7}N + {}^{0}_{y}e $$

Determine the values of x and y in the equation (2 mks)

33. What is meant by the centre of gravity of a body? (1mk)

34. State two variables that must be controlled in an experiment for comparing the thermal conductivities of different metal rods of the same diameter (2 mks)

35. Figure 10 represent a signal being fed into a demodulator of a radio receiver. Sketch in the space provided, the output signal (1 mk)

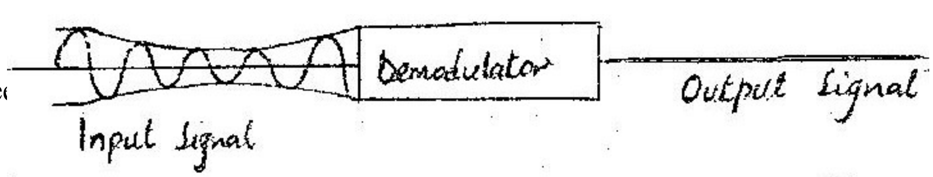


Fig. 10

36. Explain with the aid of a labeled ray diagram the wide field of view of a convex mirror (2 mks)

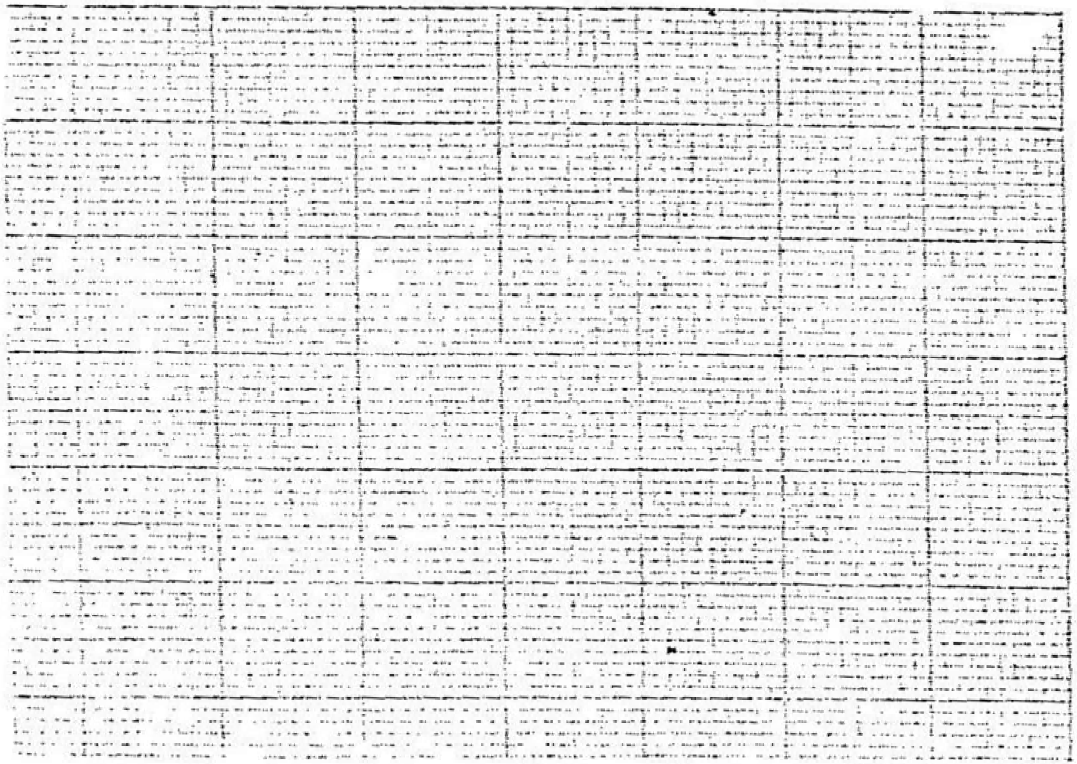
K.C.S.E 1995 PHYSICS PAPER 232/2
SECTION 1 (65 MARKS)

Answer all the questions in this section in the spaces provided

1. The data in the table below represents the motion of vehicle over a period of 7 seconds

Time (sec)	0	1	2	3	4	5	6	7
Displacement	0	20	40	60	80	95	105	110

(a) plot on the grid provided, a graph of displacement (y- axis) against time (5 mks)



(b) Describe the motion of the vehicle for the first 4 s (1 mk)

(c) Determine the velocities at 4.5s and 6.5s. Hence or otherwise determine the average acceleration of the vehicle over this time interval

2. Study the circuit diagram in figure 1 and answer the following questions

Fig.1

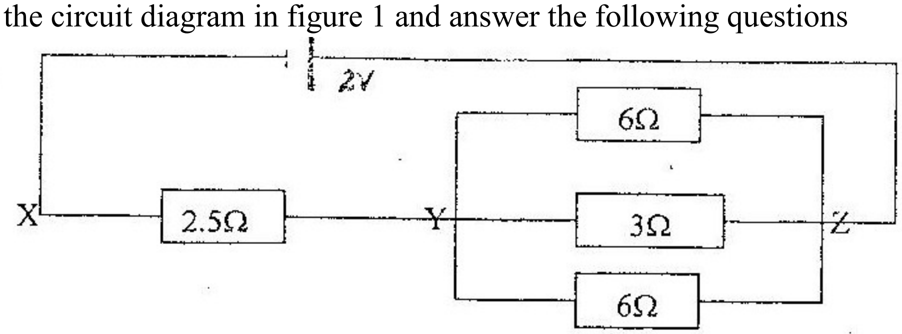


Fig 1

(a) Calculate the effective resistance between Y and Z (3 mks)

(b) Determine the current through the 3 Ω resistors (6 mks)

(c) One of the 6Ω resistor has a length of 1.0m and cross –section area of 5.0×10^{-6} m^2 (3 mks)

Calculate the resistivity of the material

3. (a) An object O is placed in front of convex mirror as shown in figure 2

Fig.2

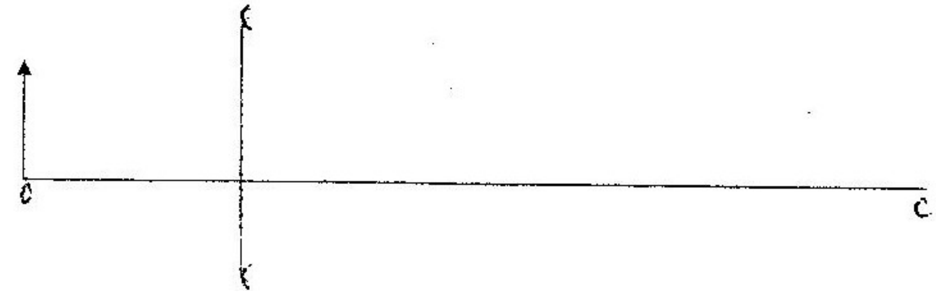


Fig. 2

(i) Draw to scale a ray diagram to show the position of the image (5 mks)
(ii) Determine the magnification (3 mks)

(b) An object placed in front of a convex lens of focal length 10 cm produces an image at a distance of 15 cm from the lens and on the same sides as the object

Determine the position of the object (4 mks)

4. (a) Draw a ray diagram to show how a convex lens works as a magnifying glass (5 mks)

(b) The diagram in figure 3 shows a certain eye defect

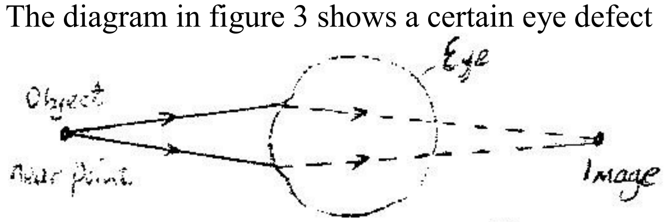


Fig. 3

(i) Name the object
(ii) Draw on the same diagram an arrangement to correct the defect (1 mk)

(c) (i) Explain why a pail of water can be swung in vertical circle without the water pouring out (3 mks)

(ii) A car of mass 1200kg is moving with a velocity of $25ms^{-1}$ around a flat bend of radius 150m. Determine the minimum frictional force between the tyres and the road that will prevent the car from sliding off. (4 mks)

5. (a) (i) State the law of electromagnetic induction (2 mks)
(ii) Describe an experiment to demonstrate Faraday's law (4 mks)

(b) (i) A researcher studying the behaviour of step- up transformer made the following observations:
"More joules per coulomb and fewer coulombs per second at the output than at the input terminals

Explain why the observation does not imply a violation of the principle of conservation of energy (4 mks)

(ii) A transformer of 480 turns in the primary coil is used to connect a 9 volt a.c electric device to a 240 v.a.c mains power supply. Calculate the number of turns in the secondary coil. (3 mks)

SECTION II (15 MARKS)
Answer one question from this section

6. (a) Distinguish between stationary and progressive waves (1mk)
   (b) (i) describe how a young's double slit may be made in a laboratory (2mks)
   (ii) State the condition for a minim to occur in an interference pattern (1mk)
   (c) The sketch graph in fig 4 shows the results of an experiment to study diffraction patterns using a double slit.

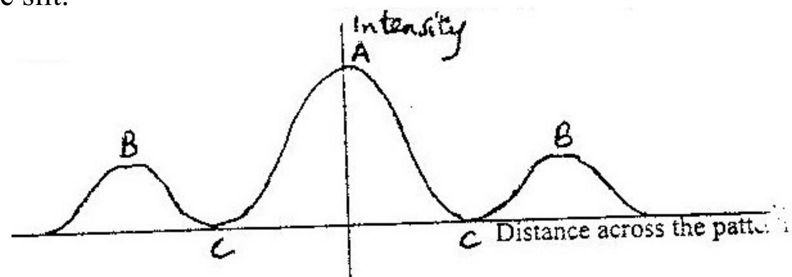


Fig. 4

   (i) Sketch an experimental set up that can be used to obtain such a pattern (4 mks)
   (ii) Name an instrument for measuring the intensity (1 mk)
   (iii) Explain how the peaks labeled A and B, and troughs labeled C are formed (6 mks)

7. (a) Describe how a p- type semi conductor is formed (3 mks)
   (b) Distinguish between p- n- p and n – p – n transistors (1 mk)
   (c) The sketch in the fig 5 shows the results of an experiment where a transistor was used as a voltage amplifier

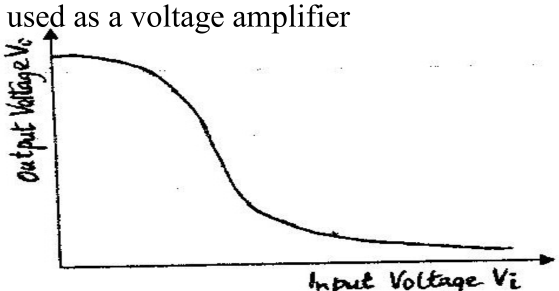


Fig. 5

   Explain hw the voltage amplification factor, β, may be obtained from the sketch graph (4 mks)
   (d) (i) Draw a circuit diagram of p – n – p transistor operating in the common emitter (C-E) mode indicate on the diagram the directions of the collector current I_c the base current I_B the emitter current I_E (4 mks)

   (ii) Write the equation relating I_C I_B I_E (1mk)

(e) Identify the type of biasing in each of the junctions of a transistor in operation (2 mks)

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1.

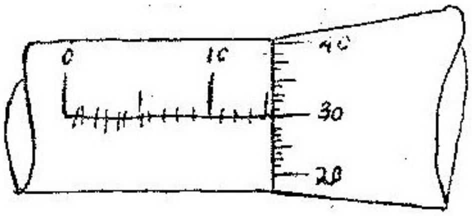


Fig. 1

The micrometer screw gauge represented by figure 1 has thimble scale of 50 divisions

What is the reading shown (1 mk)

2. What measurable quality is associated with colors of light? (1 mk)

3. State two factors that should be controlled in manufacturing a cylindrical container of uniform thickness, which should normally be in a standing position?

4.

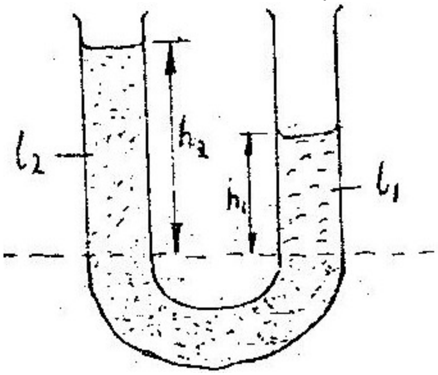


Fig. 2

Figure 2 shows a U tube containing two liquids L1 and L2 of densities 0.8 g cm^{-3} and 1.8 cm^{-3} respectively in equilibrium. Given that h_2 = 8 cm determine the value of h_1 (3mks)

5. A small nail may pierce an inflated car tyre and remain there without pressure reduction in the tyre. Explain this observation (2 mks)

6. Give a reason why a concrete beam reinforced with steel does not crack when subjected to changes in temperature (2 mks)

7. Give a reason why heat transfer by radiation is faster than heat transfer by conduction (1mk)

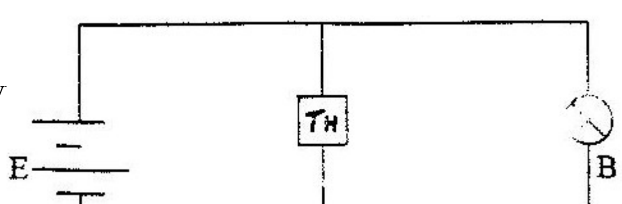
8. A vertical object placed on a bench is observed to have three shadows of different sharpness, in different directions. Explain this observation (3 mks)

9. State the law of electrostatic charges (1 mk)

10. The pitch of the note produced by a wire depends on the tension in the wire. State the other factor that effects the pitch (1 mk)

11. Name two forces that determine the shape of liquid drop on the solid surface. (2mks)

12.



Thermistor, TH, is connected in parallel with a bulb as shown in figure 3. The bulb is lit. When the thermistor is steadily heated the brightness of the bulb reduces. Explain this observation (3 mks)

13.

Fig. 4

Figure 4 shows tow parallel current conductors A and B placed close to each other. The direction of the current is into the plane of the paper.
On the same figure;

(i) Sketch the magnetic field pattern (1 mk)
(ii) Indicate the force F due to the current on each conductor (1 mk)

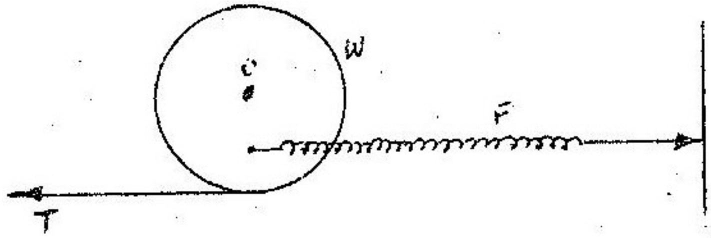


Fig. 5

Figure 5 shows a wheel W pivoted at its centre, O and held stationary by a string and a spring. The tension in the strings is T and the force on the springs is F.

Use this information to answer 14 and 15

14. State how the magnitudes of T and F compare. Give reasons for your answer (3 mks)

15. State what would happen to the wheel if the string snapped (1 mk)

16. Sketch in the space provided below, a labeled diagram to show how an arrangement of a single pulley may be used to provide a mechanical advantage of 2 (2 mks)

17. Circular water waves generated by a point sources at the centre. O of the pond are observed to have the pattern shown in figure 6

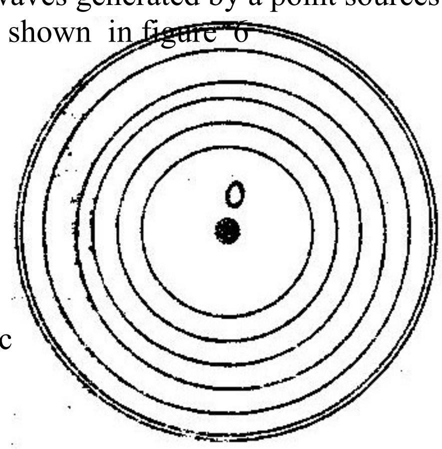


Fig. 6

Explain the pattern (2mks)

18. What characteristics of sound is applied in turning pianos? (1 mk)

19. In large current circuits large resistors in parallel are preferred to low resistors in series explain (2mks)

20. A girl heats 5 kg of water to temperature of 80^0C. When she adds m kg of water at 15^0 C the mixture attains temperature of 40^0C. Determine the value of m. (ignore heat changes due to the container) (3 mks)

21. Equal masses of water and paraffin with specific heat capacities C_W and C_P respectively are heated using identical sources of heat, for the same length of time. The final temperature θ_P of paraffin was found to be greater than final temperature than of water, Show that C_W is greater than C_P.

22. A lady holds a large concave of facal length 1 m, 80 cm from her face, state two characteristics of her image in the mirror (2 mks)

23. A small object lies at the bottom of a water pond at a depth of 1.2 m. Given that the refractive index of water is 1.3, determine the apparent dept of the object. (Give your answers to 1 decimal place)

24. State how the pressure in a moving fluid varies with the speed of the fluid (1 mk)

25. In some petrol engines where spark plugs are used, a capacitor is connected to the distributor. Suggest the function of the capacitor. (1 mk)

26. A house in which as cylinder containing cooking gas is kept unfortunately catches fire. The cylinder explodes. Give an explanation for the exposition (2mks)

27. Explain how a piece of a Polaroid reduces the sun's glare (1 mk)

28. An observer A is in a moving vehicle with a siren on while an observer B is stationary on the side of the road. State the difference between the sound heard by A and B as the vehicle approaches B at a high constant speed (2mks)

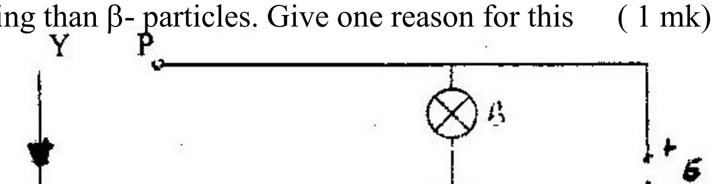
29. A solid copper sphere will sink in water while a hollow copper sphere of the same mass many float. Explain this observation (2 mks)

30. The moment of the weight of vertical door does not significantly affect the moment of the force required to open the door. Give a reason for this (1 mk)

31. What causes electromagnetic damping in a moving coil galvanometer (1mk)

32. The control grids in a cathode Ray Oscilloscope (CRO) is used to control the brightness of the beam on the screen. How is this achieved? (2 mks)

33. α- particles are more ionizing than β- particles. Give one reason for this (1 mk)



In the figure 7 the circuit diagram contains bulbs B, a transistor T and a resistor R. A diode D is connected between points Y and X as shown. In the set up bulb B is not lit. When the connections YP and XQ are made, B lights. Answer questions 34, 35 and 36 with reference to the figure.

34. Name the type of transistor used in the circuit (1 mk)

35. Explain the observation when the connections are made (3 mks)

37. In the Brownian motion experiment, smoke particles are observed to move randomly. Explain how this motion is caused (2 mks)

38. Figure 8 shows an object O placed infront of a concave lens with principal foci F and F Construct a ray diagram to locate the position of the image (3 mks)

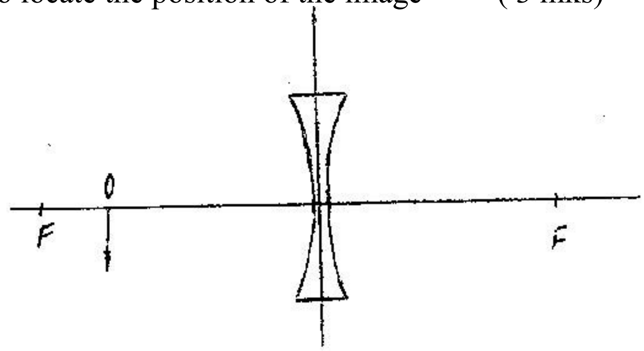


Fig 8

PHYSICS PAPER 232/1B 1996 SECTION 1 (65 MARKS)

Answer all the questions in this section in the spaces provided

1. (a) A accelerates uniformly from it initial velocity, u, the final velocity, v in time t. The distance traveled during this time is S. If the acceleration is denoted by the letter, a show that;

   (i) $V = u + at$ (2 mks)

   (ii) $S = ut + at^2$ (3 mks)

   (iii) $V^2 = u^2 + as$ (2mks)

   (b) A body moving initially at 50m/s decelerates uniformly at two $2ms^{-2}$ until it comes to rest. What distance does it cover from the time it started to decelerate
   (3 mks)

2. (a) Given a bar magnet, an iron bar and a string

   (i) Describe a simple experiment to distinguish between the magnet and the iron bar (4 mks)

   (ii) State with reasons the observation that would be made in the experiment (4 mks)

   (b) In an experiment to magnetize two substances P and Q using electric current, two curves (graphs) were obtained as shown in figure 1

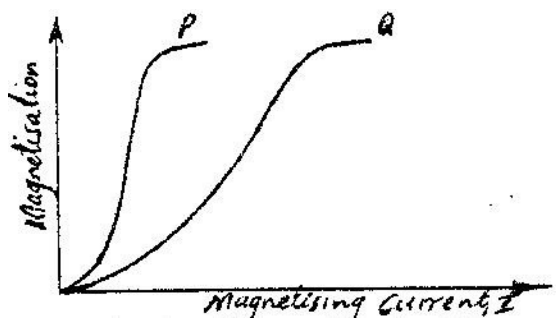


Fig. 1

   Using the information in Fig 1 explain the difference between the substances P and Q with references to the domain theory (6 mks)

3. The diagram in fig 2 represent an electric circuit in which five resistors are connected to be a battery of e.m.f 4.0 V and of negligible internal resistance

Fig. 2.

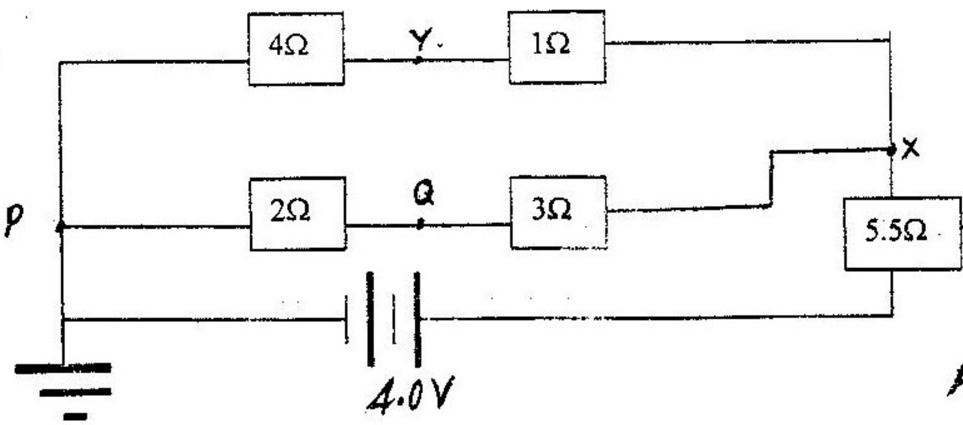


Fig-2

Determine:

(i) The total resistance of the circuit (3 mks)

(ii) The potential difference between Y and Q (2 mks)

4. (a) (i) Describe the experiment to determine the specific heat capacity C, of a block of aluminium with two holes drilled in it, to accommodate a thermometer and an electric immersion heater (2 mks)

(ii) State the measurements required in the experiment and show how they would be used to obtain C (5 mks)

(iii) State two precaution that should be taken in this experiment (2 mks)

(b) A copper calorimeter of mass 60g is filed with 100g of water at 25^0C. Steam at a normal temperature and pressure (N.T.P) is passed thought the water until a temperature 45^0C is attained. The final mass of calorimeter and the contents was found to be 163.5g. Calculate the specific latent heat of vaporization 'l' of water (6 mks)

Specific heat capacity for water is $4200JKg^{-1}$ and for copper is $378Kg^{-1}K^{1}$

5. (a) (i) What is the difference between longitudinal and transverse waves? (1 mk)

(ii) State two distinctions between the way sound waves and electromagnetic waves are transmitted (2 mks)

(b) A mineworker stands between two vertical cliffs 400m from the nearest cliff. The cliffs are X distance apart. Every time he strikes the rock once, he hears two echoes, the first one after 2.5 s, while the second follows 2s later. From this information; calculation:

(i) The speed of the sound in air (2 mks)

(ii) The value of X (3 mks)

(c) In an experiment to observe interference of light waves a double slit is placed close to the source. See figure 3

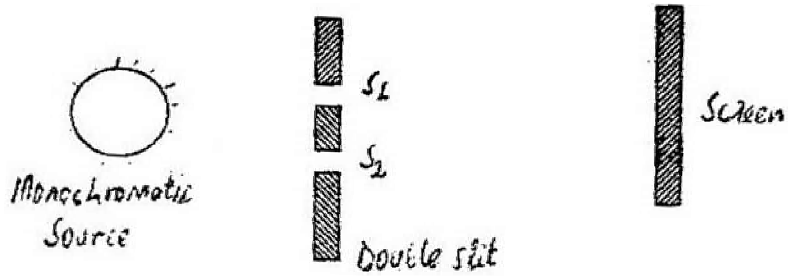


Fig 3

(i) State the function of the double slit (1 mk)

(ii) Describe what is observed on the screen (2mks)

(iii) State what is observed on the screen when

I. The slit separation S_1S_2 is reduced (1 mk)

II. White light source is used in place of monochromatic source (1 mk)

SECTION II (15 MARKS)

Answer any two question from this section in the space provides after question 7

6. (a) The fig. 4 shows the diagram of set up to investigate the variation of centripetal with the radius r, of the circle in which a body rotated

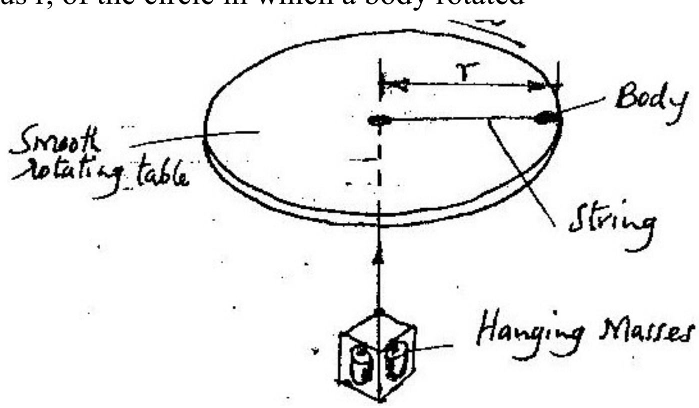


Fig. 4

Describe how the set up can be used to carry out the investigation (5 mks)

Table 1

Mass, m (g)	60	50	40	30	20
Radius, r (cm)	50	41	33	24	16

Table 1 shows results obtained from an investigation similar to the one in part (a)

(i) Plot a graph of force, F (y- axis) on the body against the radius , r, (in meters) (5mks)

(ii) Given that the mass of the body is 100g, use the graph to determine the angular velocity, (5 mks)

7. (a) Describe with the aid of a diagram an experiment set up for observing photoelectric effect

(b) Table 2 shows the relationship between the wavelength, λ of a radiation falling on the surface and the energy, k of the emitted electrons

λ(m) * 10^{-7}	20	1.5	1.0	0.5
K (J)* 10^{-19}	10	13	20	40

(i) Plot a graph of energy k (y – axis) against the frequency, f, of the incident light

(ii) Determine the work function Φ of the surface used (5 mks)

Speed of light, c = 3.00 * 10^8 ms^{-1} planks constant h = 6.663 * 10^{-34}JS]

PHYSICS PAPER 232/1 K.C.S.E 1997

Answer all the questions in this paper mathematical tables to be used

Take: *Density of mercury = 1.36×10^4*
Speed sound = $340ms^1$
Speed of light = $3.0 \times 10^8\ ms^{-1}$
$g = 10ms^{-2}$

1. Figure 1 shows a measuring cylinder, which contains water initially at level A. A solid of mass 11 g is immersed in the water, the level rises to

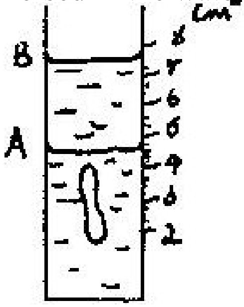


Fig. 1

Determine the density of the solid. (Give your answer to 1 decimal place)

2. Figure 2 shows a rigid body acted upon by a set of forces. The magnitudes of the forces are as follow

$F_1 = 3N_1$, $F_2 = 6N$, $F_3 = 3N$, $F_4 = 4\ N_1$, $F_5 = 3N$ and $F_6 = 3\ N$

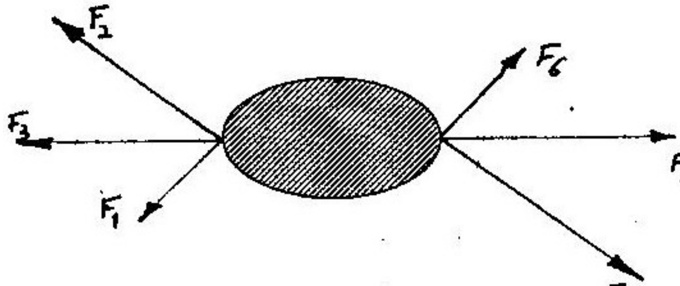


Fig. 2

Identify the couple among these forces

3. Give a reason why the weight of the body varies from place to place

4. A butcher has a beam balance and masses 0.5 kg and 2kg. How would he measure 1.5 kg of meat on the balance at once?

5. The height of the mercury column in a barometer at a place is 64cm. What would be the height of a column of paraffin in barometer at the same place? (Density of paraffin = $8.0 \times 10^2\ kgm^{-3}$)

6. The number of molecules in $18cm^3$ of a liquid is 6×10^{23}. Assuming that the diameter of the molecules is equivalent to the side of a cube having the same volume as the molecule. Determine the diameter of the molecule.
7. Explain why a glass container with thick walls is more likely to crack than one with a thin wall when a very hot liquid is poured into them.

8. State the reason why water spilled on a glass surface wets the surface

9. Figure 3 shows two aluminium containers, A and B placed on a wooded table. A and B have equal volumes of hot water initially at the same temperature.

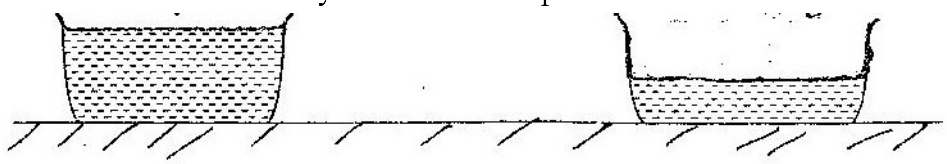


Fig. 3

10. Figure 4 shows two point objects A, and B, placed in front of a mirror M

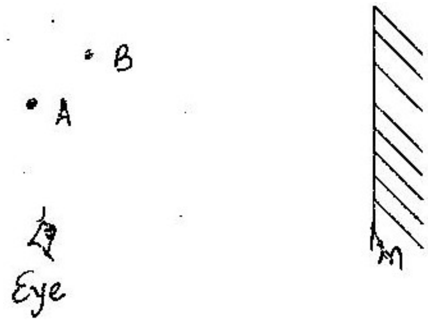


Fig. 4

Sketch a ray diagram to show the positions of their images as seen by the eye.

11. Figure 5 shows two charged identical conduction spheres on insulting stands. Each cross represents a charge. The spheres are briefly brought into contact and then separated.

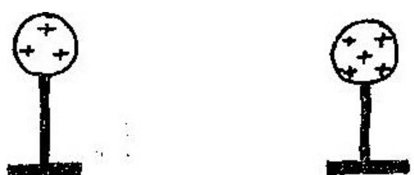


Fig. 5

Sketch in the space provided the diagrams of the spheres showing charge distribution after separation

12. Name a device used to convert light energy directly into electrical energy

13. Figure 6 shows a beam AB supported at points A and B. A large F is applied on the beam as shown. Mark on the diagram, the position X, where a notch is likely to appear.

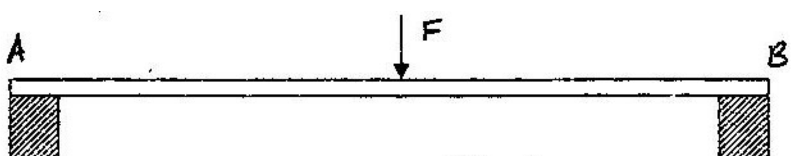


Fig. 6

14. Distinguish between soft and hard magnetic materials
15. A current of 0.5A flows in a circuit. Determine the quantity of charge that crosses a point in 4 minutes.
16. Figure 7 shows an incomplete circuit of an electromagnet. Complete the circuit between X and Y drawing the windings on the two arms of the core such that A and B are both North poles when switch S is closed. Indicate the direction of the current on the windings drawn.

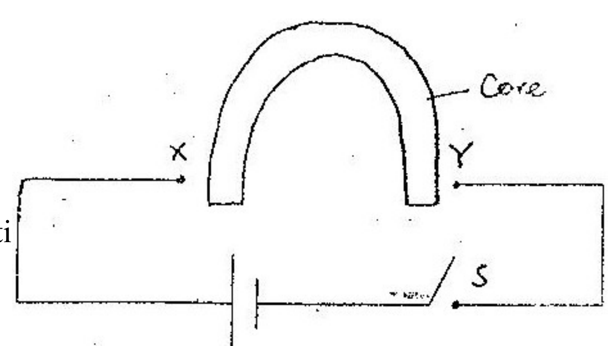


Fig. 7

17. An observer watching a fireworks displays sees the light from an explosion and hears the sound 2 seconds later. How far was the explosion from the observer?
18. Water flows in a horizontal smooth pipe. State the changes that would be observed in the nature of the flow if the speed of the water is steadily increased from low to a high value
19. A transformer in a welding machine supplies 6 volts from a 240V main supply. If the current used in the welding is 30A. Determine the current in at the mains.
20. An object dropped from a height h attains a velocity of 6 ms^{-1} just before hitting the ground. Find the value of h.
21. Calculate the wavelength of the KBC FM radio wave transmitted at a frequency of 95.6 Mega Hertz.

Using the information in figure 8 answer questions 22 and 23.

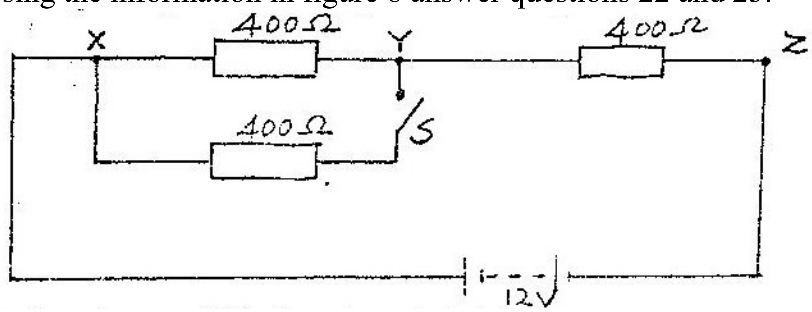


Fig. 8

22. What is the p.d across YZ when the switch S is open?
23. Determine the p.d across YZ when the switch S is closed
24. How many 1000W electric irons could be safely connected to a 240V main circuit fitted with 13A fuse?
25. Ice changes to water at 0^0C. Equal masses of the ice and water at 0^0C are each heated to 1^0C. Give a reason why more heat energy is required to heat ice.
26. Figure 9 shows two parallel rays incident on a concave mirror. F is the focal point of the mirror.

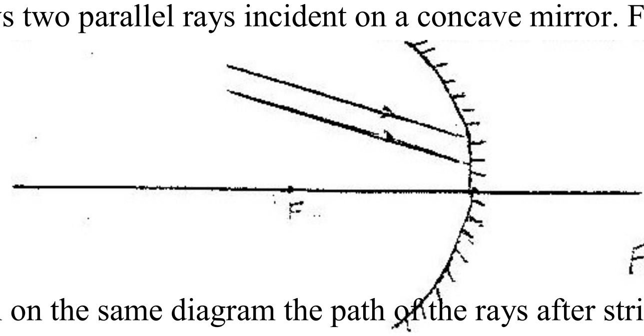


Fig. 9

Sketch on the same diagram the path of the rays after striking the mirror

27. Figure 10 shows the apparent position of a fly in air as seen by a fish in water

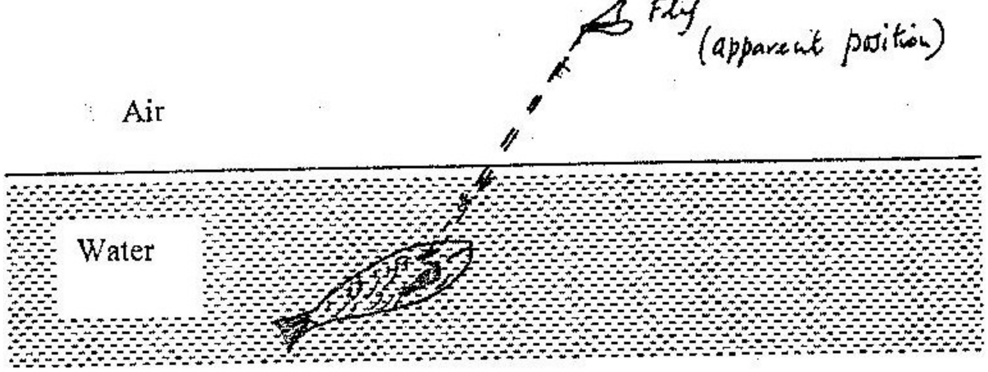


Fig. 10

Sketch on the same diagram rays to show the actual position of the fly

28. A trolley is moving at constant speed in a friction compensated track. Some plasticine is dropped on the trolley and sticks on it. State with a reason what is observed about the motion of the trolley.

29. Figure 11 shows part of a circuit containing three capacitors

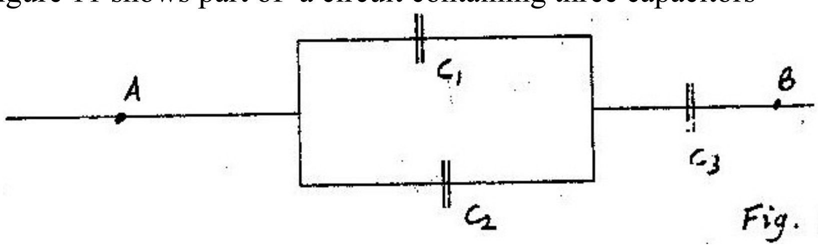


Fig. 11

Write an expression for C_T the effective capacitance between A and B.

30. What is the value of -20^{0}C on the absolute temperature scale?
31. Figure 12 shows an experiment arrangement. S_1 S_2 and S are narrow slit

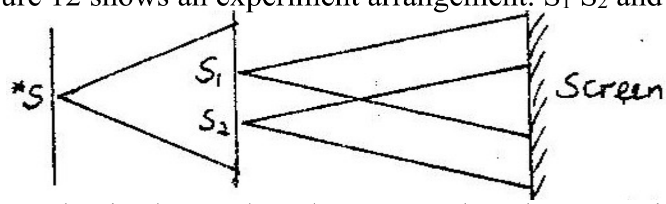


Fig. 12

State what is observed on the screen when the source is?
(a) Monochromatic (b) White light
32. Two turning forks are sounded together. What is the condition for the beats to be heard?
33. Using the components symbols shown in figure 14, sketch a series circuit diagram for a forward biased diode.


Fig. 13

34. State how eddy currents are reduced in a transformer
35. A lithium atom has 3 protons in its nucleus. Complete the diagram in figure 14 by marking X in the appropriate shells show the electron distribution when the atom is not excited

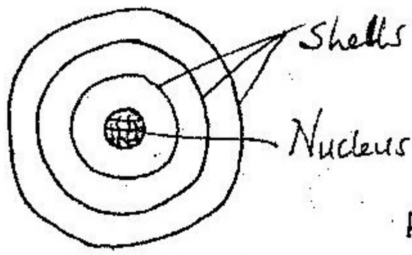


Fig. 14

36. In a sample there are 5.12 x 1020 atoms of krypton – 92 initially. If the half of krypton; 92 is 3.0s determine the number of atoms that will have decayed after 6s.

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Answer all the questions in section I and any one in section II

Take: specific heat capacity of water = 4200Jkg^{-1}K^{-1}
Latent heat of melting ice = 334,000Jkg^{-1}K^{1}
Planck's constant h = 3.34 x 10^{-34} JS
Speed of light, c = 3.0 x 10^{8}ms^{-1}

1. Figure 1 shows a circuit diagram for controlling the temperature of a room.

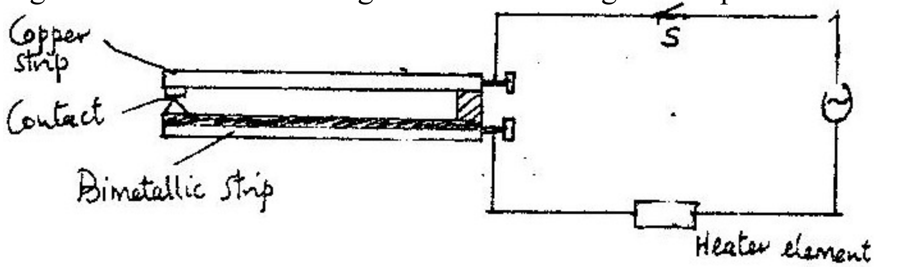


Fig. 1

(i) State and explain the purpose of the Bimetallic strip
(ii) Describe how the circuit controls the temperature when the switch is closed

(b) A drinking glass 0.02 kg contains 200gms of water at 20^{0}C. A mass of 0.04 kg of ice at 0^0 C is dropped into the glass. Determine the final temperature of the mixture. Specific heat capacity of glass = 670kg^{-1}K^{-1}. (Give your answer to correct one decimal place)

2. (a) Figure 2 shows a uniform plank 20 m long, weighing 400N resting on two supports A and B 9cm apart. A person weighing 600N walks towards B starting at A.

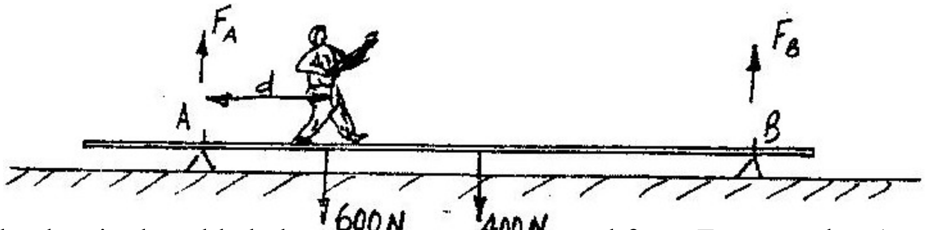
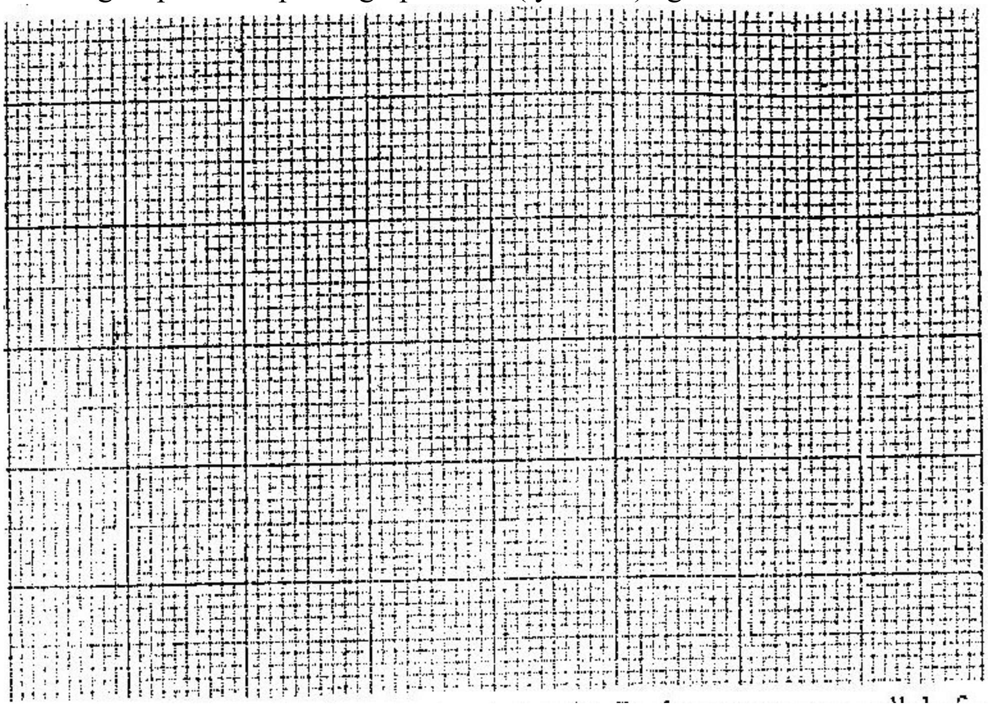


Fig.2

The data in the table below represents the upward force F_A exerted at A as a function of distance, d. The distance d is measured from A.

D (m)	0	2	4	6	8	10
F_A(N)	800	650	500	350	200	50

(i) On the grid provided plot a graph of F_A (y – axis) against the distance d.



(ii) From the graph determine how far beyond point B, the person can walk before the plank tips

(b) In the set up in the figure 3, the metre rule is in equilibrium

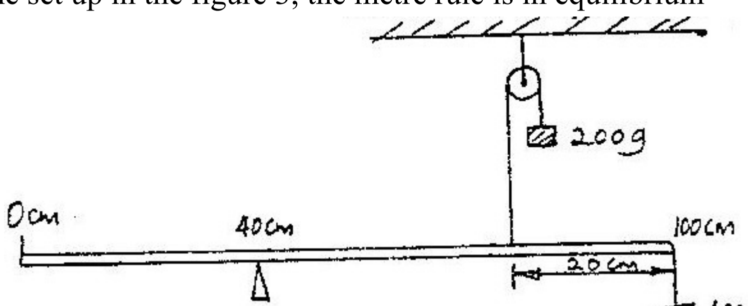


Fig. 3

Given that the metre rule is uniform, determine its weight

3. (a) A stone is thrown vertically upwards from the edges of a platform. Eventually the stone lands without bouncing on the ground below the platform. Taking the upward velocity to be positive sketch on the axis provided the velocity time graph of the motion of the stone.

(b) A car can be brought to rest from a speed of 20 ms^{-1} in a time of 2s

(i) Calculate the average deceleration

(ii) If the driver's reaction time is 0.2s, determine the shortest stopping distance

4. Figure 4 shows a force- distance graph for a car being towed on a horizontal ground

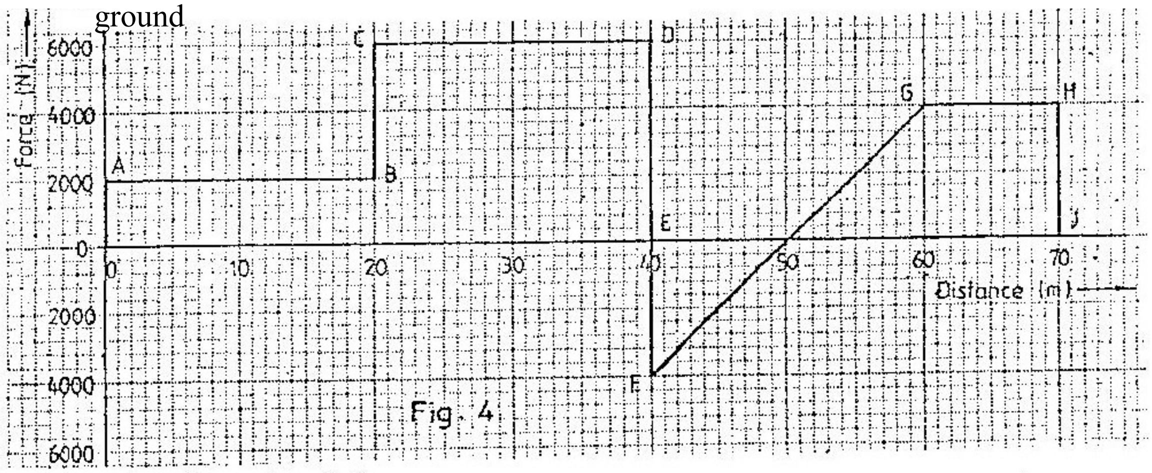


Fig. 4

(a) Calculate the total work done

(b) If the velocity just before reaching point D is $0.6ms^{-1}$, calculate the power developed by the agent providing the force at this point.

(c) An electric pump can raise water from a low level reservoir to the higher – level reservoir at the rate of 3.0×10^5 kg per hour. The vertical height of the water raised 360m. If the rate of energy loss in form of heat is 200KW, determine the efficiency of the pump

5. (a) State two factors that affect the strength of an electromagnet.

(b) In the set up in figure 5, the suspended metre rule is in equilibrium balanced by the magnet and the weight shown. The iron core is fixed to the bench.

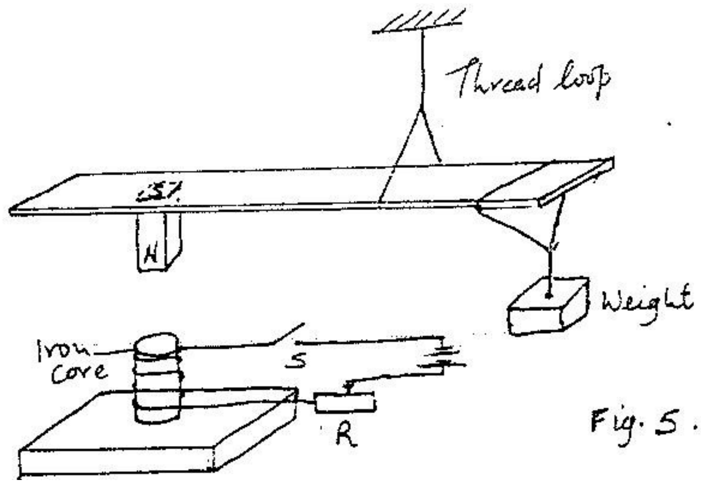


Fig. 5.

(i) State and explain the effect on metre rule when the switch S is closed

(ii) What would be the effect of reversing the battery terminals

(iii) Suggest how the set up in figure 5 can be adapted to measure the current flowing in the current circuit.

(c) Electrons emitted from a metal when light of a certain frequency is shone on the metal are found to have a maximum energy of 8.0×10^{-19}J. If the work function of the metal is 3.2×10^{-19}J, determine the wavelength of the light used.

SECTION II

6. (a) (i) Distinguish between semiconductor and conductors

Semiconductors Conductors

(ii) Give one example of a semiconductor and one for a conductor

Semiconductors Conductors

(b) An **npn** transistor is operating in the common emitter mode

(i) Draw the circuit diagram and indicate the direction of the currents

(ii) Given that the emitter current is 2.0 m A and that 0.5% of the electrons diffusing into the base combine there with holes, determine the values of the base current and the collector current

(ii) By increasing the p.d across the emitter – base junction in (ii), the emitter current increase to 4mA. Determine the transistor current amplification

7. a) i. Distinguish between transverse and longitudinal waves

ii. Give one example of a transverse and one example of longitudinal.

b) Figure 6 shows the displacement of a particle in a progressive wave incident on a boundary between deep and shallow regions.

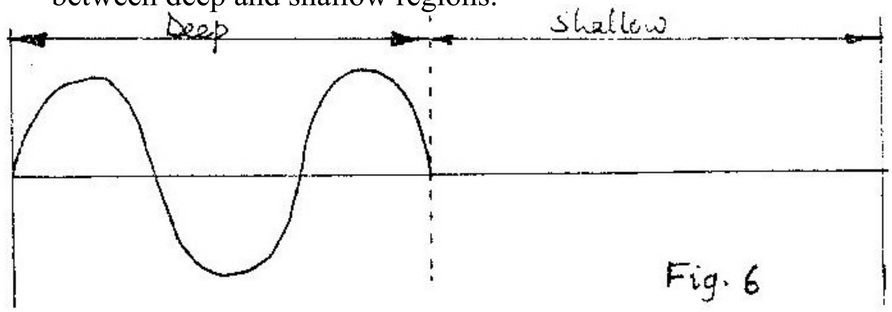


Fig. 6

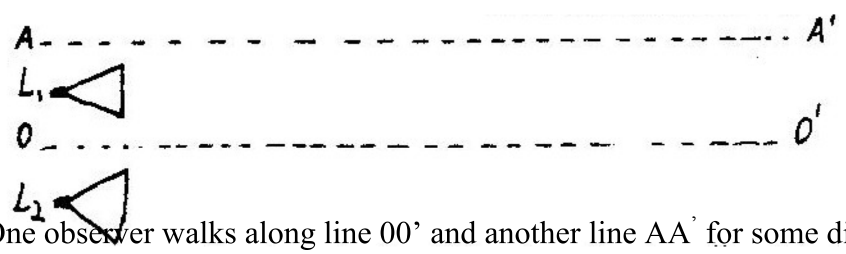
i. Complete the diagram to show what is observed after boundary. (assume no loss of energy)

ii. Explain the observation in (i) above.

(c) Water waves are observed as they pass a fixed point at a rate of 30 crests per minute. A particular wave crest takes 2s to travel between two fixed points 6m apart. Determine for the wave:

(a) The frequency (1mk) (b) Wavelength (3mks)

(d) Figure 7 shows two loud speakers L_1 and L_2 connected to a signal generator



One observer walks along line 00' and another line AA' for some distance. Describe the observations made by each observer and give reasons for your answer.

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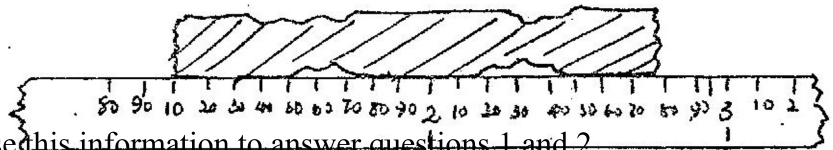
Acceleration due to gravity, g, = 10 ms²

1. Figure 1 shows a fencing post whose length is being measured using a strip of a measuring tape.



Use this information to answer questions 1 and 2.

Fig. 1

1. State the accuracy of the tape:
2. What is the length of the post?
3. A heating coil rated 1000 W takes 15 minutes to heat 20kg of a liquid from 26°C of 42°C. Determine the specific heat capacity of the liquid.
4. State one industrial use of X – rays
5. A metal pin was observed to float on the surface of pure water. However the pin sank when a few drops of soap solution were carefully added to the water. Explain his observation.
6. Figure 2 draw to scale shows a lens L1 placed 30cm fro an object O. The image is formed on the screen S 50cm from the lens.

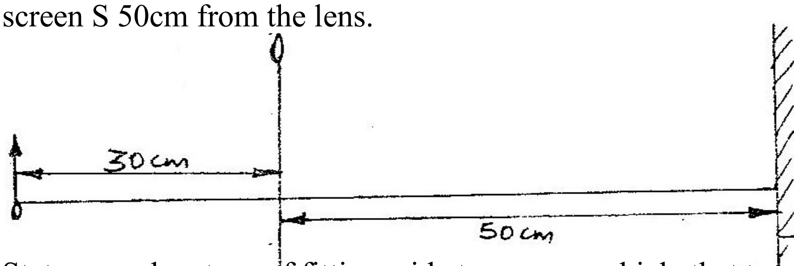


Fig.2

7. State one advantage of fitting wide tyres on a vehicle that moves on earth roads.
8. The primary coils of a transformer has 2000 turns and carries a current of 3A. If the secondary coil is designed to carry a current of 30A, calculate the maximum number of turns in the secondary coil.
9. Water of mass 3kg at a temperature of 90°C is allowed to cool for 10 minutes. State tow factors other than humidity, that determine the final temperature.
10. A car battery requires topping up with distilled water occasionally. Explain why this is necessary and why distilled water is used.
11. The internal resistance of the cell, E in figure 3 is 0.5 ohms.
    Determine the ammeter reading when the switch S is closed.

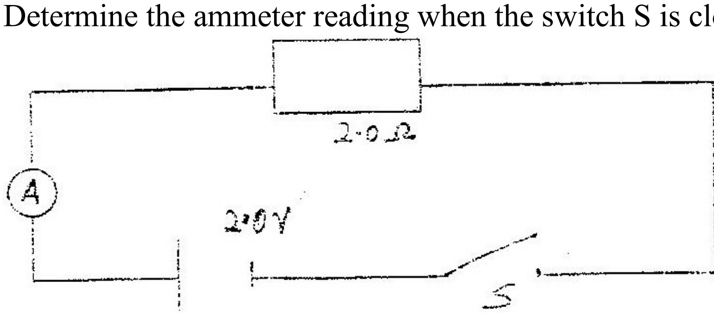


Fig.3

12. The activity of a radioactive substance, initially at 400 counts per second reduces to 50 counts per second in 72 minutes. Determine the half – life of the substance.
13. State the reason why a voltmeter of high resistance is more accurate in measuring potential differences, that one of low resistance.
14. Explain how hammering demagnetizes a magnet
15. cc
16. In figure 4 one end of a metal rod is placed in steam and the other end in melting ice. The length of the rod in between in lagged.

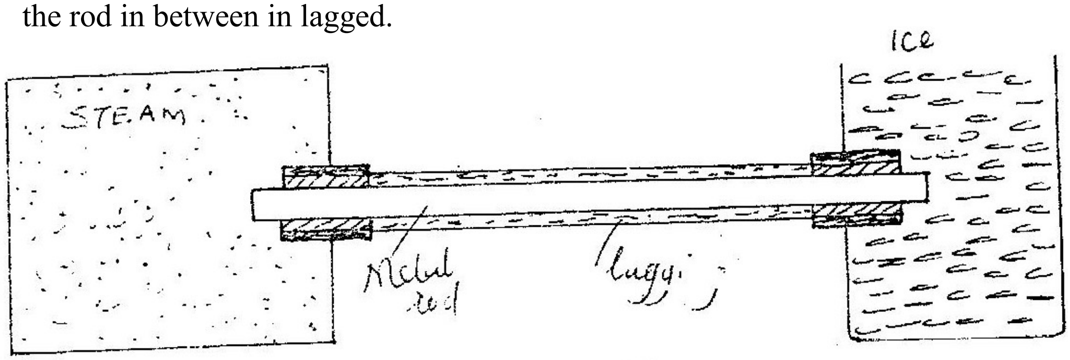


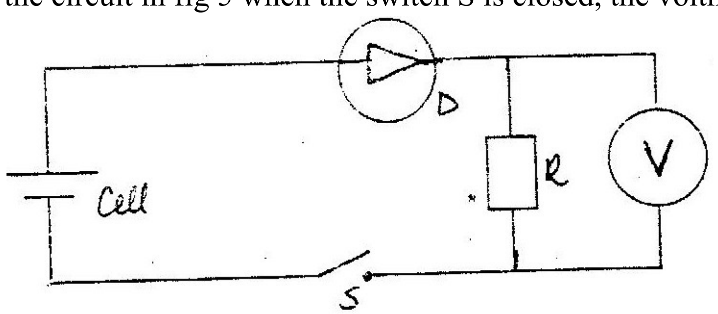
Fig. 4

State two factors that determine the rate at which ice melts.

17. Calculate the length of a wire required to make a resistor of 0.5 ohms, if the receptivity of the material is 4.9 x 10-7 Ω m and the cross sectional area is 2.0 x 10^{-6-2}
18. State the reason why the amplitude of a simple pendulum decreases with time.
19. State two differences between the cathode ray tube (CRT) of a TV and the cathode ray oscilloscope (CRO)
20. Table 1 carries information on the type of radiation, detector and use for some of the electromagnetic radiations. Fill in the blanks.

Type of radiation	Detector	Used
Microwave	Microwave receiver	
Visible light		Seeing / vision

21. In the circuit in fig 5 when the switch S is closed, the voltmeter shows a reading.



When the cell terminals are reversed and the switch is closed, the voltmeter reading is zero. Explain these observations.

22. A body of mass M is allowed to slide down an inclined plane. State two factors that affect its final velocity at the bottom of the incline.
23. Cleavage in crystals is possible in certain directions only. Explain this observation.
24. John carried a uniform post of mass 20kg horizontally on his shoulder as shown in fig 6. He placed the post on his shoulder such that the centre of gravity of the pole is 1.0m behind him. He balanced the post by applying a downward force F at a point 0.5m on the part of the post in front of him.

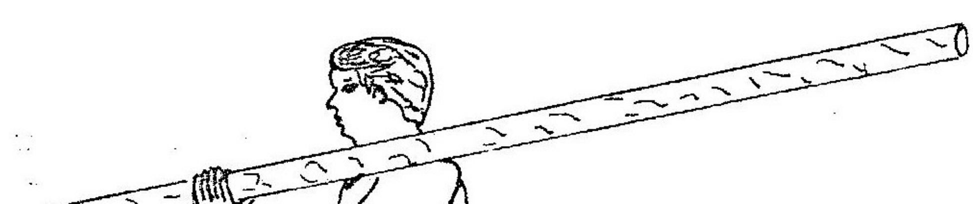


Fig 6
Determine the value of the force F.

25. Fig 7 shows a graph of pressure P, against volume, V, for a fixed mass of gas at constant temperature.

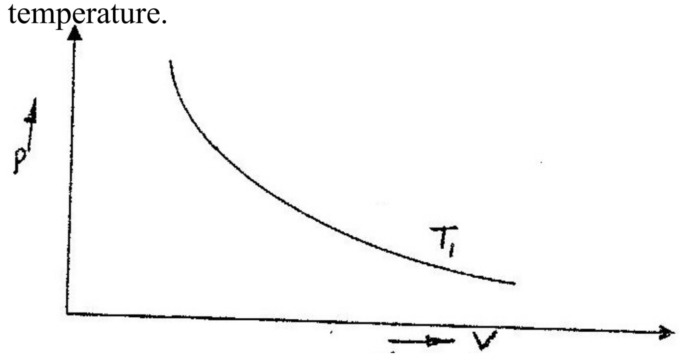


Fig 7

Sketch on the same axes a graph for the same mass of gas with a temperature T_2 lower than T_1

26. State two factors that would raise the boiling point of water to above 100oC
27. During total eclipse of the sun, both light and heat are observed to disappear simultaneously. Explain the observation.
28. What determines the quality of a musical note?
29. Fig. 8 shows a car of mass M moving along a curved part of the road with a constant speed.

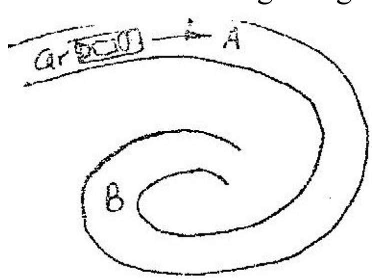


Fig 8
Explain the fact that the car is more likely to slide at B than at A if the speed is not changed.

30. Fig 9 shows a Bunsen burner.

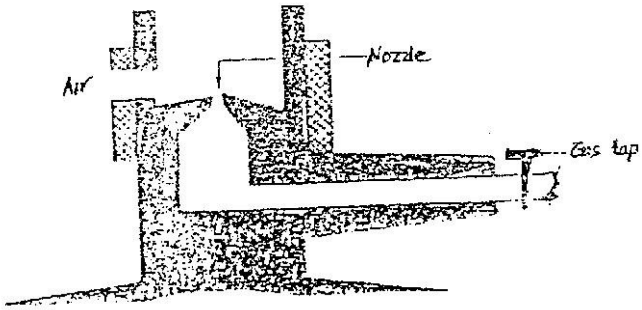


Fig. 9

Use Bernoulli's principle to explain how air is drawn into the burner, when, the gas tap is opened.

31. Fig 10 shows a fire alarm circuit.

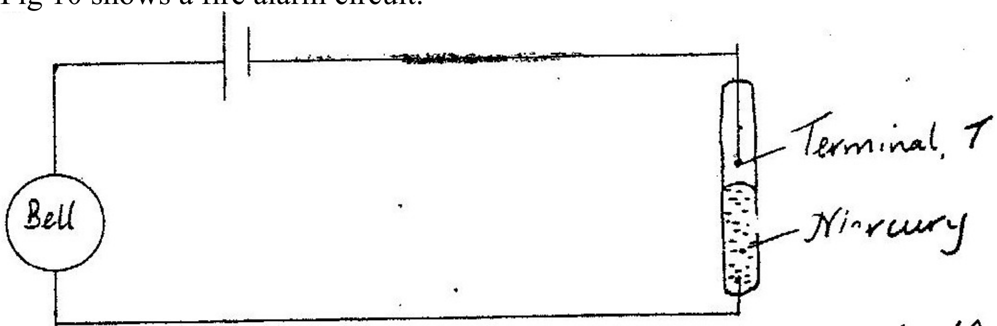


Fig. 10

Explain how the alarm functions.

32. Fig 11 shows a double slit placed in front of a source, s of waves, a director D is placed beyond the slits, such that its position can be adjusted along the line XY.

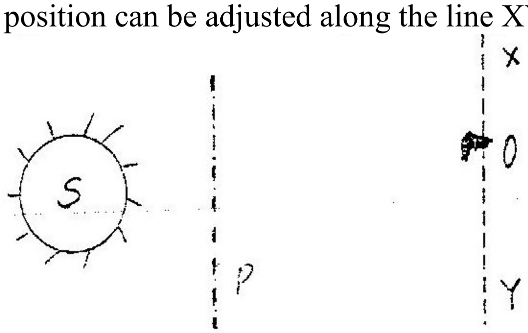


Fig. 11

State with a reason, what the detector records along XY.

33. What is meant by virtual image?

34. Fig 12 shows a body of weight 50N placed on a surface which is inclined at an angle of 30^0 to the horizontal . The body experiences a maximum frictional force of 29N with the surface.

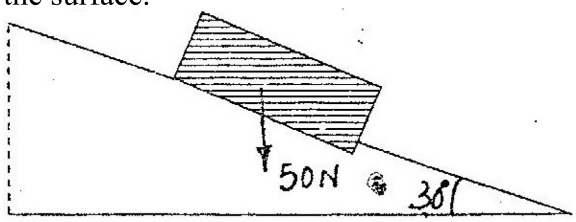


Fig. 12

Determine the force required to move the body, up the inclined with constant velocity.

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1.a) In an experiment to determine the strength of an electromagnet, the weight of pins that can be supported by the electromagnet, was recorded against the number of turns. The current was kept constant throughout the experiment. Table 1 shows the data obtained.

Number of turns, n,	0	4	8	12	16	20	24	28	32	36
Weight, of pins x 10-3(N)	0	4	14	30	58	108	198	264	296	300

Table 1

(i) Plot a graph of weigh, W (y-axis) against the number of turn's n

(ii) Use the domain theory to explain the nature of the curve.

(iii) Sketch on the same axes, the curve that would be obtained using a higher current.

b) Using a labeled diagram, explain the working of a simple relay.

2a) You are provided with two straight open tubes each about 1m long, a sound source, a sound detector and a reflecting surface. With the aid of a labeled diagram, describe an experiment to show that the angle of incidents is equal to reflection for sound waves.

b)Fig. 1 shows a block with a graduated side, and of dimension 4cm x-4cm x 4cm x 16cm, just about to be lowered into a liquid contained in an overflow can.

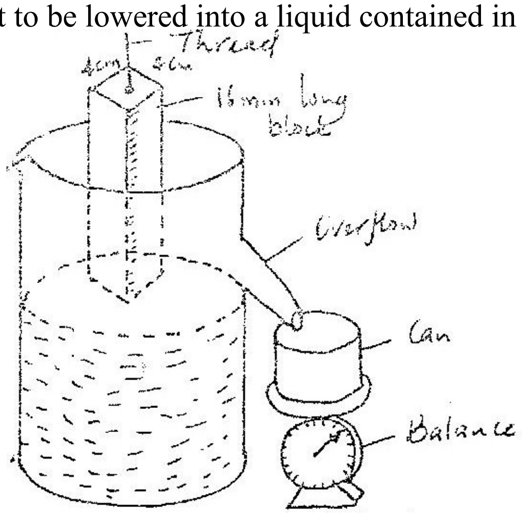


Fig. 1

During an experiment with this set-up, the following information was recorded;

-The block floated with three quarters of it submerged

-Initial reading of balance=0 grammes

-final reading of balance= 154 grammes.

Use the information to determine the density of the:

(i) Block (ii) Liquid

(Use g= 10ms2 . give your answers to 1 decimal place.)

3 a) A gun is fired vertically upwards from the top of 2 open truck moving horizontally at a uniform velocity of $50ms^{-1}$. The bullet achieves a maximum height of 45m. State with reason whether or not the bullet will land on the truck.

(i) Calculate the distance covered by the truck just before the bullet reaches the level from which it was fired. (Use g =10 ms^{-2})

b) Figure 2 shows a set-up that may be used to verify Boyle's law.

Fig 2

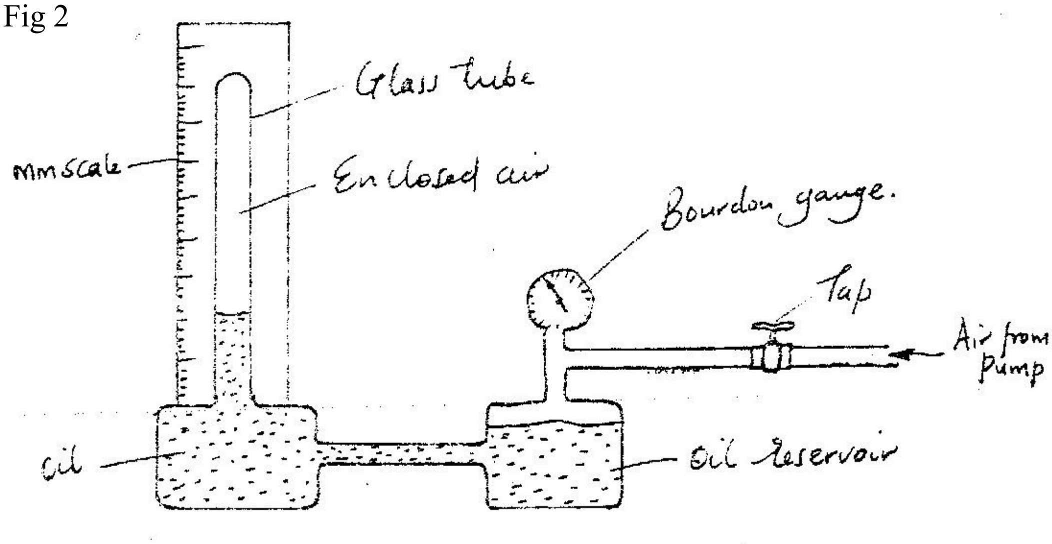


Fig. 2

i) Describe the measurements that should be taken in the experiment

ii) Explain how the measurements taken in (i) above may be used to verify Boyle's law.

4 a) In an experiment to determine the rate at which solar energy is absorbed by a surface, an aluminum block, coated black and fitted with a heater (Fig. 3) is exposed to the sun, for a period of time. The temperature rise in noted. After the temperature of the block is allowed to fall to the initial temperature, the block is electrically heated to the temperature.

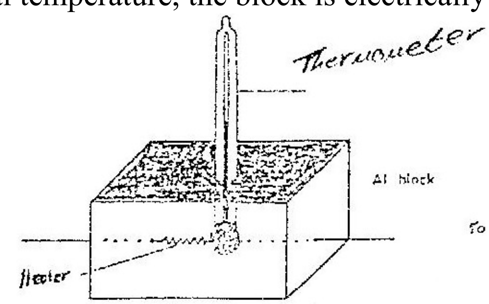


Fig. 3

(i) Draw and labeled a circuit diagram that would be used to determine the electrical energy.

(ii) State the measurements that would be taken in (a)(i) to determine the rate of heating of the block.

(iii) Explain how the measurements stated in (a) (ii) would be used to determine the rate of heating of the block by the sun.

b) Fig 4 shows a photocell

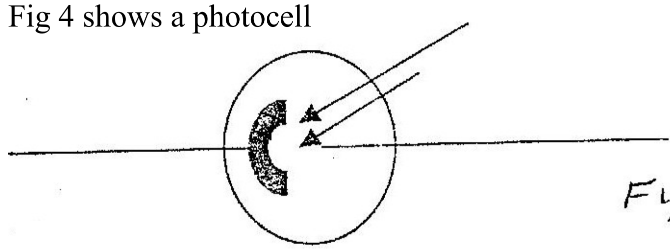


Fig. 4

(i) Label the cathode and anode.
(ii) How are electrons produced in the cell/
(iii) Draw a simple circuit including the photocell to show the direction of flow of current
(iv) Calculate the photon energy in ultraviolet radiation whose frequency is 8.60×10^{14} HZ. (Plank's constant $h=6.63 \times 10^{-34}$ Js)

5. a) A ray of white light is incident on one face of a rectangular glass prism.
i) Draw a ray diagram to illustrate the dispersion of white light by the prism, showing only the red ® and violet (V) rays.
ii) On the same diagram drawn in (i) mark and label the initial angle of incidence, 1, and the angles of reflection on the first face for red r_R and for violet r_V.
iii) Snell's law for the red and colours can be written as

$$nr = \frac{\text{Sin } I}{\text{Sin } r_R} \text{ and}$$

b) Calculate the critical angle for a material whose refractive index is 1.40.

SECTION II

6. Fig 5 shows a circuit for charging and discharging a capacitor; e, through a variable resistor R, X Y and T are points on a two-way switch.

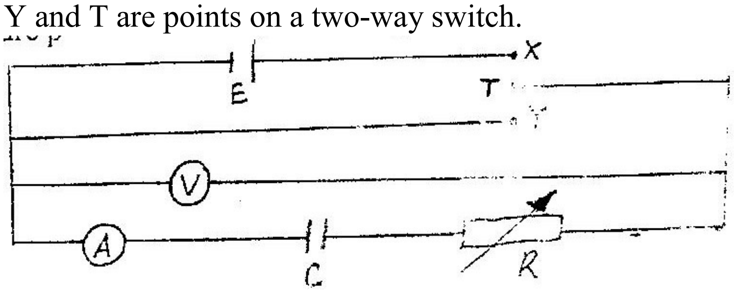


Fig. 5

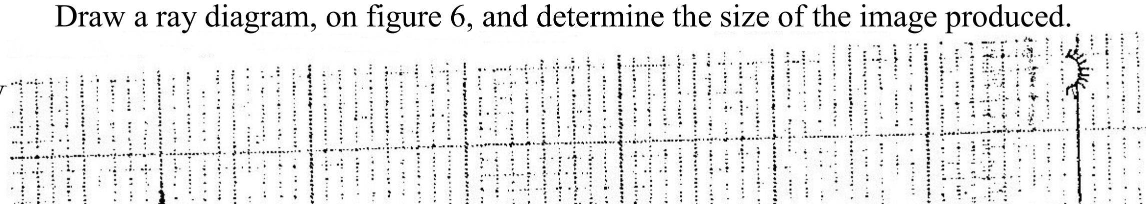
a) Explain how the charging and discharging processes are achieved.
b) Table 2 show the variation of the charge q with time t when a 500u F capacitor was discharged though a resistor.

Time, t, (s)	0	20	40	60	80	100
Charge, 0 (μc)	300	150	75	38	19	10

Table 2

(i) Plot a graph of charge 0 (y axis) against time.
(ii) Determine the current flowing in the circuit at t =30s. (Give your answer to 1 decimal place)

7 a) Fig. 6 shows an object, 0.3cm high placed in front of a concave mirror. C is the centre of curvature of the mirror. The diagram is drawn to scale: (1cm: 2cm)
Draw a ray diagram, on figure 6, and determine the size of the image produced.



b) Table 3 shows the object distance y and the corresponding image distance v, for an object placed in front of a concave mirror.

U(cm	20	25	30	40	50	70
V(cm	20	16.7	15	13.3	12.0	11.6
1/v(cm-1)						
V(cm-1)						

Table 3

i) Complete the table and plot a graph of 1/v (y-axis) against 1/u (give your answers to 3 decimal places).

ii) From the graph, determine the focal length of the mirror.

PHYSICS PAPER 232/1 K.C.S.E 1999

1. What is the reading on the vernier calipers shown in figure 1?

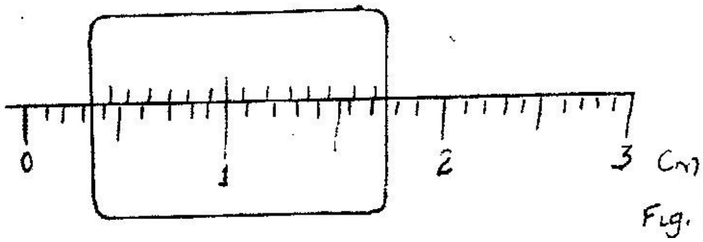


Fig. 1

2. Figure 2 shows forces f1 and F1 and F2 acting on a meter rule such that it is in equilibrium.

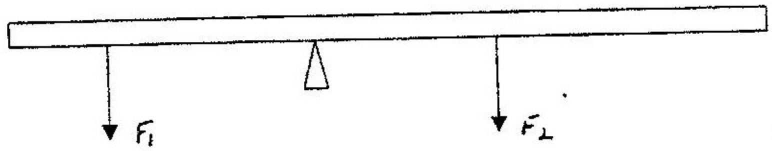


Fig. 2

Mark on the figure a third force F3 acting on the rule such that it is in equilibrium maintained.

3. state how the position of the centre of gravity of a body in stable equilibrium changes to that in the rest position when the body is slightly tilted and then released.

4. A vacuum pump was used to pump out air from the glass tube immersed in liquids as shown in figure3.

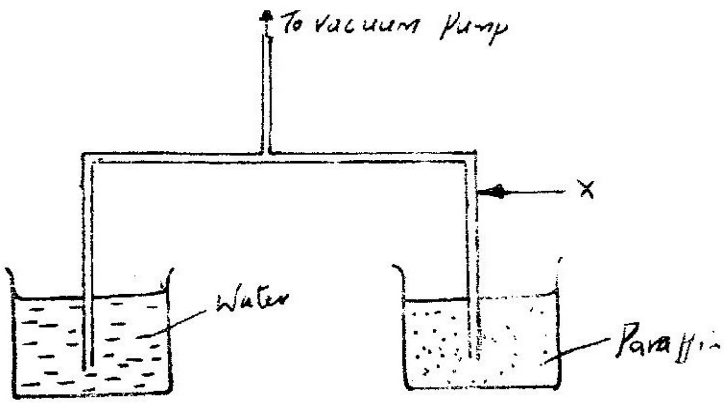


Fig. 3

After sometime the level of paranum rose to position A. Mark 1, the corresponding position for the water level. Give a reason for your answer.

5. Fig. 4 shows a capillary tube placed in though of mercury.

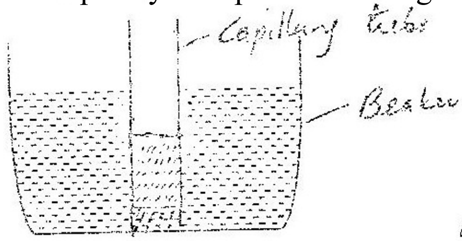


Fig. 4

Give a reason why the level of mercury in the capillary tube is lower than in the beaker.

6. Figure 5 shows a bimetallic strip at room temperature. Brass expands more than invar when heated equally.

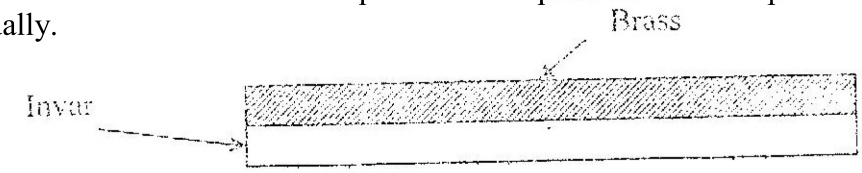


Fig. 5

Sketch the bimetallic strip after being cooled several degrees below room temperature.

7. In an experiment to study the atoms of gold, a beam of α- particles was directed onto a thin sheet of gold. The following observations were made:
   (i) Majority of the particles went straight through undeflected
   (ii) A few particles deflected through varying angles up to 180.

8. Figure 6 shows a ray of light incident on plane mirror at point O.

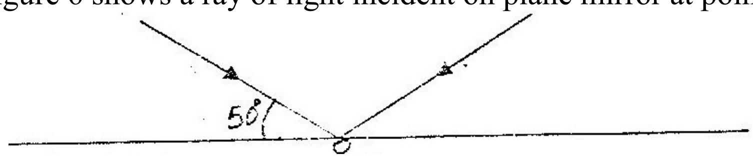


Fig. 6

The mirror is rotated clockwise through an angle 30^0 about an axis perpendicular to the paper. Determine the angle through which the reflected ray rotated.

9. Figure 7 shows a sharp pin fixed on a cap of leaf electroscope. The electroscope is highly charged and then left for sometime.

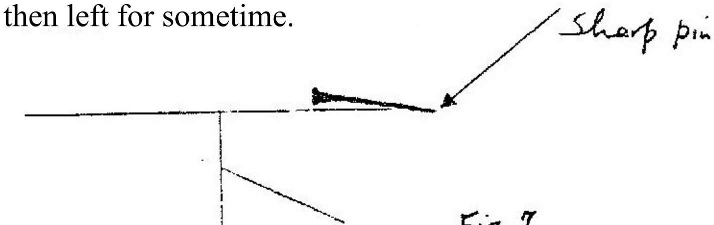


Fig. 7

Explain why the leaf collapses

10. Determine the ammeter reading when a p.d of 3.0 volts is applied across Pq in figure 8.

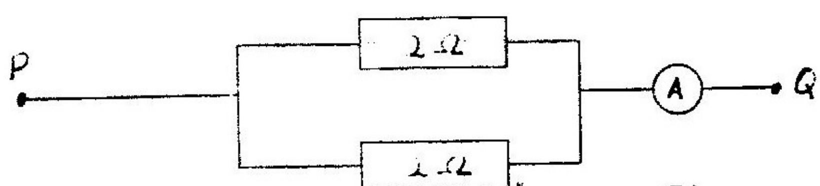
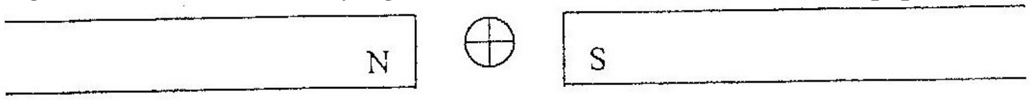


Fig. 8

11. A wire fixed at one end extends by 4mm when a load of 20N is suspended from the other end. Determine the load that would cause an extension of 1.5 mm on the wire (assume elastic limit is not exceeded)

12. How can it be shown that the strength of a magnet is concentrated at the poles?

13. Figure 9 shows a wire carrying a current whose direction is into the paper.



The wire is placed in a magnetic field. Fig. 9

Indicate on the figure the direction of the force acting on the wire.

14. Determine the moment of the couple shown in figure 10.

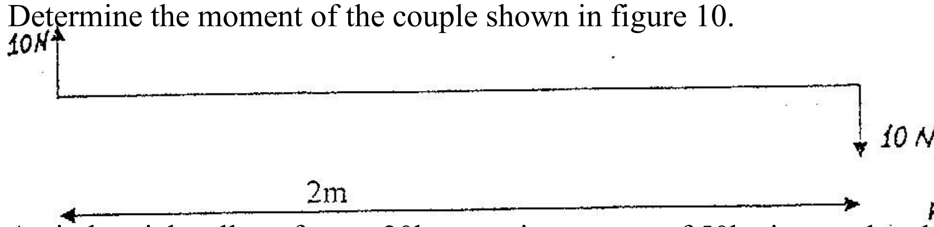


Fig: 10

15. An industrial trolley of mass 20kg carrying a mass of 50kg is acted on by a constant force. The trolley moves along a horizontal smooth surface with an acceleration of 0.5ms -2 . Determine the acceleration of the trolley after the mass falls off.

16. Figure 11 is a graph which shows how the vertical height through which a machine raises a mass 20kg varies with time.

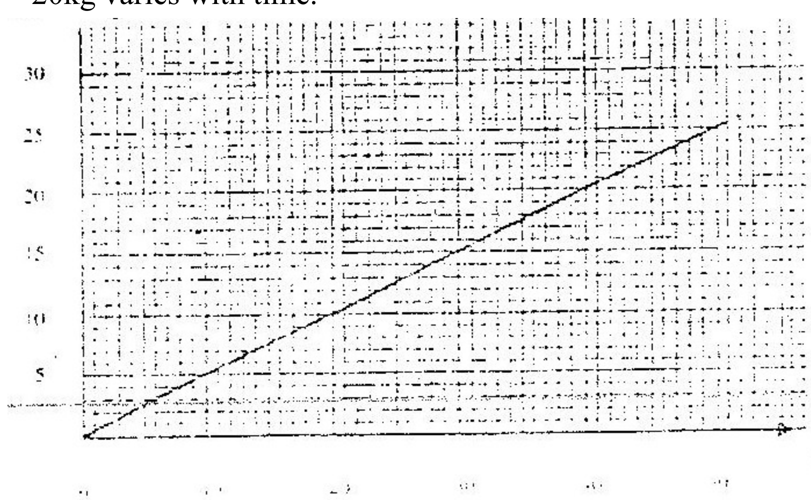
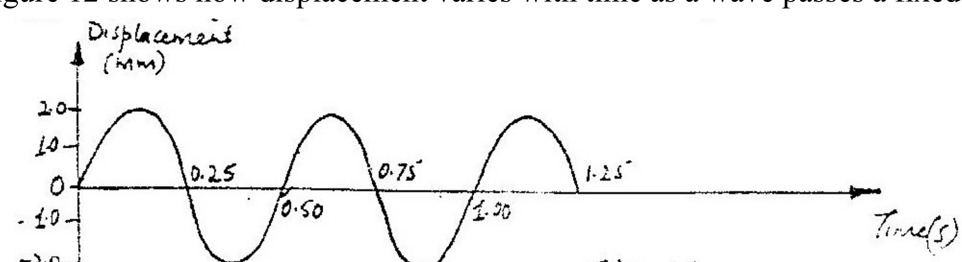


Fig. 11

Determine the power output of the machine after 40 seconds.

17. Figure 12 shows how displacement varies with time as a wave passes a fixed point.



Determine the frequency of the waves. Fig. 12

18 Two tuning forks of frequencies 256Hz and 258 Hz are sounded simultaneously and then placed close to each other, calculate the beat frequency.

19. When a current of 2.0 flows in a resistor for 10 minutes, 15,000 joules of electrical energy is displaced. Determine the voltage the resistor.

20. A substance of mass 2kg and specific heat capacity 400 Jkg K initially at 81^0C is immersed in water at 20^0C. If the final temperature is 21^0C. Determine the mass of water. (The specific heat capacity of water is 4200j/kgK). Give your answer to 1 decimal place.

21. A galvanometer of internal resistance 50Ω gives a full-scale deflection when a current of 10mA passes through it. Determine the value of the resistance required to convert the galvanometer to a voltmeter with full-scale deflection of 5 volts.

22. A microscope is focused on a mark on horizontal surface. A rectangular glass block 30mm thick is place on the mark. The microscope is then adjusted dd10mm upwards; to bring the mark back to focus, determine the refractive index of the glass.

23. State the energy transformation when fast moving electrons are suddenly stopped by a target in an X- ray tube.

24. A bullet is fired horizontally at a target. Neglecting air resistance give a reason why the horizontal acceleration of the bullet is zero.

25. Figure 13 shows a section of a pipe PQ. A constant pressure difference maintains a streamline flow of a liquid in the pipe.

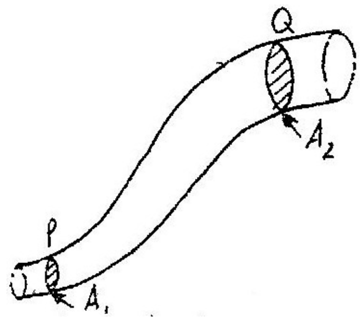


Fig. 13

If the cross-sectional area A_1 at P is less than A_2 at Q, state how the liquid velocity. V_2 at Q compares with velocity V_1 at P.

26. The figure 14 is a resistor-capacitor circuit. At time t=0, the switch is closed at A for sometime, and then opened. The switch is them closed at B for sometime.

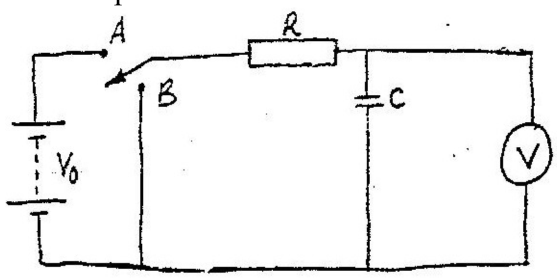
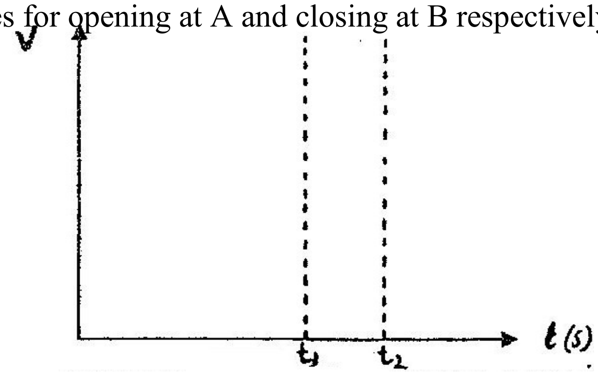


Fig. 14

On the axis provided, sketch the graph of voltage V across the capacitor against time t(t1 and t2 represents times for opening at A and closing at B respectively).



27. Determine the pressure required to compress a gas in a cylinder initially at 20^0C and at a pressure 1.03×10^{-5} to one-eight of its original volume.
28. Arrange the following in order of increasing frequencies –Gamma radiation, radio waves, infrared, and X –rays.
29. A concrete block of volume V is totally immersed in seawater of density p. Write an expression for the up thrust on the block..
30. It is observed that when ultraviolet light is shone onto a clean zinc plate connected to the cap of negatively charged leaf electroscope, the leaf collapse. Explain this observation.

31. Figure 15 shows two masses 0.1kg and 0.2kg connected by a string through a hole on a smooth horizontal surface.

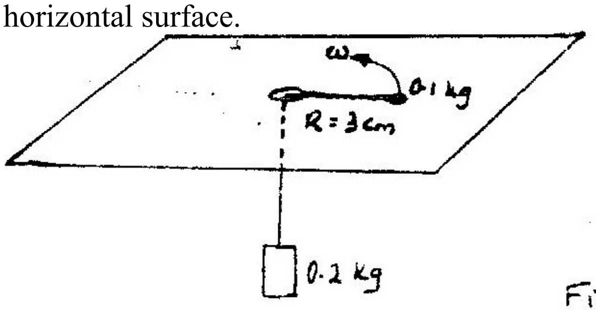


Fig. 15

The 0.1kg mass rotates in a horizontal circle of radius 3cm. Calculate the angular velocity of the mass when the system is in equilibrium. Use acceleration due to gravity g= 10ms-2

32. Sketch a diagram to show the position of an object, when a converging lens is used as an magnifying glass.

33. Figure 16 shows a wire XY at right angles to a magnetic field. XY is part of circuit containing a galvanometer.

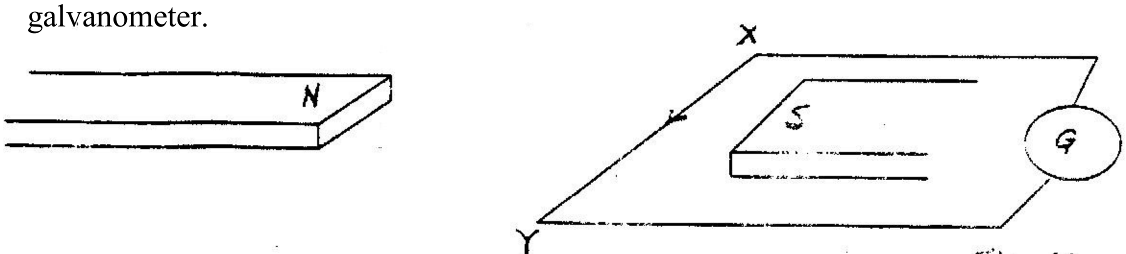


Fig. 16

XY is moved

34. Figure 17 shows the electric wiring of an electric heater A, B, C are the main wires.

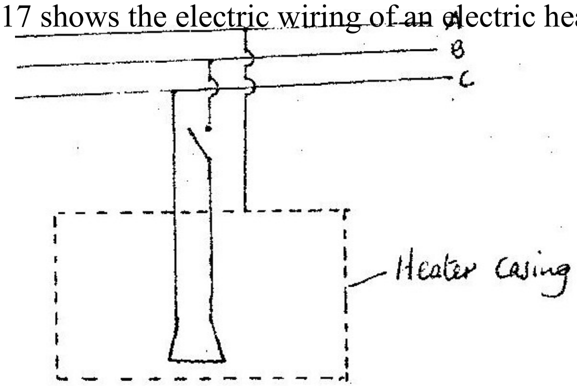


Fig. 17

Identify A ,B, and C.

35. A radioactive nuclide of atomic number z emits a beta particle and gamma rays. State the atomic number of the new nuclide.

PHYSICS PAPER 232/2 K.C.S.E 1999.

1 a) Distinguish between longitudinal and transverse waves
Longitudinal waves - Transverse waves –

b) In the Young's double slit experiment, and interference pattern of bright and dark fridges was formed as shown in figure 1 by alight of wavelength coming from two narrow slits X and Y.

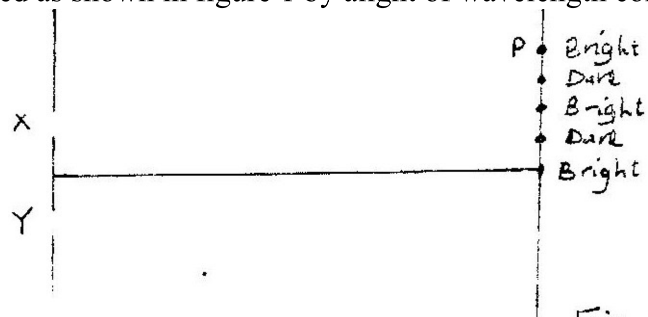


Fig. 1

i) Write an expression for the path difference between XP and YP where corresponds to the 2nd bright fringe.

ii) Explain how the dark and bright fringes are formed.

iii) State and explain what would be observed on the screen if the slits X and Y were made large.

c) Figure 2 represents a displacement – time graph for a wave.

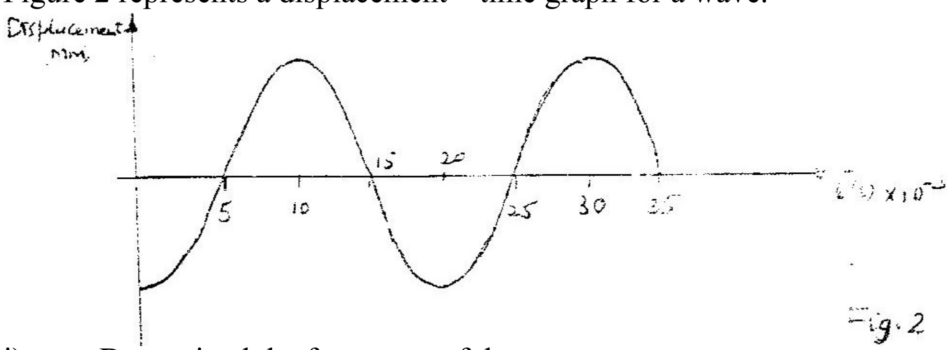


Fig. 2

i) Determined the frequency of the wave.

ii) Sketch on the same axes, the displacement – time graph of a wave of the same frequency but 180^{o} out of phase and with a smaller amplitude.

2 a) An object O placed in front of a converging lens L^{o} forms an image 1 on the other side of the lens. Another converging lens L_C placed such that the two lenses form a compound microscope.

i) Draw a reason of the set up and sketch the rays to show how the final image is formed.

ii) Give a reason why the focal length of L_o must be greater than that of L_c

b) An object is placed 30cm from a converging lens. A focused image is formed on a screen placed 30cm from the same lens on the other side. The screen in now moved 5cm towards the lens. Determine the distance the object must be moved so that a focused image is formed on the screen.

3. A tape attached to a moving trolley is run through a ticker timer. Figure 3 shows a section of the tape after running.

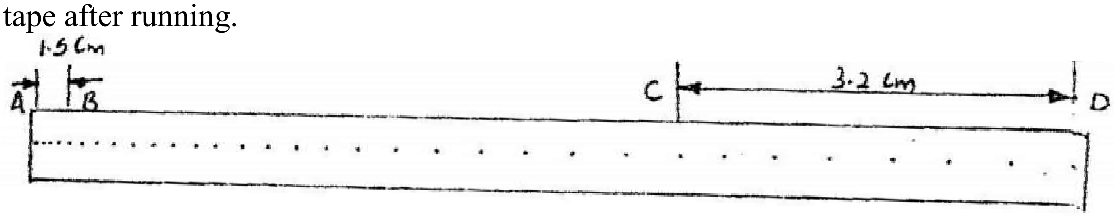


Figure 3.

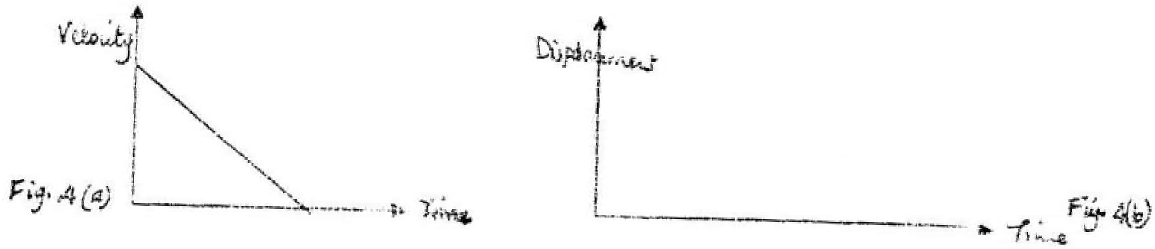
If the frequency of the ticker – timer is 50Hz, determine the:

i) Average velocity at intervals AB and CD.

ii) A average acceleration of the trolley.

b) A stone is released from a height, h. if the acceleration due to gravity is g, derive an expression of the velocity of the stone just before hitting the ground.

c) Figure 4 (a) shows a velocity – time graph of an object in motion.



Sketch on the axes provided in figure b4 (b0, the displacement – time graph of the Motion (Motion upwards is taken as positive.

4. Figure 5 represents a simple voltage amplifier circuit.

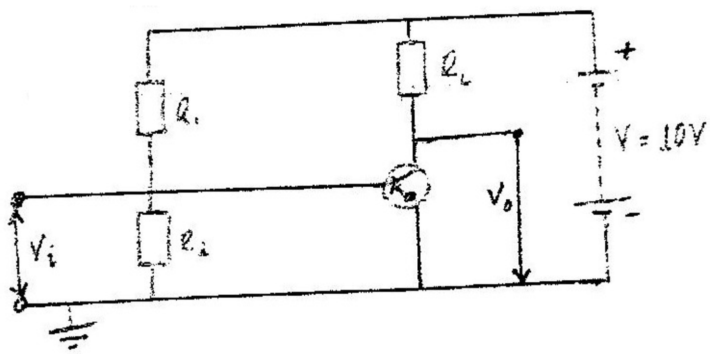


Figure 5

a) i) Identify the transistor in the circuit.

ii) Explain how the base bias is produced.

iii) Describe how an alternating signal that is fed in the input V1 is amplified.

b) When a signal is fed in the input, the collector current is 2.5mA. If the current gain is 62.5 and the voltage across the transistor (V_{CE}) is 4.5V determine the :

i) Power rating of the heater   ii) Current flowing in the circuit.

5a) A circuit consists of a battery, a metal wire, an ammeter and a switch connected in series. The switch is closed and the ammeter reading noted. The metal wire is now heated. State the observations made on the ammeter reading and give a reason for your answer.

b) An electric heater is made of a wire of resistance 100Ω and connected to a 240V mains supply. Determine the:

i) Power rating of the heater   ii) Current flowing in the circuit.

iii) Time taken for the heater to raise the temperature of 200g of water from 23°C to 95°C.(Specific heat capacity of water is $4200^{-1}K^{-1}$)

iv) Cost of using the heater for two hours a day for 30 days.(The power and lighting company charges Kshs 5.00 per kilowatt – hour).

SECTION II

6a) Explain the following observations: ice cube float on water and solid benzene sinks in liquid benzene.

bi) You are provided with the following:

-An overflow can - A beaker -A spring balance
- A metal block -Water and - String

Describe an experiment to verify Archimedes principle.

ii) A block of wood weighing 2.0N is held under water by a string attached to the bottom of a container. The tension in the string is 0.5N. Determine the density of the wood.

ci) Define half – life of a radioactive material.

ii) Figure 6 shows a graph of the variation of the number of atoms of a certain radioactive material with time.

Figure6: Determine the half – life of the material

7a) Figure 7 shows a photoelectric cell cirucuit:

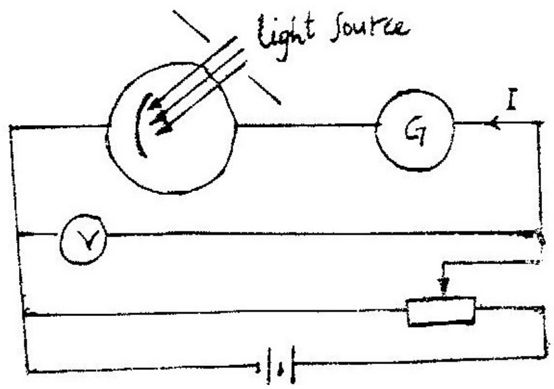


Fig. 7

The intensity of the light can be varied.

i) Describe how the circuit may be used to show how the current I varies with the potential difference V across the cell.

ii) Sketch on the same axis graphs of I versus V for three different values of light intensity E_1E_2 and E_3 such that $E_3>E_2>E_1$

b) Using a circuit similar to the one in figure 7. with the polarity of the batteries reversed, the frequency, of the light was varied at constant intensity. For each frequency, the potential difference was varied until the current was equal to zero. The value of this voltage, V_{co} was noted. The graph in figure 8 shows the relation between V_{co} and the frequency , of the incident light.Feom the graph, determine the:

i) Value of planks constant, h (charge an electron e = 1.6 x 10^{-19}Colubomb)

ii) Work function, φ , of the cathode surface of the cell . (Give your answers to 2 decimal places.)

PHYSICS PAPER 232/1 K.C.S.E 2000

1. Fig 1 shows part of a measuring cylinder calibrated in cm^3 containing water whose level is indicated. Some 3.0cm of is added into the cylinder. Indicate on the diagram the new level of water.

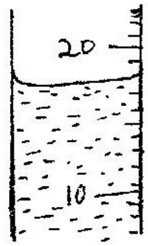


Fig. 1

2. A bag of sugar is found to have the same weight on planet earth as an identical bag of dry sawdust on planet Jupiter. Explain why the masses of the two bags must be different.
3. Fig. 2 shows a beaker placed on a bench. of ice is placed in the beaker as shown.

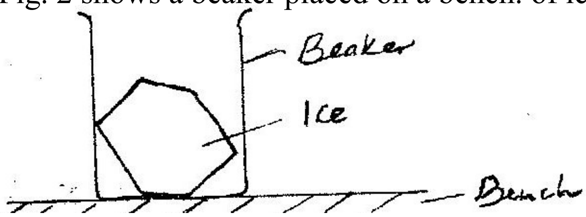


Fig. 2

State and explain the change in the stability of the beaker when the ice melts.

4. A positively charged rod is brought near the cap of a leaf electroscope. The cap is the earthed momentarily by touching with the finger. Finally the rod is withdrawn. The electroscope is found to be negatively charged. Explain how this charge is acquired.

5. Fig. 3 shows a device for closing a steam outlet.

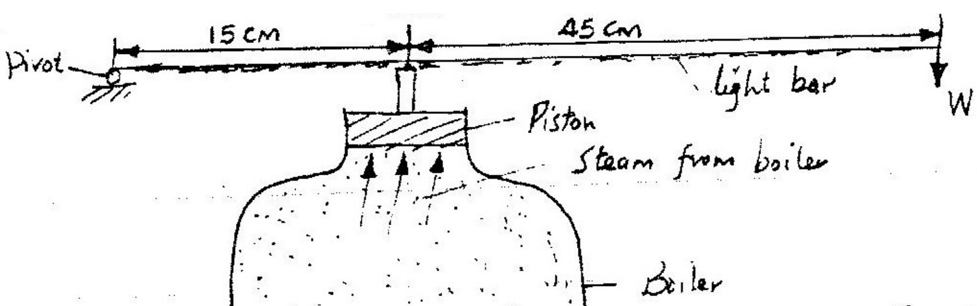


Fig. 3

The area of the position is 4.0 x 10-4 m2 and the pressure of the steam in the boiler is 2.0 x 105 Nm^3. Determine the weight W that will just hold the bar in the horizontal position shown.

6. State the reason why gases are easily compressible while liquids are solids are not?

7. Fig. 4 shows a bimetallic thermometer.

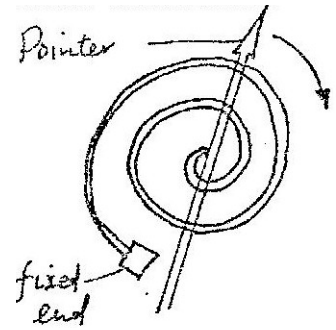


Fig. 4

Explain how a rise in temperature causes the pointer to move in the direction shown.

8. A wooden bench and a metal bench are both left in the sun for along time. Explain why the metal bench feels hotter to touch.

9. Fig. 5 shows an object O placed infront of a plane mirror.

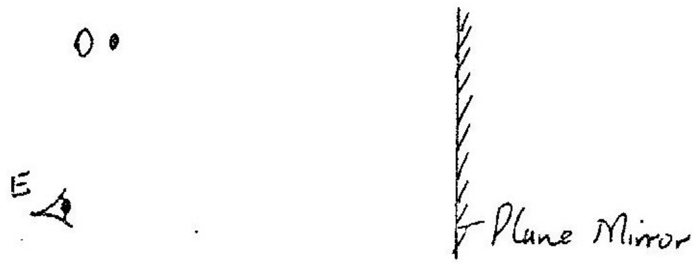


Fig. 5

On the same diagram draw rays to locate the position of the image I, as seen from the eye E.

10. State one advantage of an alkaline accumulator over a lead – acid accumulator.

11. The structure in fig. 6 is in equilibrium. Identify the struts and the ties in the structure.

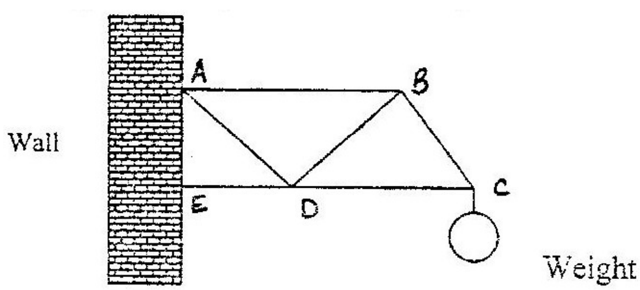


Fig. 6

12. Fig. 7 shows how magnets are stored in pairs with keepers at the ends

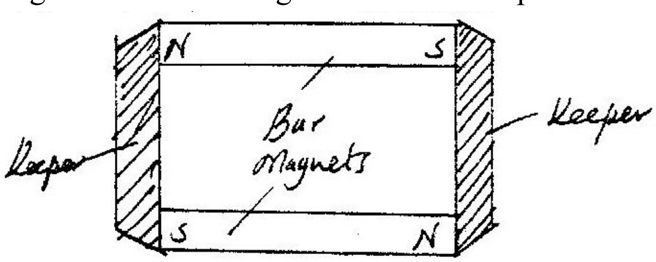


Fig. 7

Explain how this method of storing helps in retaining magnetism longer.

13. In fig 8 the arrow indicates the directions of the current in the conductor.

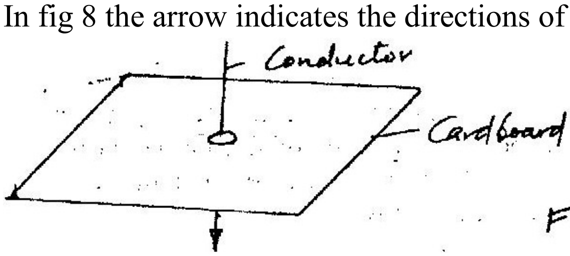


Fig. 8

Sketch on the diagram the magnetic field pattern due to the current.

14. In fig 9 the couple represented by forces F1 is acting on light uniform bar.

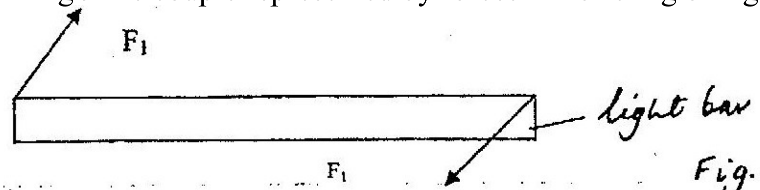


Fig. 9

Sketch on the figure a couple represented by forces F2 such that the bar is in equilibrium. And the forces F2 have minimum magnitude.

15. Fig 10 shows a pulley system being used to raise a load. Use the information given in the figure to answer the questions 15 and 16.

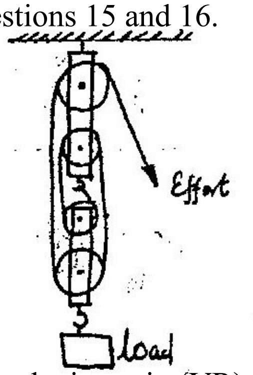


Fig. 10

Determine the velocity ratio (VR) of the system.

16. If a load on 100N is raised by applying an effort of 28N, determine the efficiency of the system.
17. Give one example of a longitudinal wave.
18. In fig. 11 ammeters have negligible resistance and the cells are all identical.

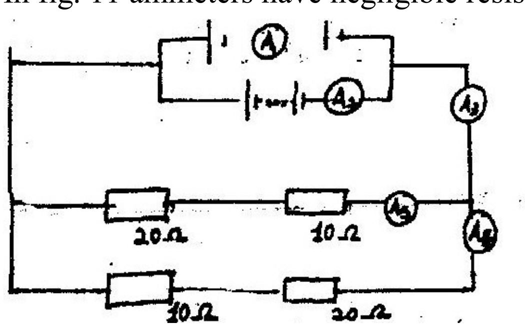
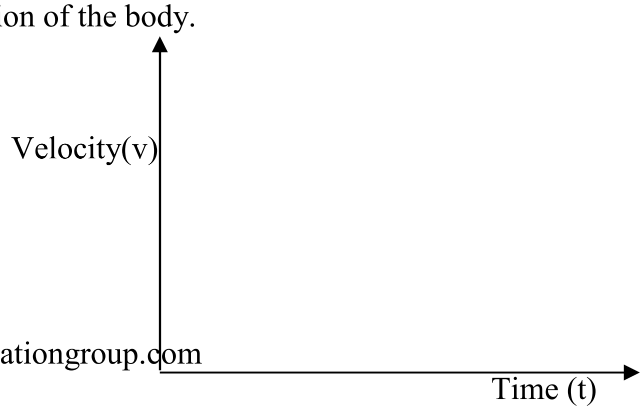


Fig. 11

Show that all the ammeters A1, A2, and A5 have the same reading.

Let A's represent current thought the ammeters using the Kirchoffs law.

19. An electric bulb rated, 40W is operating on 240V mains. Determine the resistance of its filament.
20. A body initially resting on horizontal surface is accelerated by a constant force. It passes over a small region where it experiences a force of friction equal to the accelerating force before returning to the frictionless horizontal surface. On the axes provided, sketch the velocity time graph for the motion of the body.



21. A wire is stretched between two fixed points such that when it is plucked, it produces sound. Explain why the pitch of the sound produced may become lower when the temperature of the surrounding rises.

22. Two identical blocks of copper are taken from the same furnace. One block is dropped into a well - lagged calorimeter containing 200g of methylated spirit. Both water and spirit were initially at the same temperature. After being given time to stabilize the temperature, it was found that more spirit than water had evaporated.
State two factors that could have caused this difference.

23. Fig. 12 shows a ray of light incident on a convex mirror.

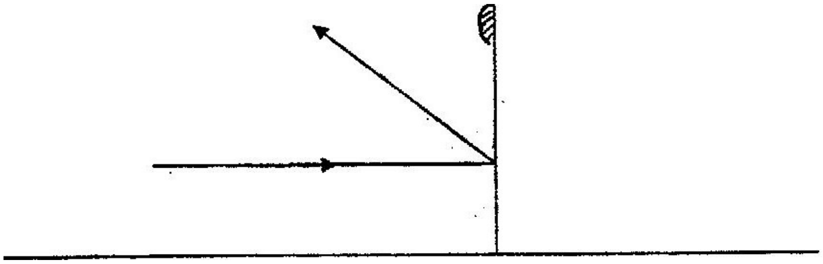
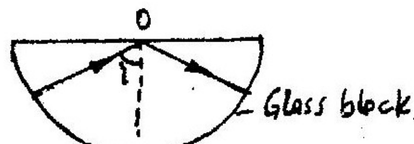


Fig. 12

Using a suitable construction on the same diagram determine the radius of curvature of the mirror.

24. Fig 13. Shows a semicircular glass block placed on a bench. A ray of light is incident at point O as shown. The angle of incidence, I , is just greater than the critical angle of glass.



A drop of water is now placed on the bench so as to make contact with the glass at point O. Sketch on the same figure the path followed by the ray after placing the drop of water.

25. A student holds a sheet of paper at one end so that it hangs in the position A shown in fig. 14

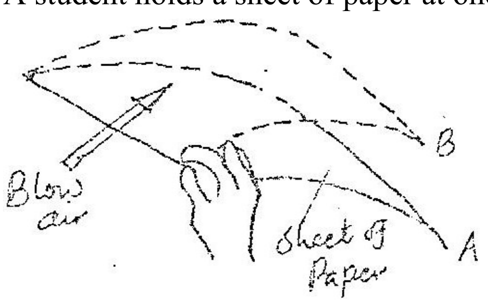
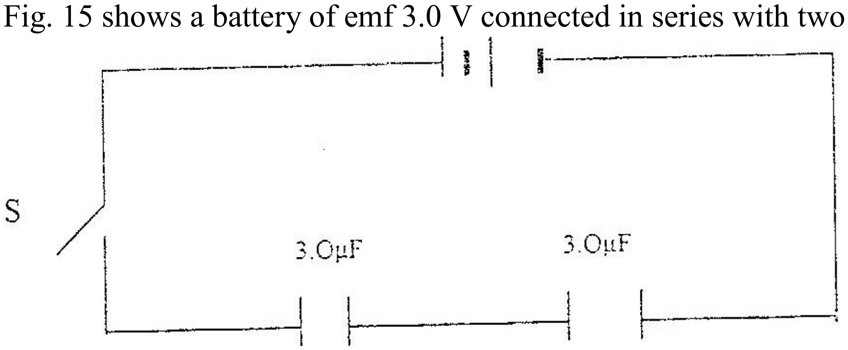


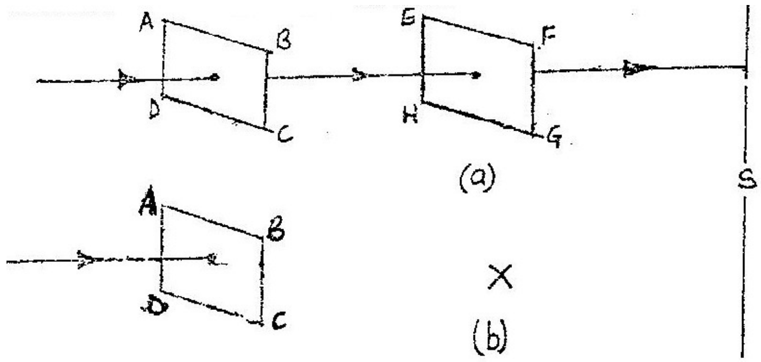
Fig. 14

Explain why the paper rises to the position B when the student blows air in the direction shown by the arrow.

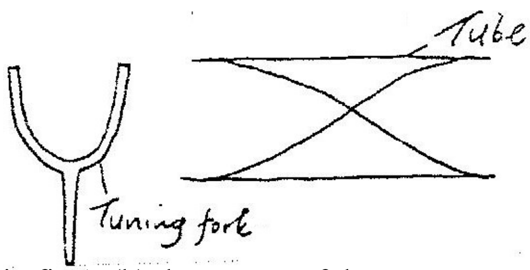
26. Fig. 15 shows a battery of emf 3.0 V connected in series with two capacitors.



27. In fig 16.(a) the Polaroids ABCD and EFGH are oriented such that maximum light reaches the screen S. Sketch at X on Fig. 16 (b) the orientation of EFGH such that no light reaches S.



28. Fig 17 (a) shows the wave pattern at resonance in an open tube when a turning fork of frequency f_o is sounded near one end of the tube.



Sketch in fig 17(b) the pattern of the wave at resonance when a fork of frequency $3f_o$ is sounded near one end of an identical tube.

29. State two uses of microwaves.

30. In fig. 18 ultra – violet (u,v) light falls on a zinc plate placed on a charged leaf electroscope. It is observed that the leaf collapses.

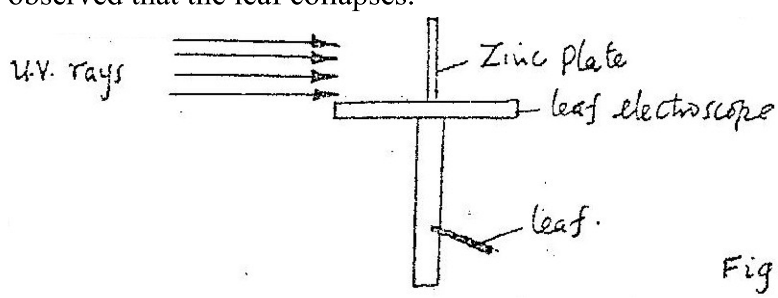


Fig. 18

31. Fig (19) drawn to scale) shows the image, I, formed by a diverging lens. F is principal focus of the lens.

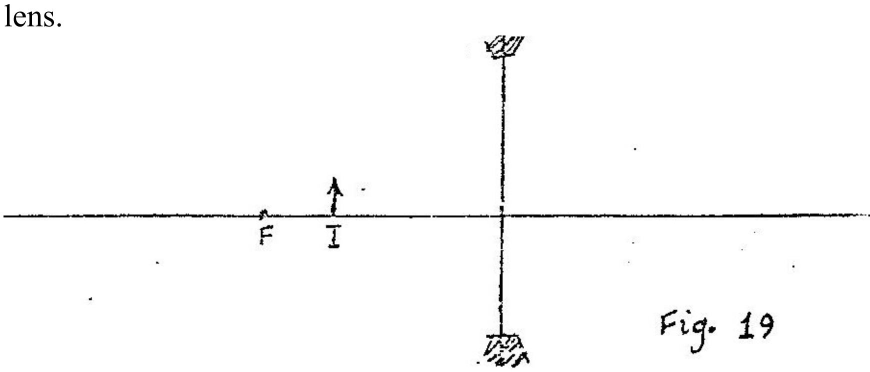


Fig. 19

By drawing the appropriate rays on the same diagram, locate the position of the object.

An armature composed of turns of insulated copper wire would on laminated soft –iron core is rotated in a magnetic field to generate an e.m.f. Use this information to answer questions 31 and 32.

32. State tow factors other than the speed of rotation that affect the molecule of the e.m.f generated.

33. State the reason why soft iron is laminated.

34. An atom changes from an excited state to an unexcited state releasing energy. State one factor that affects the frequency of the radiation released.

35. State and explain the effect of increasing the E.H.T in an x-ray tube on the X-rays produced.

36. The graph in Fig 20 shows the disintegration per second versus time in seconds, s for a sample of radioactive material; determine the half – life of the sample.

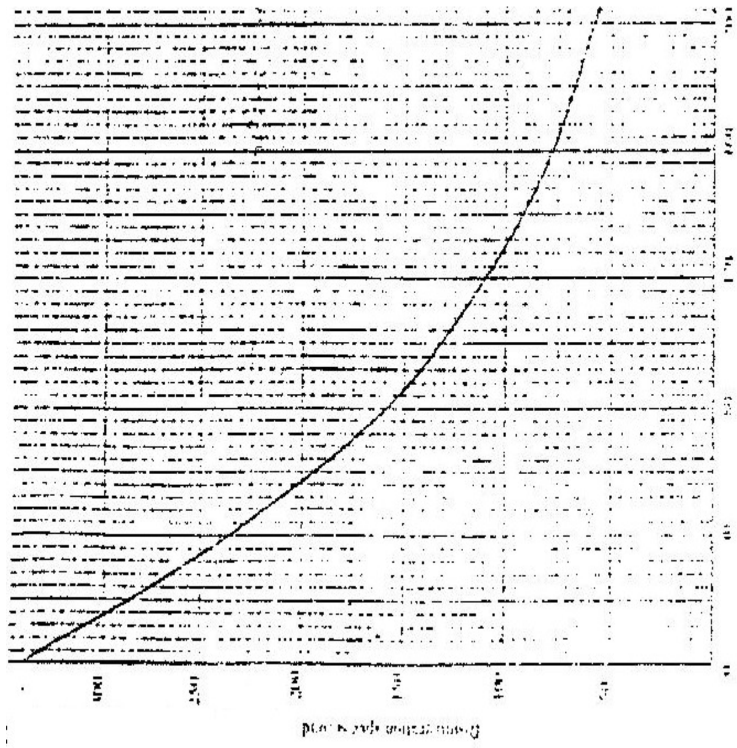


Fig. 20

PHYSICS PAPER 232/2 K.C.S.E 2000

1a) i) State one application of each of the following.
Convex mirror- Parabolic mirror –

ii) Fig. 1, which is drawn to a scale of 1:5, represents an object O and its image 'I' formed by a concave mirror.

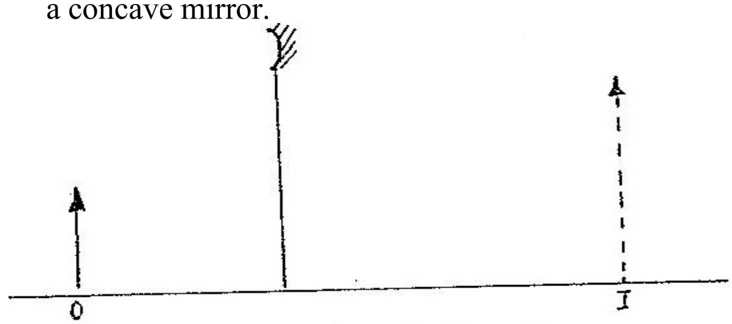
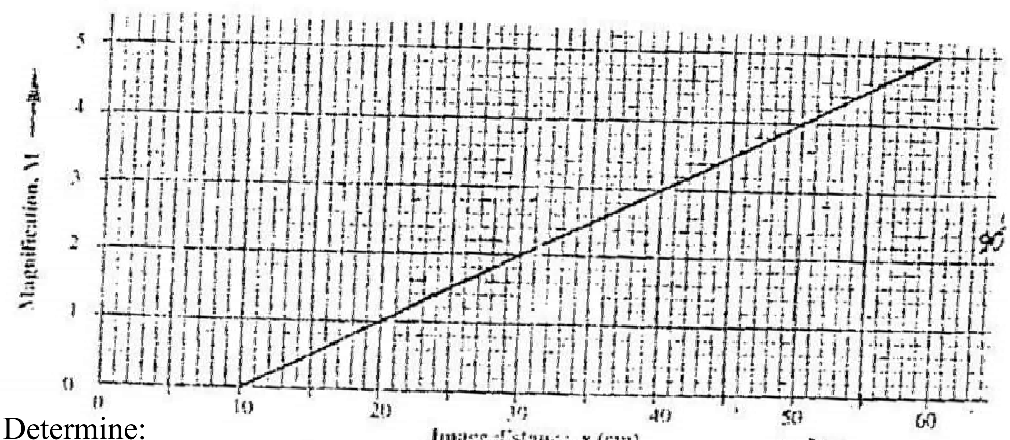


Fig. 1

By drawing suitable rays, locate and mark on the figure the position of the principal focus 'F' of the mirror. Determine the focal length f.

b) The graph in Fig. 2 shows the variation of magnification, M with image distance, V for a concave mirror.



Determine:

i) The object position when the image position is 45cm

ii) The focal length of the mirror.

2a) Two identical spherical steel balls are released from the top of two tall jars containing liquids L_1 and L_2 respectively. Fig 3 shows the velocity – time graph of the option of the balls.

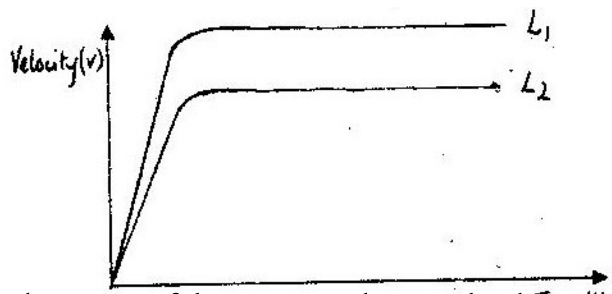
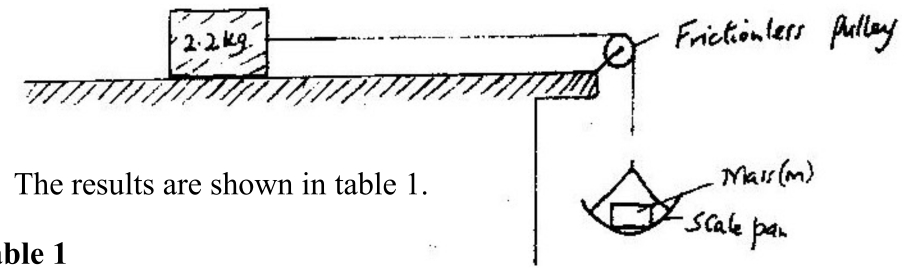


Fig. 3

Explain the nature of the curves and state why they are different.

b) In an experiment to determine the proportionality constant, μ between two wooden surfaces sliding on each other, a block of mass 2.20kg was placed on a horizontal bench. The block was then made to slide by adding mass ‘M’ On the scale as shown in Fig 4. The experiment was repeated for other values of ‘m’.The acceleration of the block was measured for each mass added.



The results are shown in table 1.

Table 1

Mass, m (kg)	0.70	1.00	1.50	2.00	2.50
Acceleration, a,(m/s^2)	0.38	1.74	4.02	6.29	8.56

i) Name and indicate on figure 4 the forces acting on the 2.20kg mass.

ii) Plot the graph of acceleration, a against the mass m

iii) Given that $a = \frac{mg}{2.20} - \mu g$, where g = 10ms-2, use the graph to

Determine μ. Intercept = μg

Intercept = 2.80 ± 0.2 (from graph)

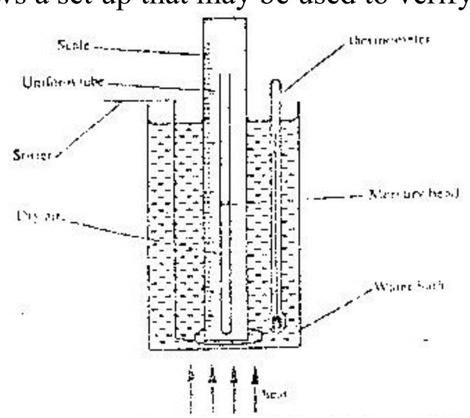
$$M = \frac{2.80 \pm 0.2}{10}$$

$$M = 0.28 \pm 0.02$$

3a) Using the kinetic theory of gases, explain how a rise in the temperature of a gas causes a rise in the pressure of the gas if the volume is kept constant.

b) Fig. 5 shows a set up that may be used to verify Charles Law.

Figure 5.



i) State the measurements that should be taken in the experiment.

ii) Explain how the measurements taken in (i) above, may be used to verify Charles Law.

iii) What is the purpose of the water bath.

c) A certain mass of hydrogen gas occupies a volume of 1.6m3 at a pressure of 1.5 x 105 pa and temperature 12^{o}C. Determine its volume when the temperature is O^{o}C at a pressure of 1.0 x 10^5 pa.

4. 6(a) (i) State one property of soft iron that makes it suitable for use as a transformer core.

(ii) Fig 6 represents a step- down transformer with 500 turns in the primary and 50 turns in the secondary. The turns are wound uniformly on the core. The lengths of PQ and QR are indicated. Determine the p.d across PQ.

(b) Fig 7 represents a block of uniform cross sectional area of 6.0cm^2 floating on two liquids A and B. The lengths of the block in each liquid are shown.

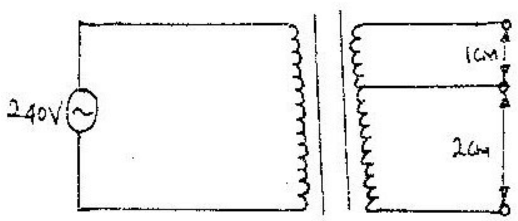


Fig.6

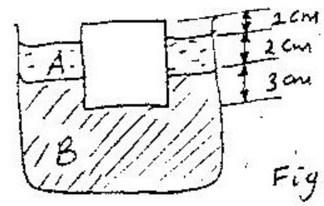
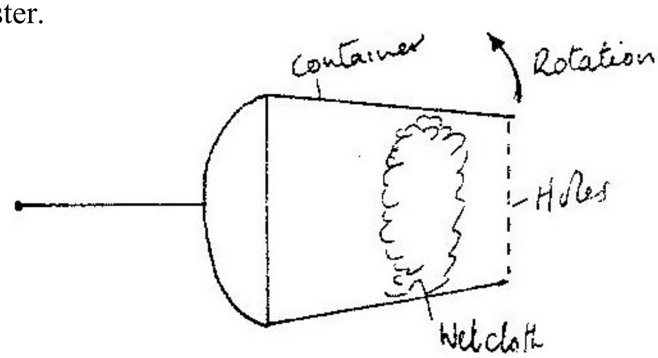


Fig.7

Given that the density of liquid A is 800kgm^{-3} and that of liquid B is 1000kgm^3 determine the:
(i) b weight of liquid A displaced
(ii) Weight of liquid B displaced
(iii) Density of the block

5. (a) Fig 8 shows a container with small holes at the bottom in which wet clothes have been put. When the container is whirled in air at high speed as shown, it is observed that the clothes dry faster.



Explain how the rotation of the container causes the clothes to dry faster.

(b) (i) A glass block of mass 100g is placed in turn at various distances from the centre of a table which is rotating at constant angular velocity. It is found that a distance of 8.0 cm from the centre, the block just starts to slide off the table. If the force of the friction between the block and the table is 0.4 N determine.

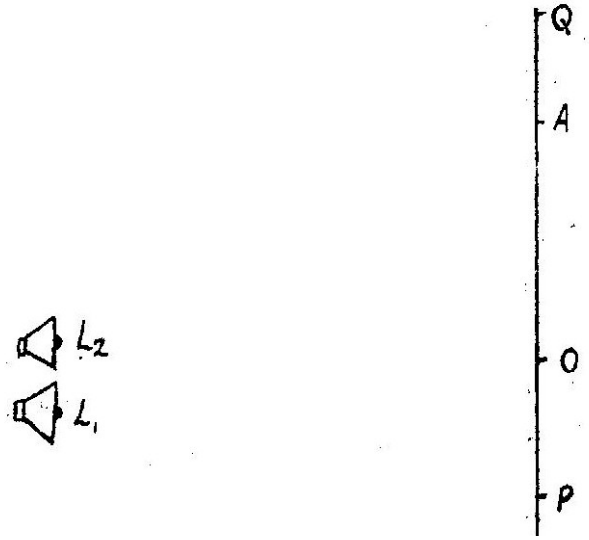
(I) The angular velocity of the table
(II) The force required to hold the block at a distance of 12 cm from the centre of the table.

(ii) A glass of mass 200 g is now placed at a distance of 8.0 cm from the centre of the table in (i) above, and the table rotated at the same constant angular velocity. State with a reason whether or not the block will slide.

SECTION II

6a) State the necessary conditions for interference to occur in waves

b) Fig 9. Drawn to scale of 1: 200 shows two speakers L_1 and L_2 connected to a signal generator (not shown) producing sound waves of frequency 350Hz. An observer walking along PQ hears loud and low sounds at alternative positions.



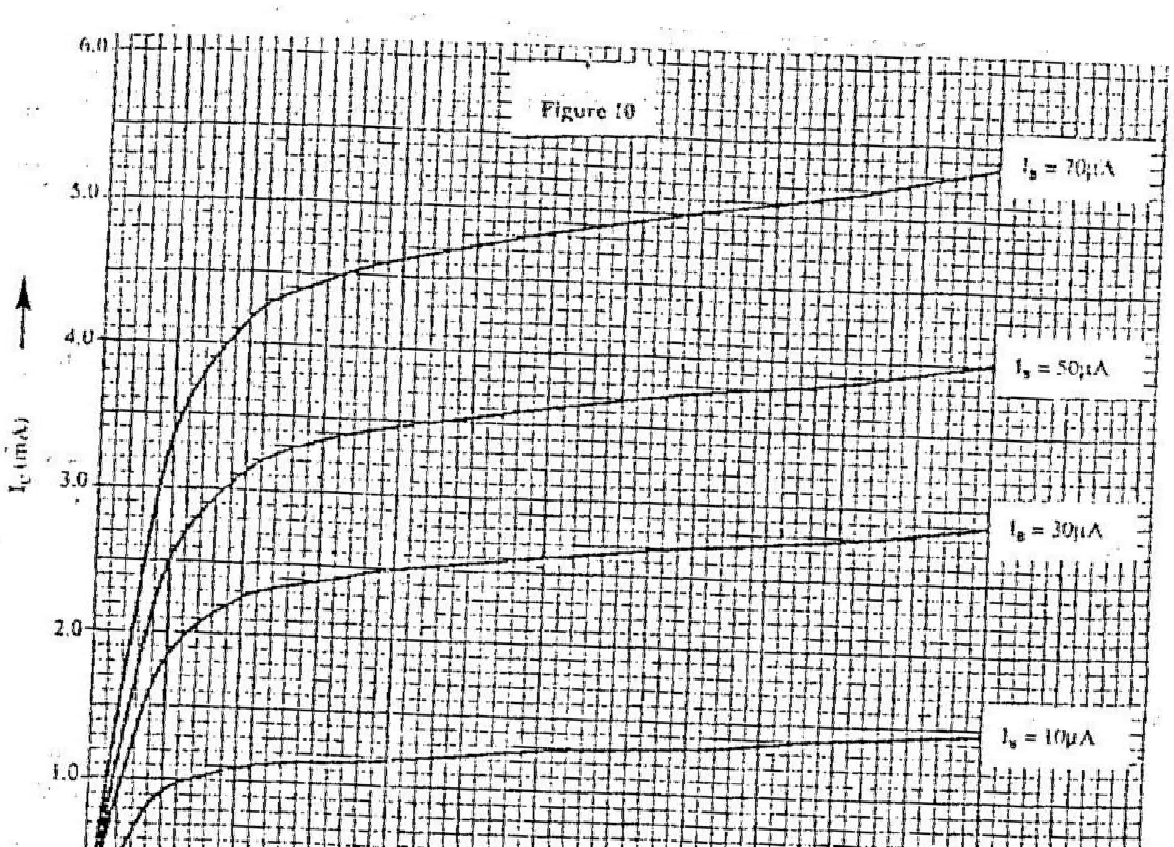
(i) Explain how the observations made are caused

(ii) At point O a loud sound is heard and at point A, the next loud sound is heard. Use this information and the diagram to determine the velocity of sound in air.

(iii) State and explain the effect of increasing the frequency of the signal generator on the distance OA.

7. (a) Explain how a p- type semiconductor is made from a pure a semiconductor

(b) The curves in fig 10. Show the output characteristics of a n – p-n transistor in common emitter mode. The p.d of the battery, V_{cc} is 9.0V and the load resistors R_L is 1.8 k Ω



i. Draw the circuit diagram for the experiment set- up that may be used to obtain the curves in the figure.

ii. Given that ohm's law for the circuit is $V_{CE} = V_{cc} - I_cR_L$, draw on the same axes, the load line for the circuit (hint: load - line passes through. ($V_{CE} = 0$ and $I_c = 0$)
Drawing load line on graph (see graph)
When $I_B = 30\mu A$, An alternating signal is fed into the base so that the base current changes by $\pm$ 20μA. Use the graph to determine the corresponding change in collector current I_c and hence determine the current gain β.

PHYSICS PAPER 232/1 K.C.S.E 2001

1. Fig. 1 shows a burette partly filed with a liquid. The burette was initially full to the mark O. If the quantity of the liquid removed has a mass of 22g, determine the density of the liquid.

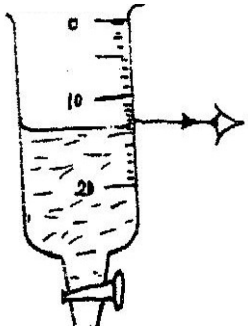


Fig. 1

2. Fig 2 shows a uniform bar in equilibrium.

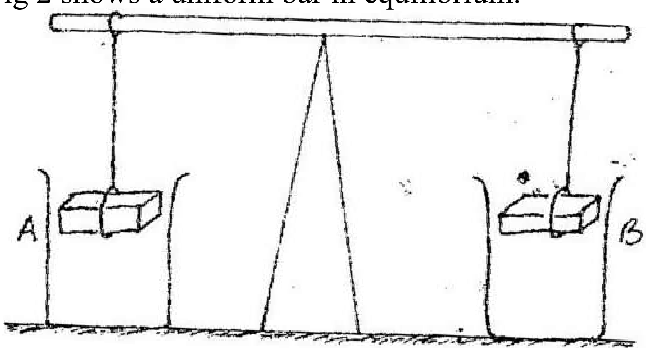


Figure 2

When water is added into the beakers A and B until the weights are submerged, it is observed that the bar tips towards B. Explain this observation.

3. Fig 3 shows two identical hollow spheres. Spheres A is completely filled with the liquid while B is partly filled with identical liquid.

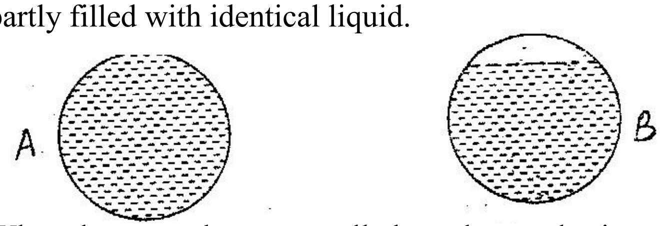


Fig. 3

When the two spheres are rolled gently on a horizontal surface. It is observed that the sphere B stops earlier that the sphere A. Explain this observation.

4. State the reason why it may not be possible to suck liquid into your mouth using drinking straw on the surface of the moon.

5. Fig. 4 (i) shows a beaker filled with water. Some potassium permanganate was gently introduced at the bottom of the beaker at the position shown.

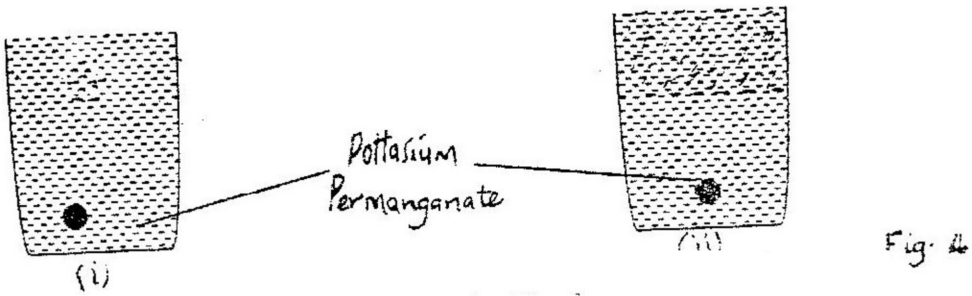
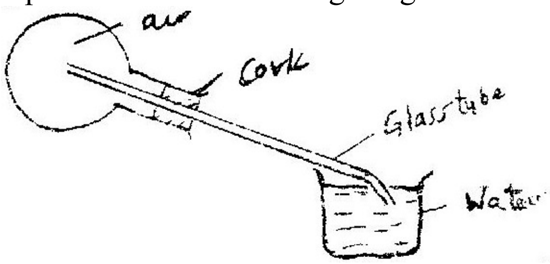


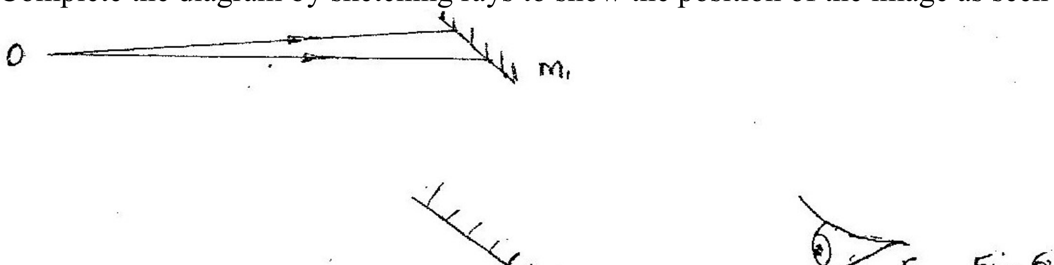
Fig. 4(ii) shows the appearance of the liquid after about 30 minutes. Explain how this appearance was caused.

Fig. 5 shows a flask fitted with a glass tube dipped into a beaker containing water at room temperature. The cork fixing the glass tube to the flask is airtight.

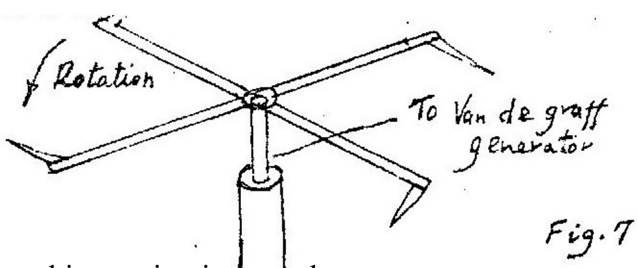


Use the information and the figure to answer questions 6 and 7.

6. State what is observed when ice- cold water is poured on the flask.
7. Give a reason for the observation in question 6.
8. Fig. 6 shows an object O being viewed using tow inclined mirrors M_1 and M_2.
Complete the diagram by sketching rays to show the position of the image as seen by the eye E.

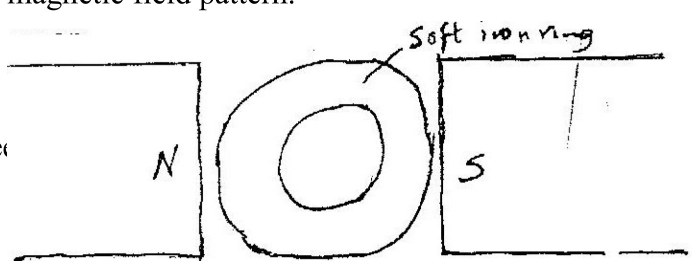


9 Fig. 7 shows "windmill" which when connected to the dome of a positively charged Van de Graff generator is observed to rotate as indicated. A, B, C and D are sharp points
Figure 7.



Explain how this rotation is caused.

10. Explain how polarization reduces current in simple cell.
11. Fig 8 shows a soft-iron ring placed between the poles of a magnet. On the same diagram sketch the magnetic field pattern.



12. Fig. 9 shows a uniform light bar one meter in length in equilibrium under the action of forces F1 F2 F3 and F4. All the forces are in the same plane. Use the information on the figure to answer questions 12 and 13.

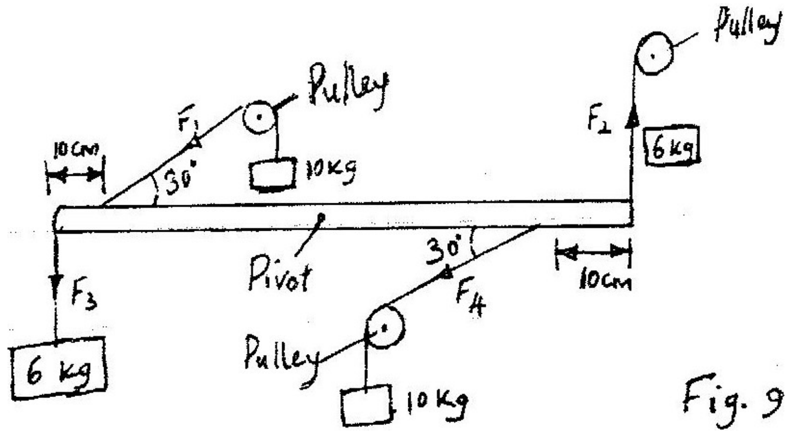


Fig. 9

Name one set of forces on the figure that constitutes a couple.

13. Determine the moment of the couple named in question 12.

14. A bullet moving at a velocity of 300ms^{-1} hits a tree trunk of diameter 50cm. It emerges from the opposite side with a velocity of 150ms^{-1}. Determine the average deceleration of the bullet in the trunk.

15. A certain machine raises 2.0 tonnes of water through 22 metres.It the efficiency of the machine is 80%, how much work is done on the machine.(Acceleration due to gravity g = 10ms^{-2})

16. Fig 10. Shows water waves incident on a shallow region of the shape shown with dotted line.

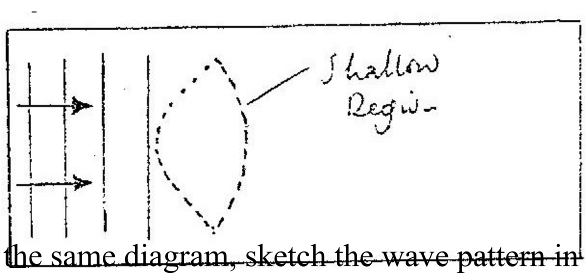


Fig 10

On the same diagram, sketch the wave pattern in and beyond the shallow region.

17. The ammeter in the circuit in Fig. 11 has negligible resistance.
When the switch S is closed, the ammeter reads 0.01A. Determine the internal resistance of the battery.
18. An electric heater rated 240V ; 300w is to be connected to a 240V mains supply, through a 10A fuse. Determine whether the fuse is suitable or not.
19. Fig 12 shows tow identical containers A and B into which a copper rod is fitted. The containers are well lagged.

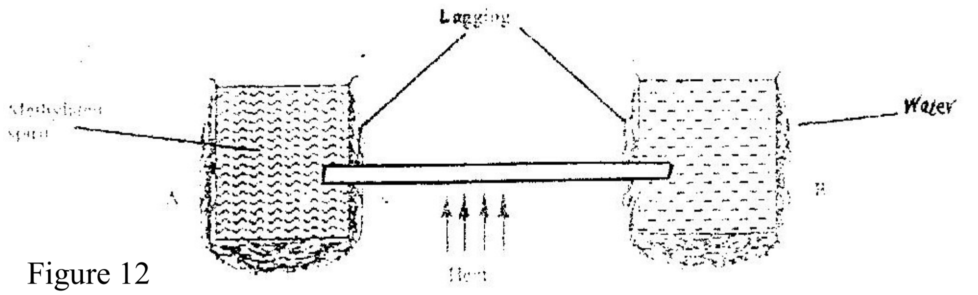


Figure 12

Fig. 12

The liquids in the containers were initially at the same temperature if the heat is a applied continuously at the position shown, state with reason for the container through which the loss of heat is likely to be higher.
20. Fig. 13 shows a point object O placed in front of a concave mirror.
Draw appropriate rays to locate the image of the object.

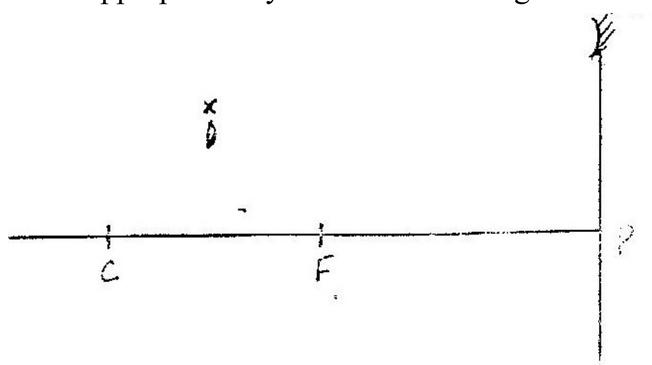


Fig. 13

21. Fig. 15 14 shows a ray of light incident on a glass prism.

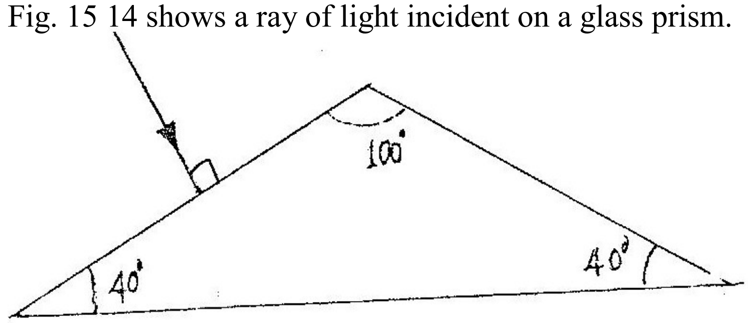


Fig. 14

If the critical angle of the glass is 39o sketch on the same diagram the path of the ray until it emerges from the prism.

22. Fig. 15 shows a tall jar containing two fluids A and B. The viscosity of A is higher than that of B. A solid sphere is released at the top of the jar and falls through the fluids.

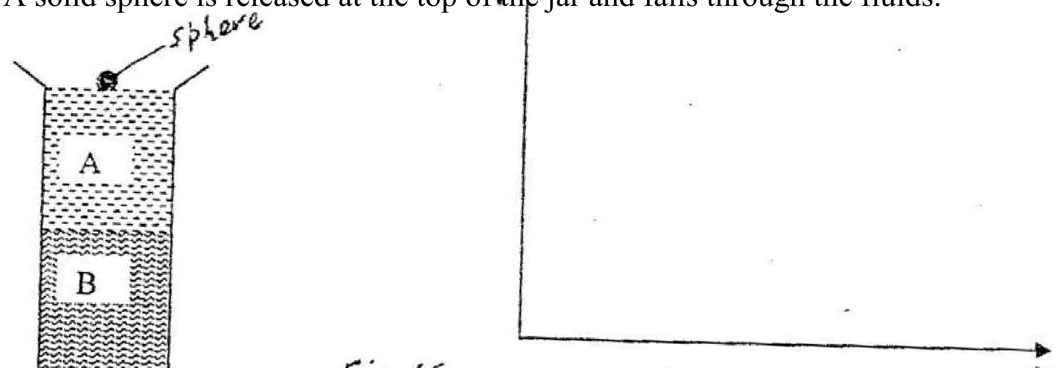


Fig. 15

On the axes provided, sketch the velocity – time graph for the motion of the spheres through the fluids.

23. Fig. 16 shows a non – viscous fluid flowing through a pipe a long which vertical tubes A, B and C have been fitted.

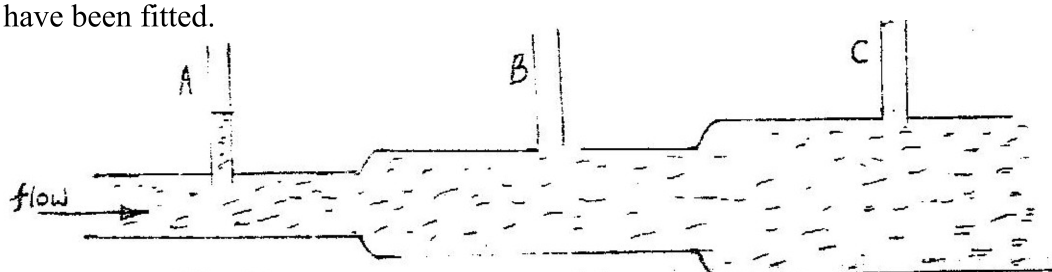


Fig. 16

Complete the diagram by indicating the possible levels of the fluid in tubes B and C.

24. Two identical containers A and B are placed on a bench. Container A is filled with oxygen gas and container B with hydrogen gas such that the two gases have equal masses. If the containers are maintained at the same temperature state with reason the container in which the pressure is higher.

25. Fig. 17(i) shows a stretched string AB vibrating in its fundamental mode.

Figure 17(I)

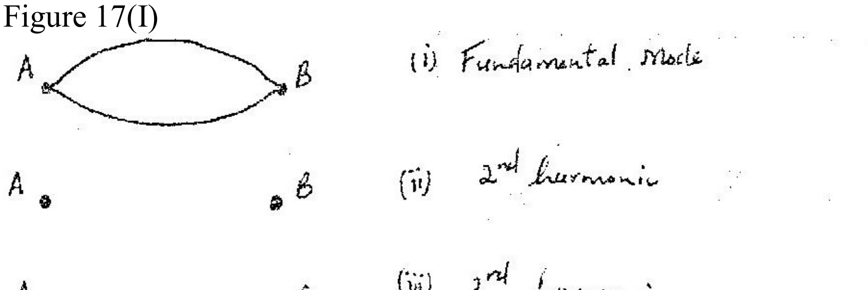


Fig. 17(i)

Sketch in fig 17. (ii) and (ii) the 2nd and 3rd harmonic of the string respectively.

26. Fig. 18 shows the wave patterns produced in one second when two tuning forks were sounded together.

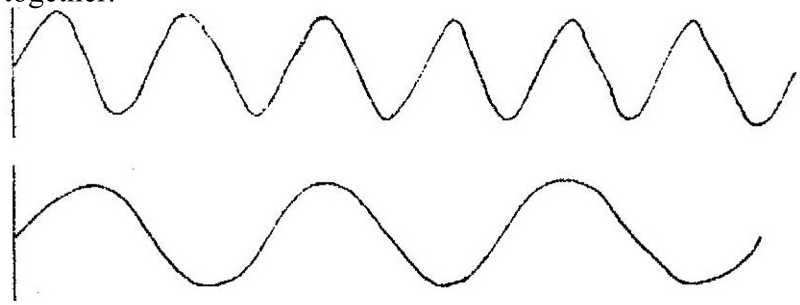


Fig. 18

Determine the beat frequency.

27. State the reason why radio waves signals are easier to receive than TV (television) signals in a place surrounded by hills.

28. Fig. 19 shows two spheres made of wax each of mass 0.10kg held in a liquid by strings A and B.

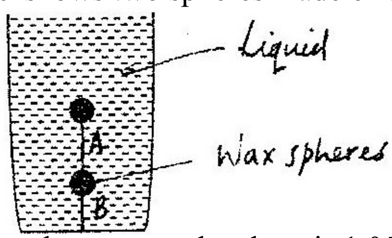


Fig. 19

If the upthrust on each sphere is 1.05N, determine the tension in each string.(acceleration due to gravity g = $10ms^{-2}$)

29. Fig. 20 shows a ball being whirled in a vertical plane.

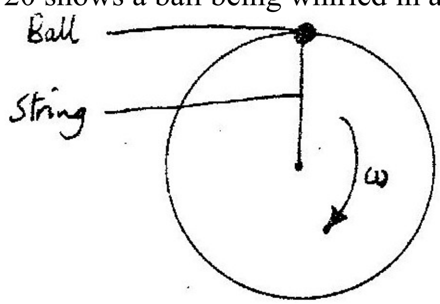


Fig. 20

Sketch on the same figure the path followed by the ball if the string cuts when the ball is at the position shown in the figure.

30. Fig 21 shows a converging lens whose local point F is marked.

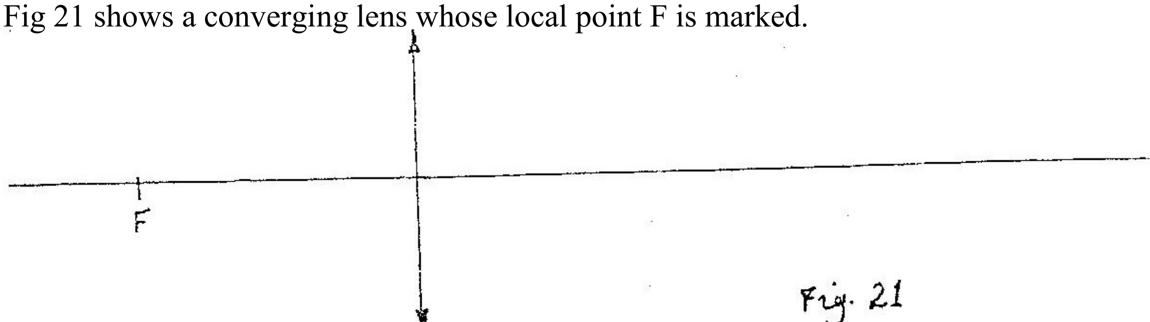
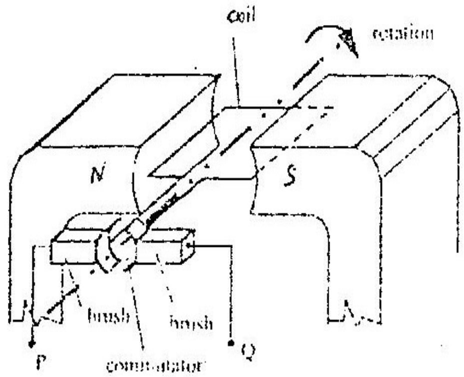
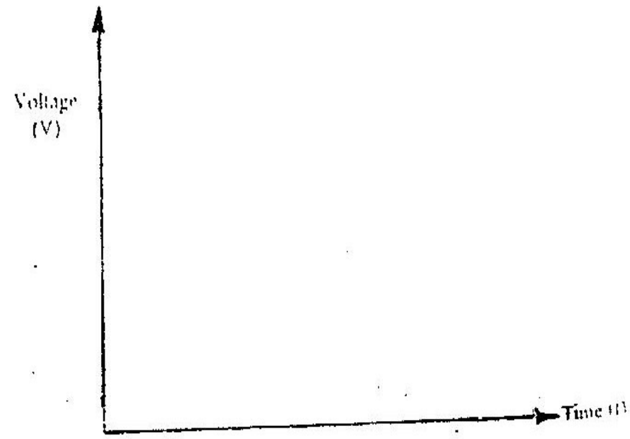


Fig. 21

An object is placed in front of the lens such that the lens forms a real magnified image. Sketch on the same diagram array diagram to represent this.

31. Fig. 22 shows an electric generator. The points P and Q are connected to a cathode ray oscilloscope (CRO).





Sketch on the axes provided the graph of the voltage output as seen on the CRO Given that when t = 0 the coil is at the position shown in the figure.

32. A 60W bulb is used continuously for 36 hours. Determine the energy consumed. Give your answer in kilowatt hour (kWh).

33. State the factor that determines the hardness of the X – rays produced in an X – ray tube.

34. The following reaction is part of a radioactive series:

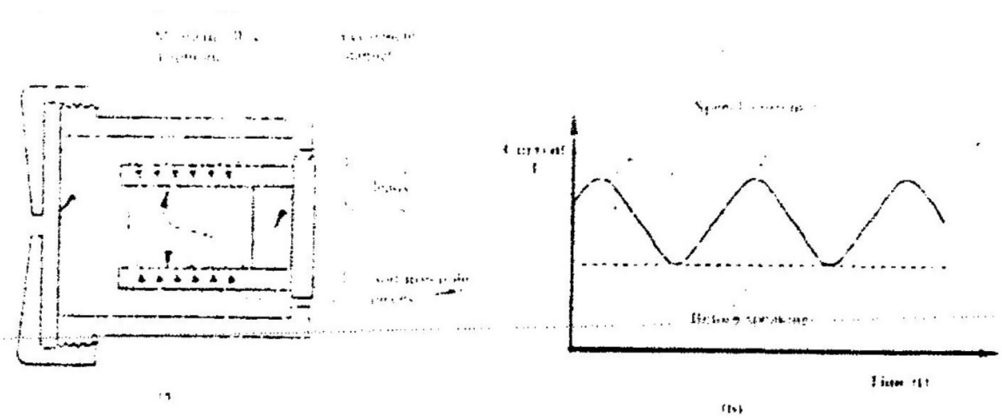
$$^{120}_{83}X\ Y \longrightarrow {}^{210}_{4} \longrightarrow {}^{c}_{b}$$

Identify the radiation r and determine the values of b and c.

PHYSICS PAPER 232/2 K.C.S.E 2001

1. A block of ice of mass 40g at 0oC is placed in a calorimeter containing 400g of water at 20oC .Ignoring the heat absorbed by the calorimeter, determine the final temperature of the mixture after all the ices has melted. (Specific latent heat capacity of fusion of ice= 340,00J/kg, specific heat capacity of water = 4,200j/kg).

2. a) Fig 1 (a) shows the circuit of a simple telephone receiver. When the telephone is lifted, a steady current flows through the solenoids. When a person speaks into the microphone on the other side, a varying current flows. These two currents are shown in fig. 1(b).



i) State the reason why solenoids are wounds in opposite directions around the soft-iron core pieces as shown.

ii) Explain how the speech current from the microphone is converted into sound in the receiver.

iii) State and explain the effect of replacing the soft iron core pieces with steel core pieces.

b) A step down transformer has 400 turns in the primary coil and 20 turns in the secondary coil A 50Ωresister is connected to the secondary output. If the r.m.s (root-mean-square) value of the primary voltage is 240; determine the peak value of the current in the in the secondary circuit.

c) a hole of area 2.0 cm^2 at the bottom of a tank 2.0m deep is closed with a cork. Determine the force on the cork when the tank is filled with water. (Density of water is $1000kg/m^3$ and acceleration due to gravity is $10m/s^2$).

4. Fig 3 shows the main features of a cathode ray tube (CRT) of a cathode ray oscilloscope (CRO)

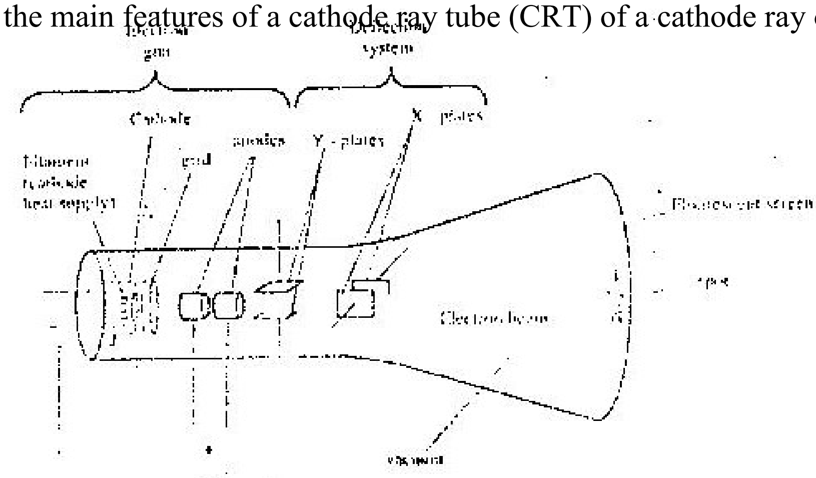


Figure 3

i) Describe how the electrons are produced in the tube.

ii) State and explain the function of the grid.

iii) State what would be observed on the screen if an a.c voltage is connected across the y-plates.

iv) State how the deflection system of a television differs fro that of a CRO.

v) Give the reason why it is possible to have a wider screen in the television set than on the C.R.O.

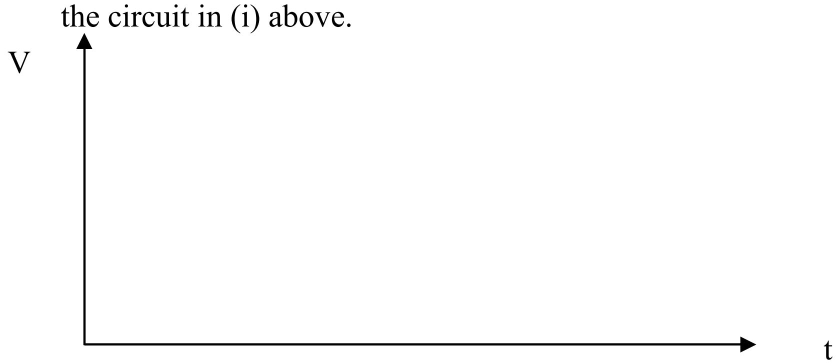
b) In an excited hydrogen atom. An electron moves from an energy level of -1.36×10^{-19}J. Determine the wavelength of the radiation emitted. (Planks constant h= 6.63×10^{-34} Js and speed of light c= 3.0×10^{8} ms^{-1}).

5 a) You are provided with 12V a.c source, four diodes and resistor.

i) Draw a circuit diagram for a full wave rectifier and show the points at which the output is taken.

AC source shown-symbols; arrangement of diode (one for each pair); correct position of R; correct position of output.

ii) Sketch the graph of the output when a capacitor is put in parallel with the resistor in the circuit in (i) above.



b) A certain transistor is connected in common-emitter-mode. The base current I_B is 0.50 ma. Determine the values of the:

(i) Emitter current I_E.

(ii) Base-collector current gain β

(iii) Current gain α

SECTION II

6 a i) State one of the Newton's law of motion

ii) A body resting on a horizontal surface is given an initial velocity V so that it slides on the surface for some distance before coming to a stop. Table I shows the distances d moved by the body of various values of μ.

Velocity ($ms\_^{-1}$)μ	0.20	0.40	0.60	0.80	1.20	1.20
Distance, d (m)	0.007	0.027	0.027	0.110	0.170	0.200

Given that v^2 is 20μd where μ is a constant for the surface, plot a appropriate graph and use it to determine μ. Determine values of μ on table.

b) A train of mass 200 tonnes starts from rest and accelerates uniformly at $0.5ms^{-2}$ determine its momentum after moving 100m.

7 ai) State the pressure law of an ideal gas.

ii) The pressure p, of a fixed mass of a gas at constant temperature T= 300K is varied continuously. The corresponding values of P and the volume V of the gas are shown in table 2.

Pressure, p(x 10^5Pa)	2.00	2.50	3.00	3.50	4.00	4.50
Volume, V (m^3)	0.025	020	0.017	0.014	0.012	0.011

Given that P^V = 2RT where R is a constant, plot an appropriate graph and use it to determine r.

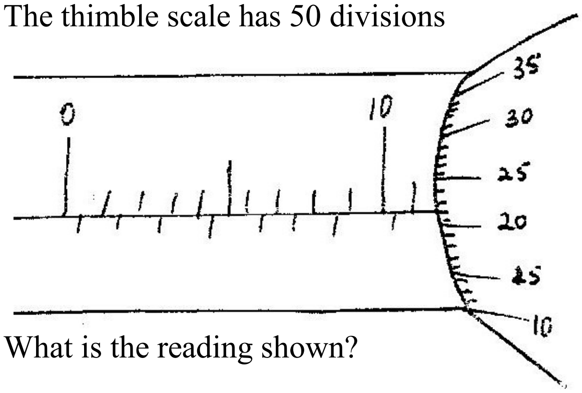
I/V (M^3)	40.0	5	58.8	71.4	83.3	90.0

b) A tin closed with an airtight lid contains air at a pressure of 1.0 x 10^{5+} Pa and temperature of 12 ^{0}C. The tin is heated in a water bath until the lid opens. If the temperature at which the lid opens is 88^{0}C, determine the pressure attained by the gas. (Ignore expansion of the tin).

I/P x 10^5 (pa -1)	0.5	0.40	0.33	0.29	0.25	0.22

PHYSICS PAPER 232/1 K.C.S.E 2002

1. Fig one shows a micrometer crew gauge being used to measure the diameter of a metal rod. The thimble scale has 50 divisions



What is the reading shown?

Fig. 1

2. Fig. 2 represents a rock balanced at point O.G is the center of gravity of the rock. Use this information to answer questions 2 and 3.

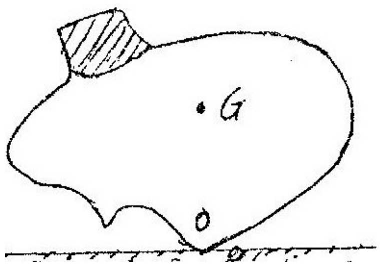


Fig. 2

Draw and label on the figure, the forces acting on the rock.

3. If the portion of the rock represented by the shaded part is chopped off explain why the rock may topple to the right.

4. A current of 0.70 A flows through a wire when a p.d of 0.35 V id applied at the ends of the wire. If the wire is 0.5m long and has a cross section area of 8.0 x 10-3 m-2, determine its resistivity.

5. The total weight of a car with passengers is 25,000N. The area of contact of each of the four tyres with the ground is 0.025m2. Determine the minimum car tyre pressure.

6. When an inflated balloon is placed at equal in a refrigerator it is noted that its volume reduces. Use the kinetic theory of gases to explain this observation.

7. An electric heater is placed at equal distances from two similar metal cans A and B filled with water at room temperature. The outer surface of can is shiny while that of can B is dull black. State with reasons which can will be at a higher temperature after the heater is switched on for some time.

8. Fig. 3 shows two rays of A and B entering a semi – circular glass block which has a critical angle of 42^{o}. The rays are incident at an air – glass boundary at point O.

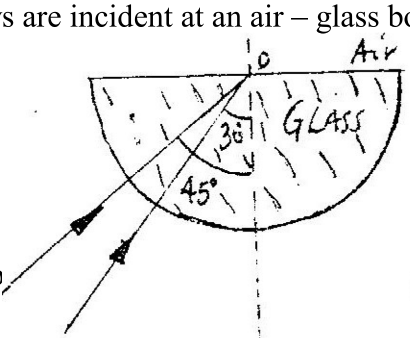
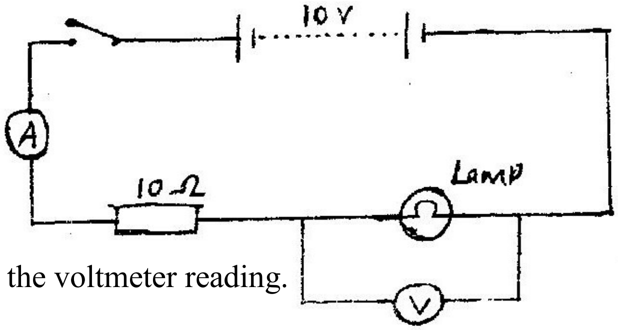


Fig. 3

Complete the path of the two rays from point O. label A’ and B’ the corresponding rays.

9. Fig. 4 shows electrical circuit. When the switch is closed the ammeter reading is 0.3 A.



Determine the voltmeter reading.

Fig. 4

10. Fig. 5 shows a wire A and a spring B made of the same material. The thickness of the wire is the same in the both cases. Masses are added on each at the same intervals and the extension noted each time.

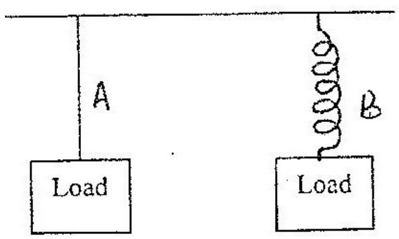
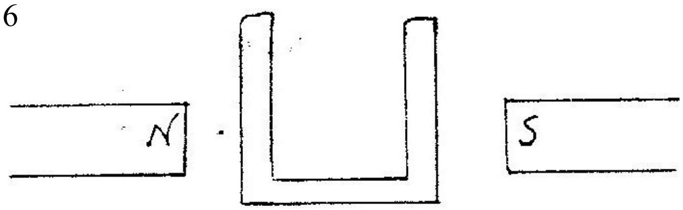


Fig. 5

On the same axes provided, sketch the graphs of extension against load for each. (hookers law is obeyed.)

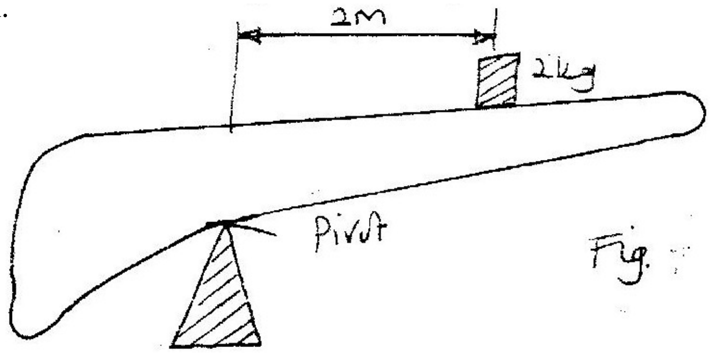
11. Fig. 6 shows a soft iron placed between poles of two magnets.

Figure 6



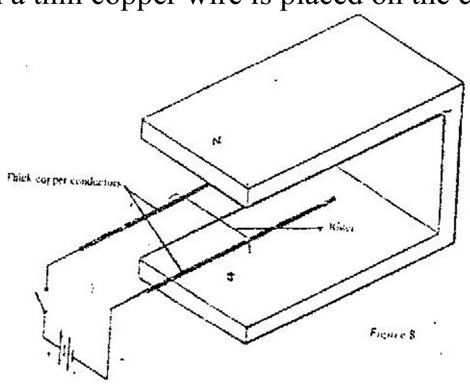
Sketch the magnetic field pattern.

12. Fig. 7 shows a non – uniform log of mass 100kg balanced on the pivot by a 2kg mass placed as shown.



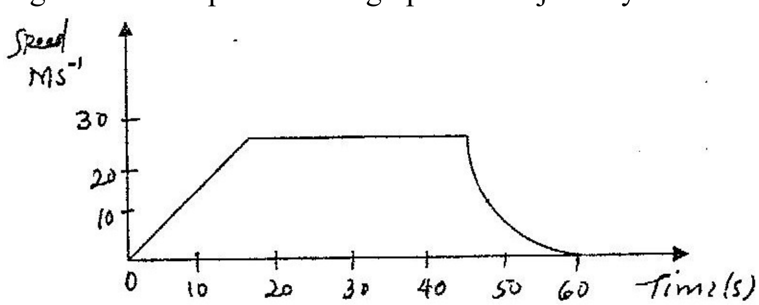
Determine the distance of the center of gravity of the log from the pivot.

13. Fig. 8 shows two parallel thick copper conductors connected to a D.C. power supply. A rider made from a thin copper wire is placed on the conductors.



State and explain what is observed on the rider when the switch is closed.

14. Fig. 9 shows a speed – time graph for the journey of a motorcar.



Determine the distance the car travels in the first 40 seconds.

15. Fig. 10 shows how the potential energy, (P.E) of a ball thrown vertically upwards, varies with height.

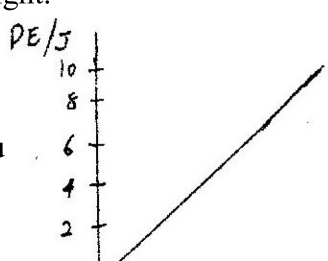


Fig. 10

On the same axes, plot a graph of the kinetic energy of the ball.

16. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

RADIO	INFRARED	VISIBLE	A	X - RAYS	GAMMA RAYS

Name the radiation represented by A.

17. Name two factors other than tension, which determine the frequency of sound form stretched wire at room temperature.

18. An electric bulb with a filament of resistance 480Ω is connected to a 240V mains supply. Determine the energy dissipated in 2 minutes (3mks).

19. An immersion heater rated 90W is placed is a liquid of mass 2kg. When the heater is switched on for 15 minutes the temperature of the liquid rises form 20°C to 30°C .Determine the specific heat capacity of the liquid. (Assume no heat losses)

20. A high jumper usually lands on thick soft mattress. Explain how the mattress helps in reducing the force of impact.

21. Fig. 11 shows part of the circuit containing tow capacitors of 2μF and 3μF respectively.

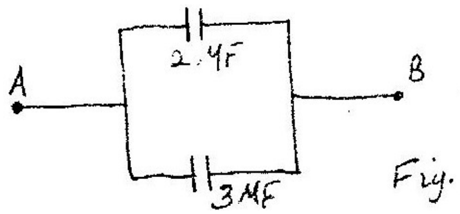
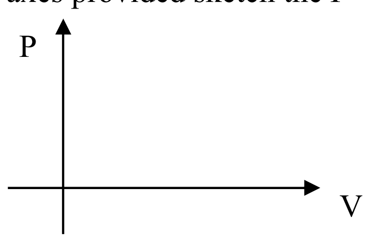


Fig. 11

Determine the p.d across AB given that the total charge in the capacitors is $1x10^{-4}$ Coulombs.

22. On the axes provided sketch the P-V graph for a gas obeying Boyle's law.



23. Fig. 12 shows water waves incident on an aperture AB.

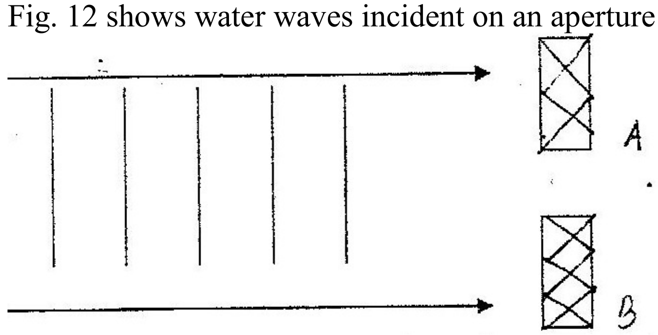
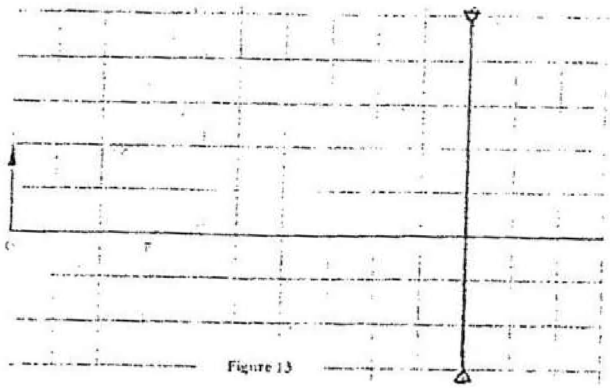


Fig. 12

On the same diagram, sketch the waves after going through the aperture.

24. The audible frequency range for a certain person is 30 Hz and 16,500 Hz. Determine the largest wavelength of sound in air the person can detect.(Speed of sound in air = 330m/s)
25. A block of glass of mass 250g floats in mercury. What volume of glass lies under the surface of the mercury? (Density of mercury is 13.6 x 103 kgm^{-3}).
26. A small object moving in a horizontal circle of radius 0.2m makes 8 revolutions per second. Determine its centripetal acceleration.
27. Cobalt 60 is a radio isotope that has a half – life of 5.25 years. What fraction of the original atoms in a sample will remain after 21 years?
28. Fig. 13 represents an object O placed 10cm in front of a diverging lens is the focal point of the lens.



Draw rays to locate the position of the image. Determine the image distance.

29. The circuit figure 14 represents a simple radio receiver.

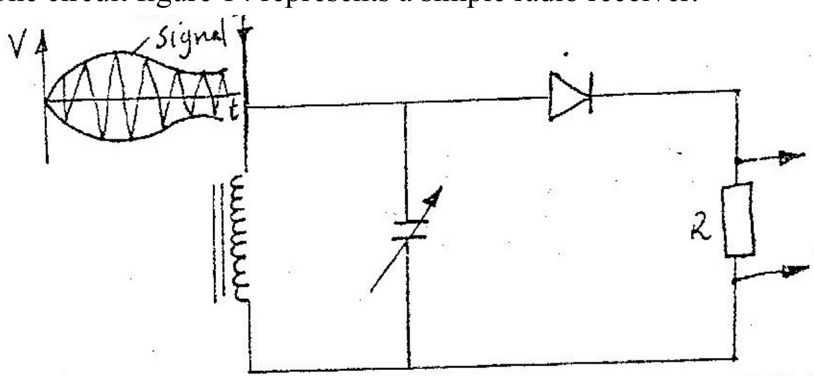


Fig. 14

On the axes provided, sketch the waveform observed on the CRO for the signal shown.

30. The following table shows electrical appliances to be used in a house. The electrical rating for each appliance is shown. The following fuses are available, 5A, 15A, 30A and 45A.

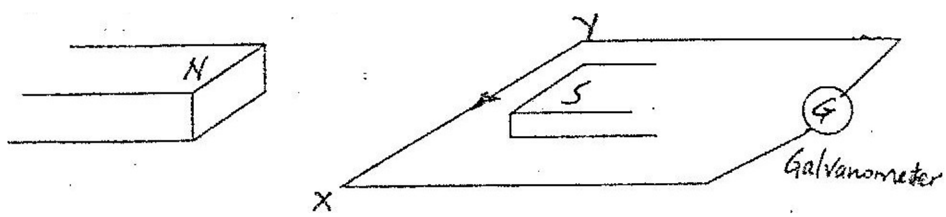
Appliances	Voltage (V)	Power (W)
T.V	250	300
Iron box	250	750
Electrical kettle	250	2,000

Determine which one of the fuses is suitable for the house.

31. A nucleus is represents by 10742x. State the number of neutrons in the nucleus.

32. State the property of X-rays, which makes it possible to detect cracks in bones.

33. Fig. 15 shows a wire XY placed in a magnetic field.



State the direction in which the wire must be moved for the current to move in the direction shown.

34. Light of a certain wavelength strikes the surface of a metal. State what determines the maximum kinetic energy of the electron emitted.

PHYSICS PAPER 232/2 K.C.S.E 2002

1. Figure 1 shows the path of array of yellow light through a glass prism. The speed of yellow light in the prisms is 1.88×10^8m/s.

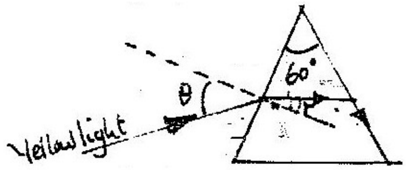


Fig 1

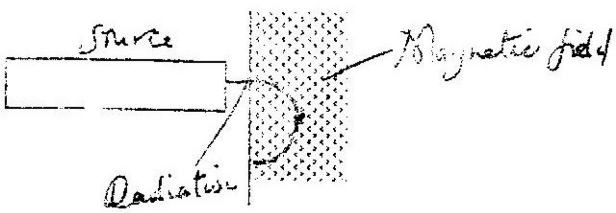
a) Determine the refractive index of the prism material for the light (speed of light in vacuum e = 3.0 x 108 ms^{-1})

b) Show on the figure the critical angle, c, and determine its value.

c) Given that r = 21.2°, determine the angle θ

d) On the same figure, sketch the path of the light after striking the prism if the prism was replaced by another of similar shape but lower refractive index. (Use dotted line for your answer)

2. Fig. 3. Shows the path of radiation form a radioactive source after entering a magnetic field. The magnetic field is directed into the paper and is perpendicular to the plane of the paper as shown in the figure.



Identify the radiation

b) Below is a nuclear reaction

$$ {}^{232}_{90}A \xrightarrow{K} {}^{228}_{88} \longrightarrow {}^{Y}_{X} $$

i) Identify radiation K

ii) Determine the values of X and Y.

(c) Fig 3 shows a device for producing metal foils of constant thickness. Any change in thickness can be detected by the Geiger tube and recorded by the Geiger. The pressure adjusted by the roller is then adjusted to keep the thickness constant.

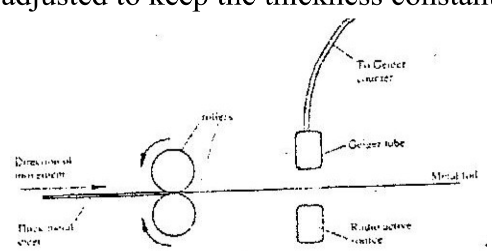


Figure 3

(i) State the change in the metal foil that will lead to a decrease in the Geiger counter reading

(ii) Give a reason for your answer in c(i) above

(iii) State the change in the roller pressure that should be made as a result of this decrease in the Geiger counter reading.

(iv) Give a reason for your in (c) (iii) above

(v) Explain why a source emitting □ (alpha) particles only would not be suitable for this device.

(vi) Explain why a radioactive source of a half-life of 1600 years is more suitable for use in the device than one of a half-life of 8 minutes.

3. Fig. 4 shows a block of a mass 30.0 kg being pulled up a slope by a force P at a constant speed. The friction force on the block is 20.0N.

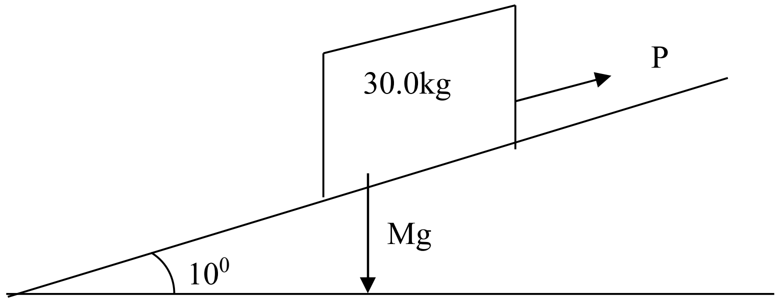


Fig. 4

a i) On the same figure name and indicate the other forces acting on the block.

ii) Determine the component of the weight acting on the trolley down the slope

iii) Determine the value of P.

b) On reaching the top of the slope, the block is left to run freely down the slope.

i) Which one of the forces previously acting on the block would then act in the opposite?

ii) Determine the acceleration of the block down the slope.

iii) What is the effect of increasing the angle of slope on your answer in (ii) above.

4. a) Fig 5. Shows the variation of temperature, T (^{0}C), with time, t (seconds). When frozen water is heated for sometime.

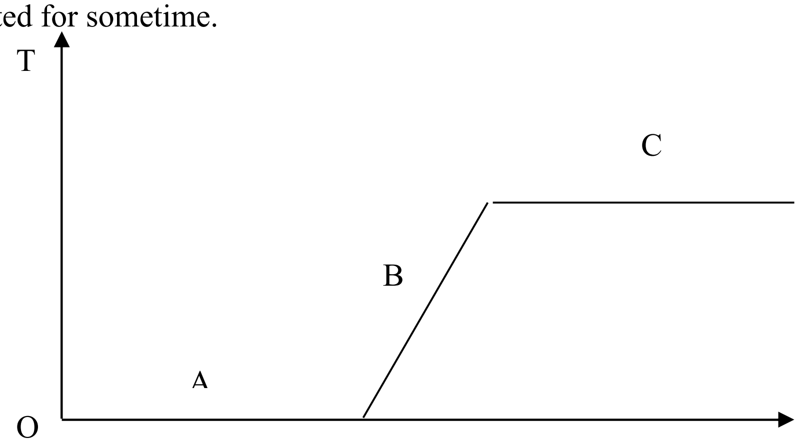


Fig. 5

(i) Explain the shape of the curve at the parts labeled AB and C.

A B C

(ii) It is observed that when the temperature starts to rise, the volume initially decreases and then increases. State the reason for this observation.

(iii) In the fig. 5 sketch and explain the curve that would be obtained if frozen water was used. (Hint: specific heat capacity for seawater is lower what of fresh water.

(b) Determine the quantity of heat energy required to change 3.0 kg of ice at 0^0 C to water at 5 ^{0}C. Specific latent heat of fusion of ice is 3.36 x 10^5 J/kg. Specific heat capacity of water is 4200J/kgK)

5 a) Fig 6.1 shows the cross- section of a ripple tank full of water. A piece of cork floats on the surface of the water as shown. Fig 6 II shows the water surface viewed from above. A straight edge vibrator placed at the end A of ripple tank generates water waves, which travel towards end B as shown.

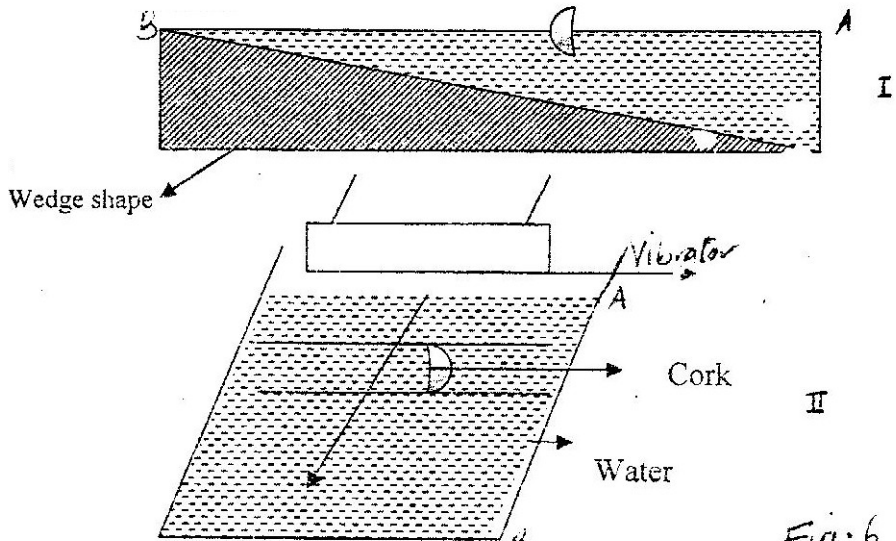


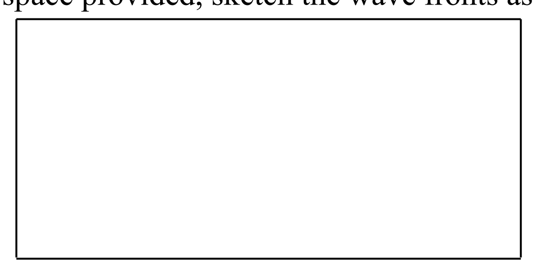
Fig. 6

(i) Identify the type of waves generated on the water surface.

(ii) It is observed that as the waves pass the cork, there is no net movement on the cork. Explain this observation

(iii) A student estimates that successive waves pass the cork every 0.20 seconds. If the speed of the waves is 0.30 ms^{-1}, determine the frequency and wavelength of the waves at that point.

iv) In the space provided, sketch the wave fronts as viewed from a point above the ripple tank.

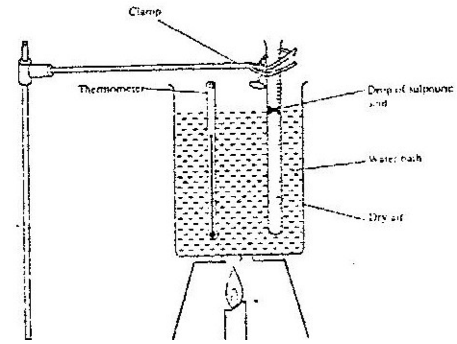


v) Explain the answer in part (iv) above

b) A tuning fork is sounded at the mouth of a pipe whose one end is closed with a moveable piston. Resonance is observed successively when the piston is 77cm and then at 129 cm. If the speed of sound in air is 340ms $^{-1}$, determine the frequency of the tuning fork.

6. a) State the law that relates the volume of a gas to the temperature of a gas.

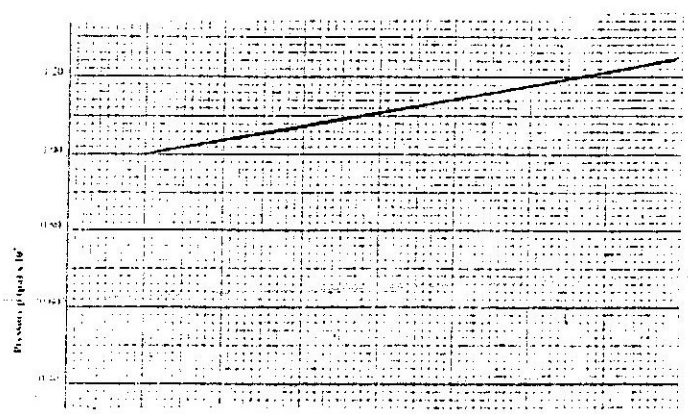
b) Fig 7. shows an experiment set-up that may be used to investigate one of the laws. The glass tube has a uniform bore and it is graduated in millimeters



i) Describe how the experiment was carried out and explain how the results obtained verify the law.

ii) Limitations of the set up are?

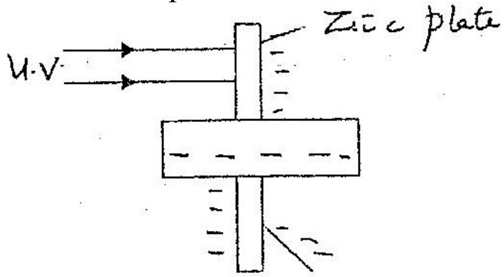
c) In an experiment to find the relation between pressure, p, and temperature, θ, of a gas at a constant volume, values of temperature were determined. The results obtained are shown in the graph below.



(i) From the graph, determine the pressure at a temperature of 273K.

(ii) Assuming the relation $p/T_0+\theta$ = constant holds for this graph determine the value of the constant T_0

7a) Fig. 8 shows ultra violet light striking a polished zinc plate placed on a negatively charged gold – leaf electroscope.



Explain the following observations

i) The leaf of the electroscope falls.

ii) When the same experiment was repeated with a positively charged electroscope the leaf did not fall.

bi) State two factors which determine the speed of photoelectrons emitted by a metal surface

ii) In an experiment using a photocell, u, v. light of varying frequency but constant intensity was made to strike a metal surface. The maximum kinetic energy ($K.E_{max}$)of photoelectrons for each frequency, was measured. The graph shows how KE_{max} varies with f.

Given that KE max = hf - Φ , determine the value of the constants h and φ form the graph.

c) Light of frequency 5.5 x 1014 Hz is made to strike a surface whose work function is 2.5eV. Show that photoelectric effect will not take place.(Use the value of h from (b) above.

PHYSICS PAPER 232/1 K.C.S.E 2003

1. Figure 1 shows a measuring cylinder containing some liquid

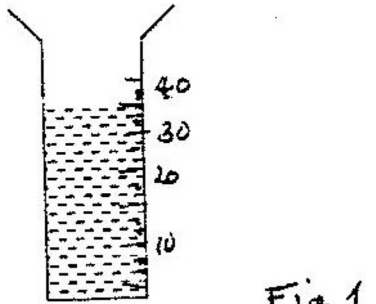


Figure 1

Another 5cm^3 of the liquid is added into the cylinder. Indicate on the diagram the new level of the liquid.

2. Two identical spring balances R and S each weighing 0.5N are arranged as shown in Figure 2.

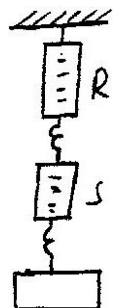


Figure 2

What is the reading on balance R?

3. Figure 3 shows two identical trolleys with loads A and B. The loads are identical in shape and size.

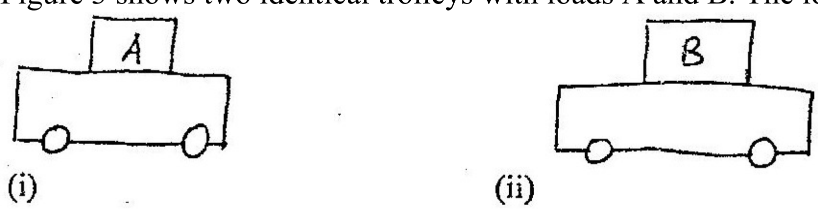


Figure 3

Given that the density of A is greater than that of B, explain why the trolley in figure 3(ii) is more suitable.

4. The reading on a mercury barometer at a place in 700mm. What is the pressure at the place Nm-2 (Density of mercury is 1.36×10^4 kgm^{-3})

5. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell.

6. In the set up shown in Figure 4, it is observed that the level of the water initially drops before starting to rise.

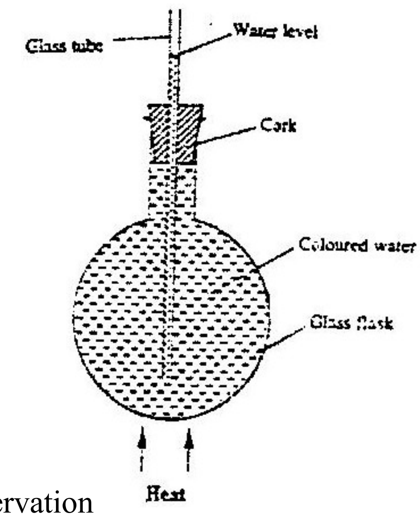


Figure 4
Explain this observation

7. When a Bunsen burner is lit below wire gauze, it is noted that the flame initially burns below the gauze as shown in Figure 5 (i).After sometime, the flame burns below as well as above the gauze as shown in Figure 5(ii).

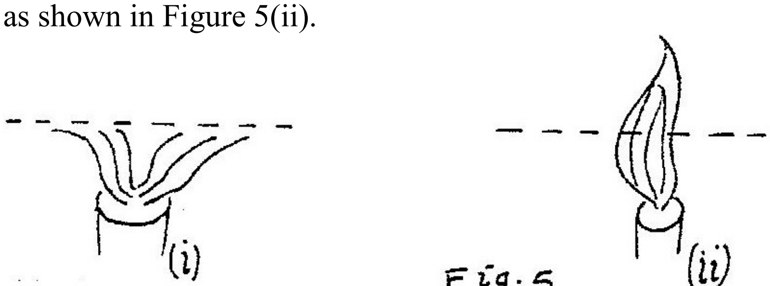


Fig. 5

Explain this observation

8. Figure 6 shows a ray of light being reflected from a mirror.

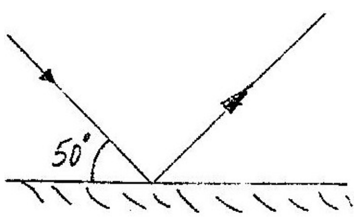


Figure 6
What is the angle of reflection?

9. Figure 7 shows a highly negatively charged rod being brought slowly near the cap of a positively charged leaf electroscope. It is observed that the leaf initially falls and then rises.

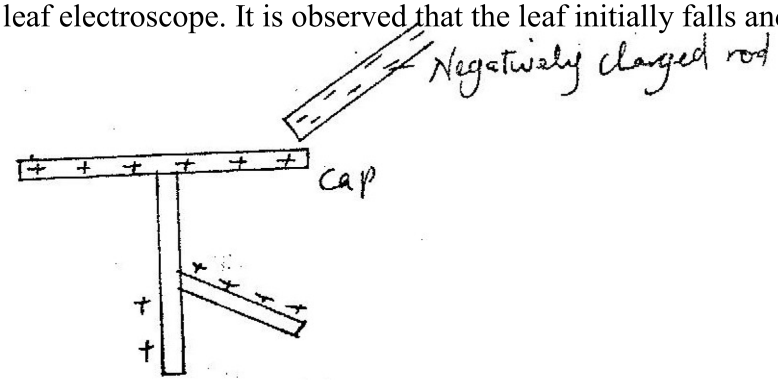


Figure 7

Explain this observation

10. State one advantage of a lead – acid accumulator over a nickel – iron (NiFe) accumulator.

11. One of the factors that affect the surface tension of a liquid is the presence of impurities. State one other factor.

12. Figure 8 shows a bar of soft iron placed near a magnet.

Figure 8

On the same diagram, sketch the magnetic field pattern due to the set up

13. Give a reason why the core of the electromagnet of an electric bell is made of soft iron and not steel.

14. Figure 9 shows a uniform bar in equilibrium under the action of two forces.

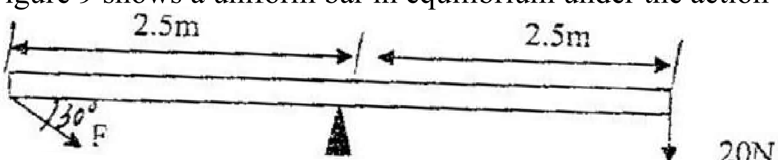


Figure 9

Determine the value of F

15. One of the conditions for total internal reflection to occur is that angle of incidence must be greater than the critical angle of the medium. State the other condition.

16. Figure 10 (draw to scale) shows an image I formed by a diverging lens, L.

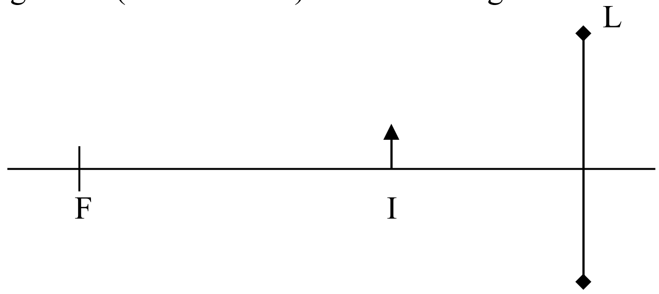


Fig 10

On the same diagram, draw appropriate rays to locate the position of object. Determine the object distance.

17. An electric bulb is rated 75W, 240V. Determine the resistance of the bulb

18. The following equation shows part of a radioactive decay process.

$${}^{234}_{90}\mathbf{T} \xrightarrow{x} {}^{234}_{91}\mathbf{Pa}$$

Name the radiation x.

19. Pure silicon can be changed into p –type semiconductor by adding an impurity. Explain how this is achieved.

20. When a piece of metal is placed on water, it sinks. But when the same piece of metal is placed on a block of wood, both are found to float. Explain this observation.

21. A girl standing 600m away from a cliff bangs two pieces of wood together and hears and echo 3.5 seconds later. Determine the speed of sound in air at that place.

22. On the axes provided in Figure 11, sketch a graph of velocity (V0 versus time (t) for uniformly accelerated motion given that when t = 0, v s greater than zero

Figure 11

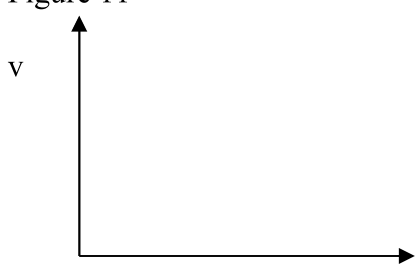
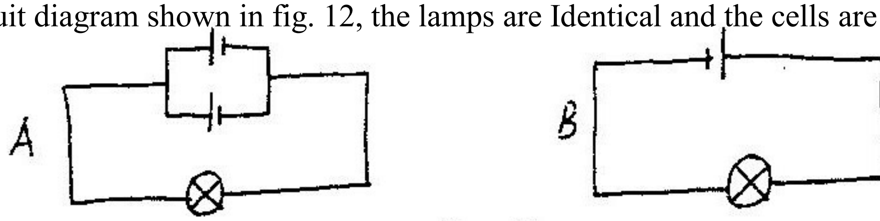


fig. 11

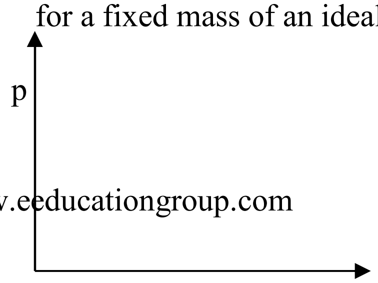
23. In the circuit diagram shown in fig. 12, the lamps are Identical and the cells are also identical.

Figure 12.



State with reason, in which circuit the lamp will be lit for longer period.

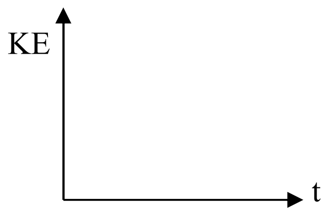
24. On the axes provided in Fig. 13, sketch a graph of pressure(p) against reciprocal of volume(1/V) for a fixed mass of an ideal gas at constant temperature.



1/V fig. 13

25. Give a reason why the target in an X-ray tube is made of tungsten or molybdenum.

26. Two identical stones A and B are released from the same height above the ground fall through air while A falls through water.
Figure 14.



On the axes provided in Figure 14, sketch the graphs of kinetic energy (KE) against time (t)

27. Figure 15 shows an experimental arrangement for determining the wavelength of light,

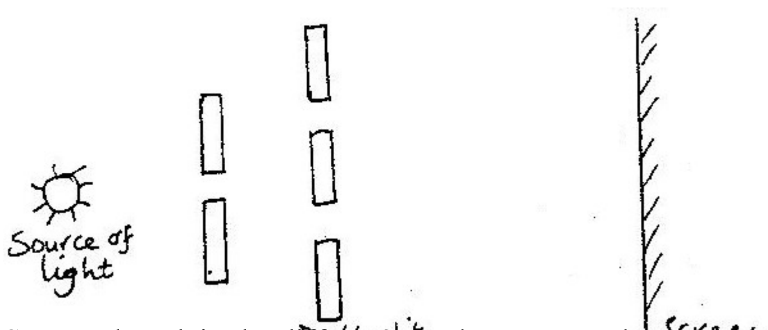


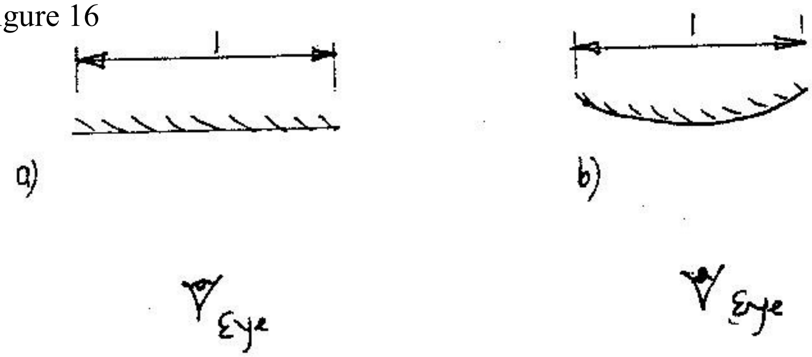
Fig. 15

State and explain the difference in the patterns observed on the screen other than the difference in colour when the source of red light is replaced by a source of violet light.

28. A heating element rated 2.5 kW is used to raise the temperature of 3.0kg of water through 500°C. Calculate the time required to effect this. (Specific heat capacity of water is 4200 J/kgK)

29. Figure 16 (a) and (b) show a convex mirror and a plane mirror of equal aperture.

Figure 16

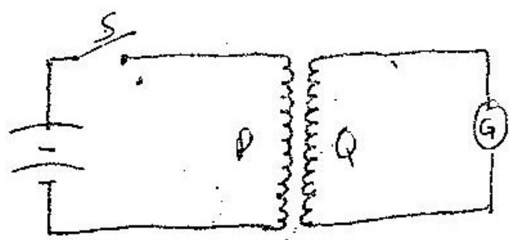


By sketching a pair of incident and reflected rays for each (a) and (b) show how the convex mirror provides to the eye, a wider field of view than the plane mirror.

30. A resultant force F acts on a body of mass m causing an acceleration a1 on the body. When the same force acts on a body of mass 2m, it causes an acceleration a_2. Express a_2 in terms of a.

31. Arrange the following gin order of increasing frequency:
Visible light, infrared radiation, X – rays, u. v. radiation, radio waves.

Two identical copper coils p and Q are placed close to each other as shown in Figure 17. Coil P is connected to a D>C power supply and coil Q is connected to a galvanometer, G.



Use this information to answer questions 32 and 33. Fig. 17

32. State and explain what would be observed on the galvanometer immediately the switch S is closed.

33. State with reason the difference that would be noted in the observation made in question 32 if the number of turns in coils Q were doubled.

34. Figure 18 shows the pattern produced by an A.C voltage on a CRO screen.

Figure 18.

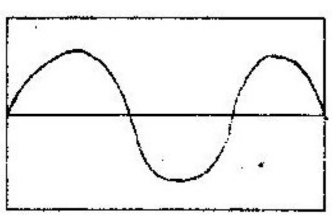


Fig. 18

On the same figure, sketch the pattern produced by the same voltage when the time base is switched off.

35. The minimum frequency of radiation necessary to cause photoelectric effect on a certain metal surface in 9.06×10^{14} Hz. Determine the work function fo the metal.(planks constant $h = 6.63 \times 10^{-34}$ Js)

36. Figure 19 shows a pith ball placed in a flask. When a jet of air is blown over the mouth of the flask as shown, the pith ball is observed to rise form the bottom

Figure 19

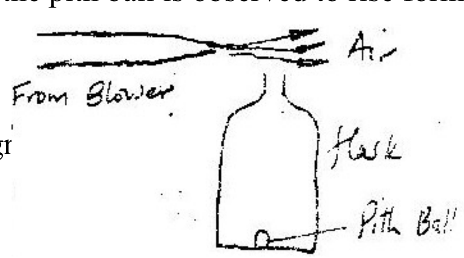
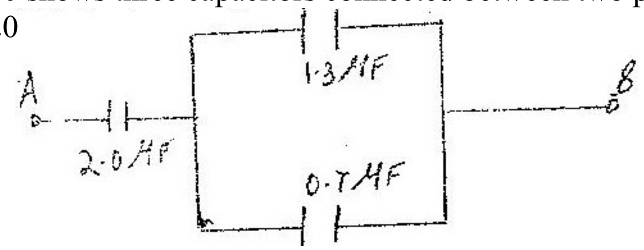


Fig. 19

Explain this observation

37. Figure 20 shows three capacitors connected between two points A and B.
Figure 20



Determine the capacitance across AB

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1a. Fig 1 shows the displacement time graph of the motion of a particle.

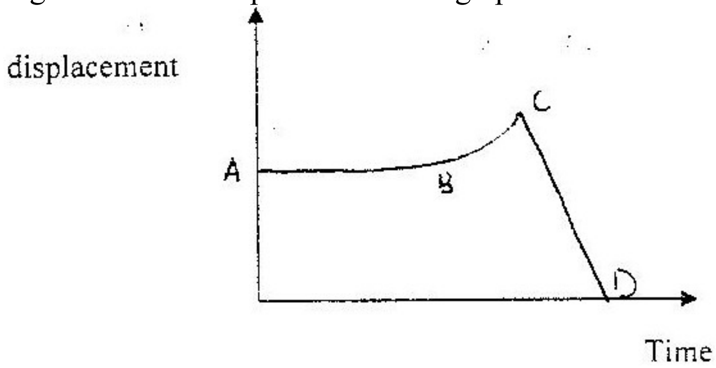


Fig. 1

State the nature of the motion of the particle between:

(i) A and B (ii) B and c (iii) C and D

b) A ball is thrown horizontally from the top of a vertical tower and strikes the ground at point 50m from the bottom of the tower. Given that the height of the tower is 45m, determine the :

i) Time taken by the ball to hit the ground.

ii) The initial horizontal velocity of the ball

iii) Vertical velocity of the ball just before striking the ground. (Take acceleration due to gravity g as $10ms^{-2}$) Total 13 marks

2a) A crane lifts a load of 200kg through a vertical distance of 3.0m in 6 seconds.
Determine:

(i) Work done

(ii) Power development by the crane.

(iii) Efficiency of the crane given that it is operated by an electric motor rated 12.5kW.

(b) A child of mass 20kg sits on a swing of length 4m and swings through a vertical height of 0.9m as shown in figure 2..

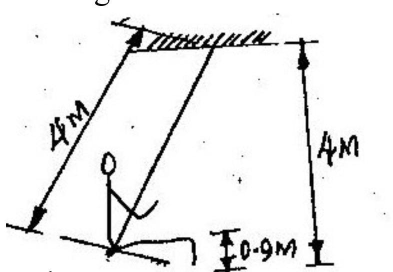


Fig. 2.

Determine:

(i) Speed of the child when passing through the lowest point.

(ii) Force exerted on the child by the seat of swing when passing through the lowest point.

(14mks)

3a) State what is meant by the term 'specific latent heat of vaporization'

b) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0C was passed into water contained in a well-lagged copper calorimeter. The following measurements were made;

(i) Determine the:

I Mass of condensed steam

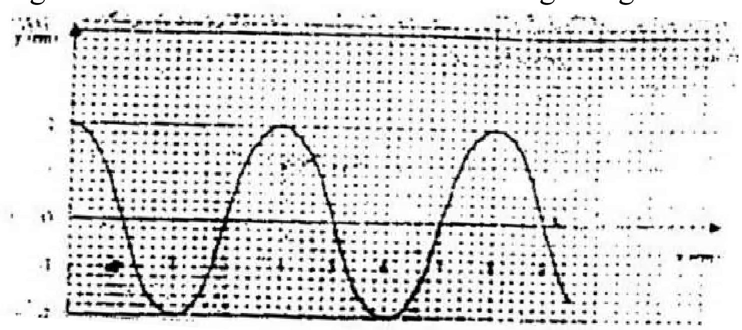
II Heat gained by water

Heat gained by calorimeter

(ii) Given that L is the specific latent heat of vaporization of steam, I write an expression for the heat given out steam.

II Determine the value of L.

4 a) Figure 3 shows a transverse wave traveling along x-axis.



(i) Determine the:

I Wavelength of the wave

II Amplitude of the wave.

(ii) If the time taken by the wave to move from 0 to A is 0.09 seconds, determine the:

I Frequency of the wave.

II Speed of the wave

b) Figure 4 shows a Geiger muller (GM) tube

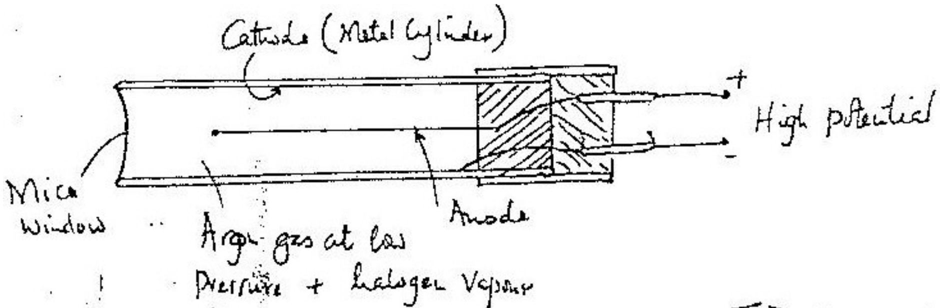


Fig. 4

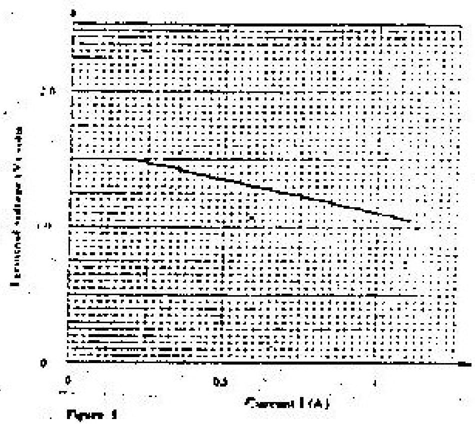
(i) Give the reason why the mica window is made thin.

(ii) Explain how the radiation entering the tube through the window is detected by the tube.

(iii) What is the purpose of the halogen vapour

5 a) States what is meant by electromotive force (em.f) of battery.

b) The graph in figure 5 shows the terminal voltage, V, of a certain battery varies with the current, I, being drawn from the battery.



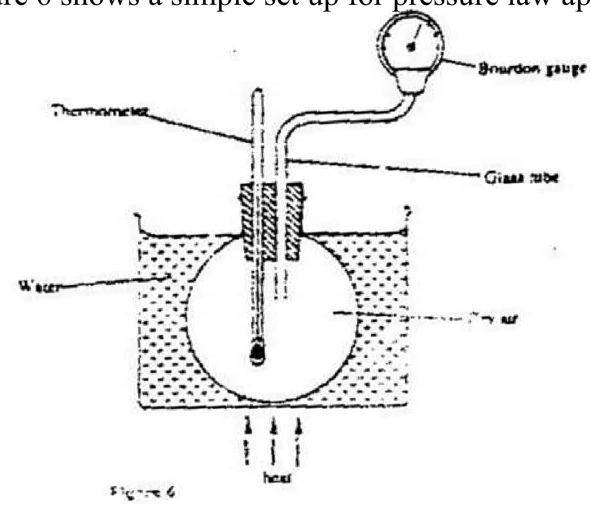
(i) Write an expression relating the e.m.f. E, terminal voltage, V, current, I and the internal resistance, r, of the battery for the circuit drawn in
(i) above.

(iii) From the graph determine the; I internal resistance, r, of the battery.

(C) A galvanometer of resistance 10Ω gives a full-scale deflection when a current of 0.03A flows through it. Determine the resistance of the resistor, which would be required to convert the galvanometer to an ammeter reading up to 3.0a.

SECTION II

6 a) Figure 6 shows a simple set up for pressure law apparatus.



Describe how the apparatus may be used to verify pressure law. Initial reading of pressure and temperatures are recorded.

b) The graph in fig 7 shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at a constant volume.

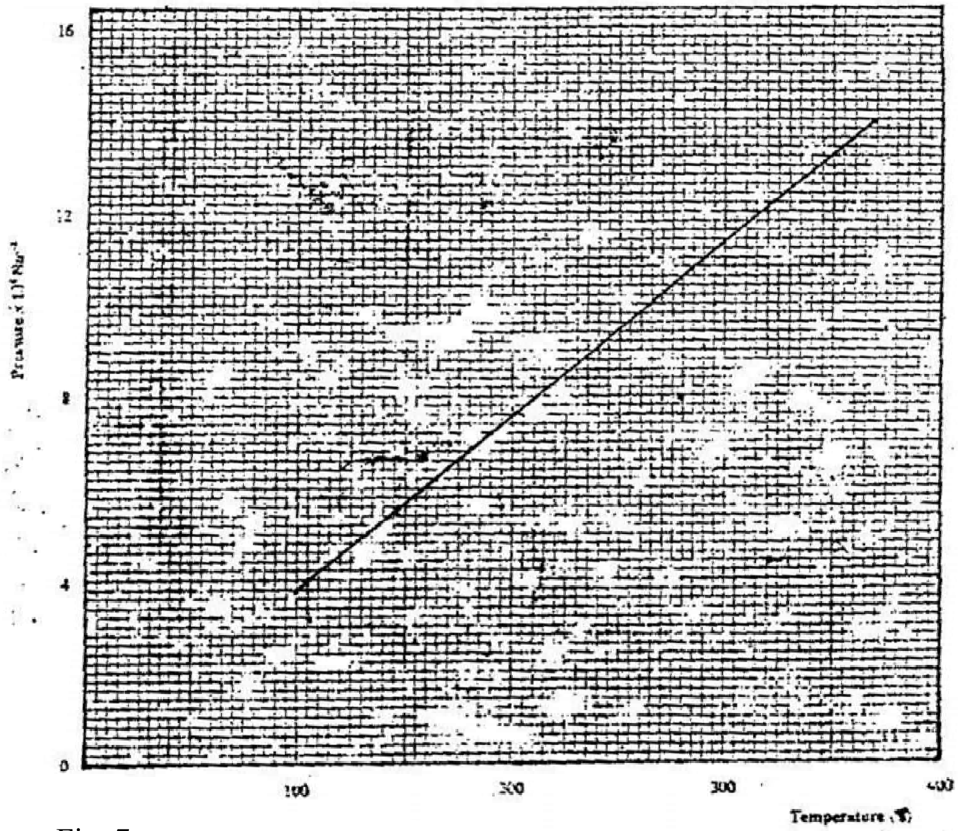


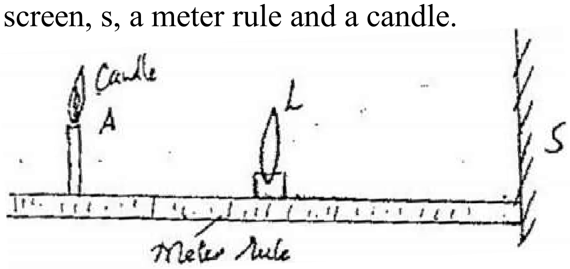
Fig. 7

(i) Given that the relationship between pressure, p, and temperature, T n Kelvin is of the form P = kT+ C where k and C are constants, determine from the graph, values of k and c.

(ii) Why would it be impossible for pressure of the gas to reduced to zero in practice?

(c) A gas is put into a container of fixed volume at a pressure of 2.1×10^5 Nm^{-2} and temperature 27^0C. the gas is then heated temperature of 327^0C.
Determine the new pressure.

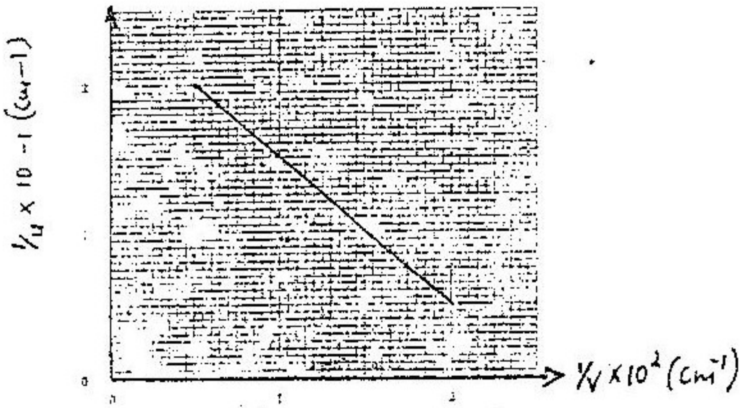
7. a) Fig. 8. shows an experimental set up consisting of a mounted lens. L, a screen, s, a meter rule and a candle.



(i) Describe how the set-up may be used to determine the focal length, f, of the lens.

(ii) State the reason why the set-up would not work if the lens were replaced with a diverging lens.

(b) The graph in figure 9. shows the relationship between $^1/_r$ and $^1/_v$ for converging lens where u and v are the object and image distances respectively.



For the graph, determine the focal length, f of lens.

(c) An object placed 15cm from a convex lens is magnified two times. Determine the focal length of the lens.

PHYSICS PAPER 1 2004 QUESTIONS

1. Figure 1 shows a micrometer screw gauge being used to measure the diameter of a ball bearing. A magnified portion of the scale is shown.

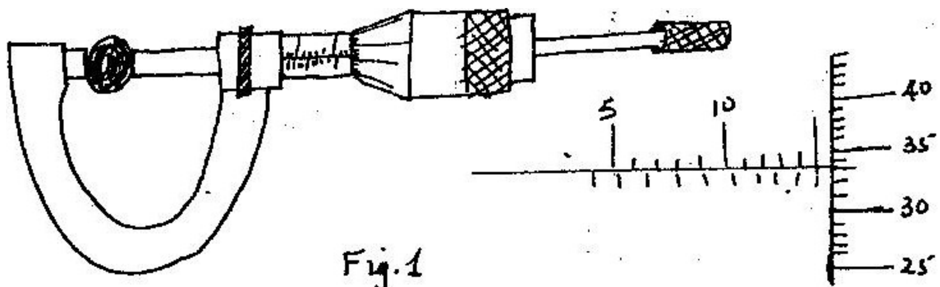


Fig. 1

Record the diameter of the ball bearing …………………………………………………..

2. The system in figure 2 is in equilibrium at room temperature.
The system is taken outside where the temperature is 10^0c higher for sometime.

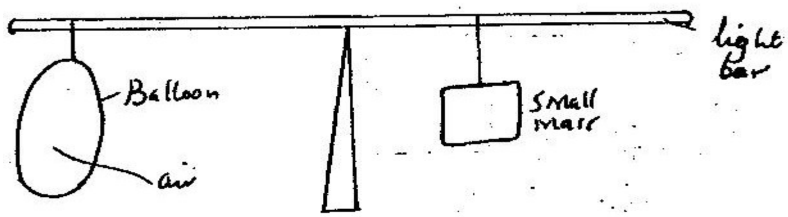


Fig. 2

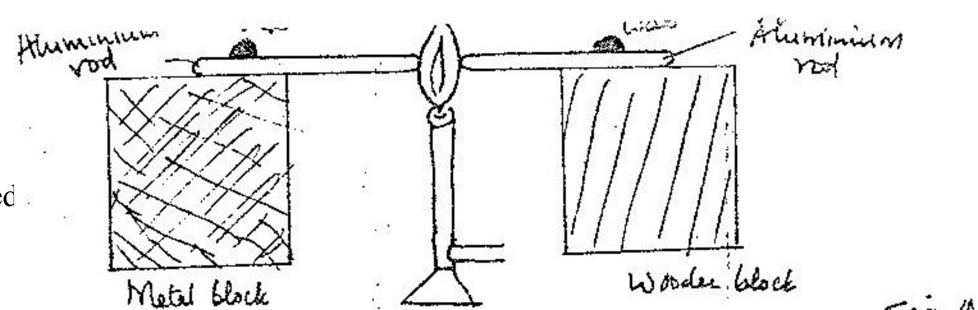
Explain why it tips to the right immediately it is returned to the room.

3. Fig 3 shows a rectangular block of wood with a hollow section (inside) at the position shown. The block is resting on a Horizontal bench
   (i) State the effected on the stability of the block when the hollow section is filled with water.
   ii) Explain your answer in (i) above.

4. Give a reason why water is not a suitable liquid for use in a barometer.

5. The temperature of water in a measuring cylinder is lowered from about 20^0 c to 0^0. On the axes provided, sketch the graph of the Volume against temperature assuming the water does not freeze.

6. Two identical aluminium rods as shown in figure 4. One rests on metal block the other on the wooden Block. The protruding ends are heated on a Bunsen burners shown.



State with reason on which bar the wax is likely to melt.

7. Figure 5 shows two mirrors inclined at an angle of 60^0 to each other. A ray of light is shown

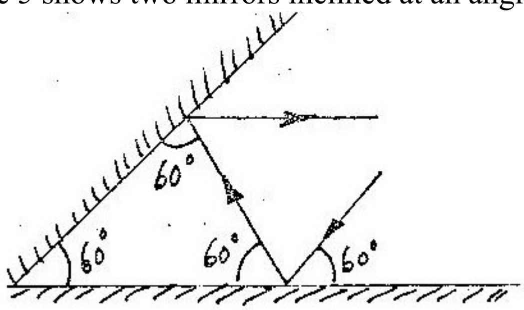


Fig 5

Sketch the same diagram, the path of the ray until it leaves the two mirrors. Indicate the angles at each reflection.

8. Figure 6 (a) shows three spherical balls of the same size placed on insulating stands. Balls A and B are conductors while ball C is non conductor. Ball A was initially charged as shown. The quantity of charge is represented by the number of dashes.

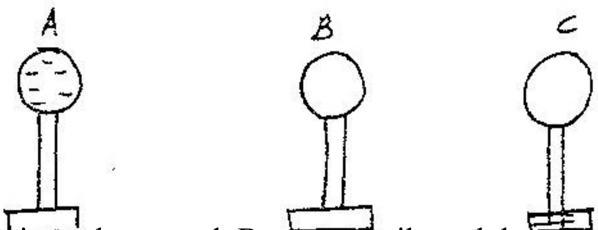


Fig 6(a)

Ball A is made to touch B momentarily and then C. Show on Figure 6(b), the final distribution of charge on the balls.

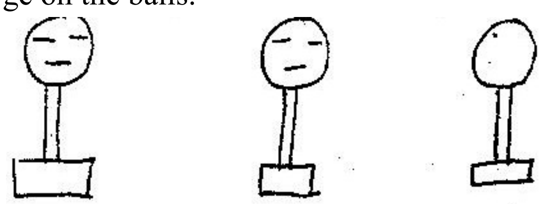


Fig. 6(b)

9. State the purpose of Manganese dioxide in a dry cell
10. State one way of reducing surface tension in water.
11. Figure 7 shows the poles of two magnets close together.

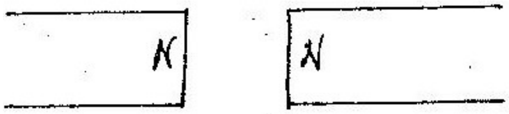


Fig 7

Figure 8 shows a current-carrying coil in a magnetic field.

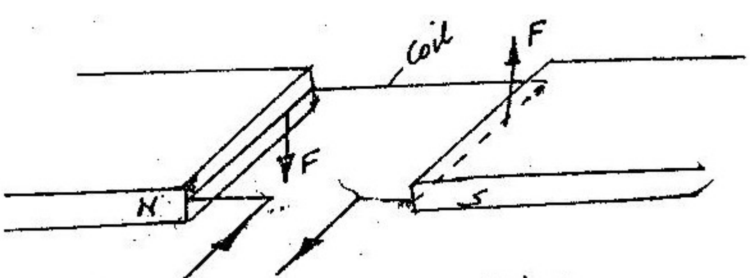


Fig.8

Use the information on the figure to answer question 12 and 13.

12. Mark on figure 8 the direction of the forces acting on the sides of the coil labeled
13. State two ways of increasing the force on the coil.
14. The system in figure 9 is in equilibrium.

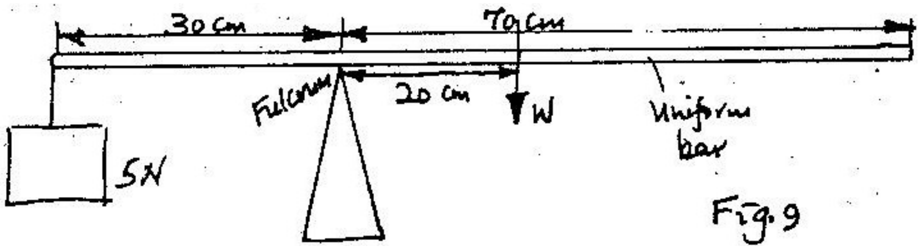


Fig. 9

Determine the weight if the bar.

15. Figure 10 show two circuits in which identical dry cells and identical bulbs are used. Use the information in the figure to answer questions 15 and 16.

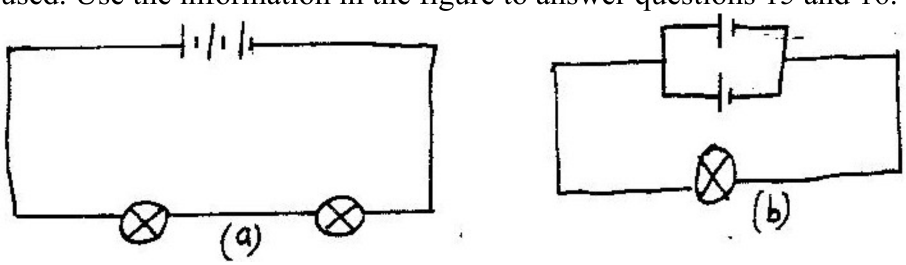
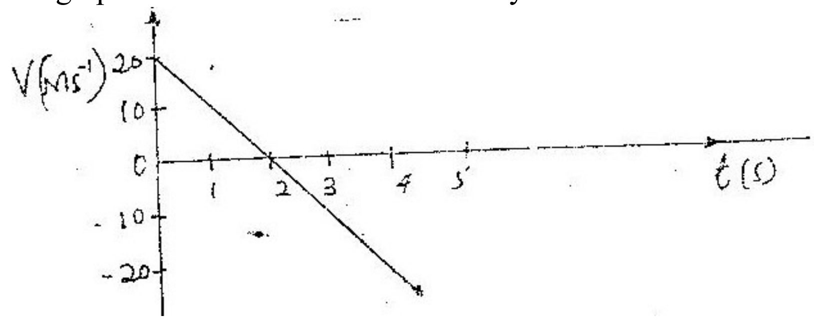


Fig. 10

Explain why the bulb in Figure 10(10) will be brighter than each of the bulbs in Figure 10 (a)

16. Give the reason why the cells in figure 10(b) can be used for a longer period than the cells in Figure 10 (a)

17. The graph below shows how the velocity varies with time for a body thrown vertically upwards.



Determine the total distance moved by the body.

18. A body of mass 60kg is pulled at a uniform velocity up smooth inclined surface as shown in Figure 11

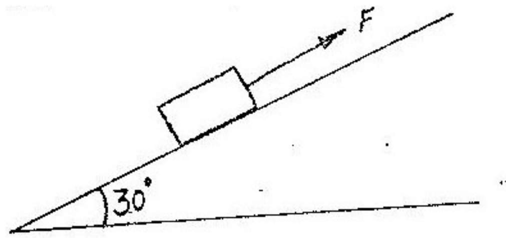


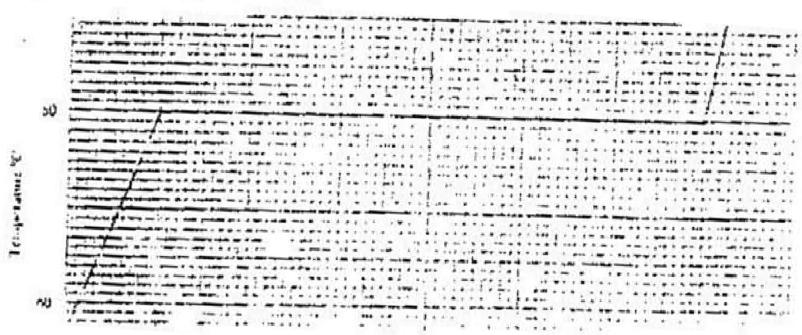
Fig. 11

If the distance moves along the incline is 4.0m, determine work done by the force F.

19. State the difference between mechanical and electromagnetic waves.

20. An electric heater is connected to the mains supply. A fault in the mains reduces the supply potential slightly.
Explain the effect on the rate of heating of the heater.

A certain powder of mass. 0.10kg was heated in a container by an electric heater rated 50 w for sometime. The graph below shows the variation of the temperature of the powder with time. Use this information and the graph to answer question 21 and 22.



21. Determine the quantity of heat by the heater from the time the power starts to melt to the time it has all melted.

22. Determine the specific latent heat of fusion of powder assuming the container absorbs negligible amount of heat.

23. Figure 12 shows a parabolic surface with a source of light placed at its focal point F

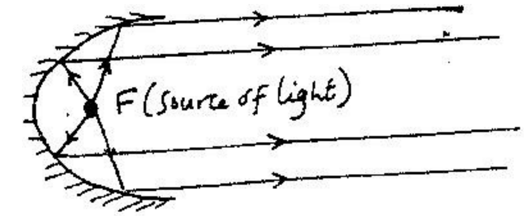


Fig. 12

Drarays to show reflection from the surface when rays from the source strike the surface at points ABC and D.

24. Figure 13 shows a coin placed in a large empty container. And observer looking into the container from the position shown is unable to see the coin.

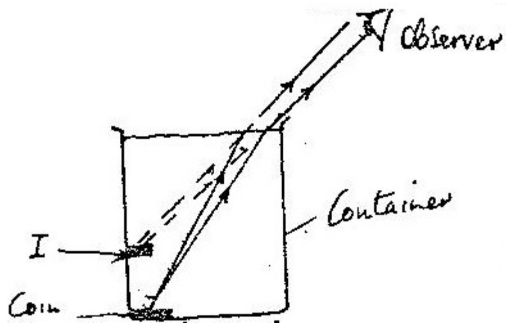


Fig. 13

Sketch two rays from a point on the coin to show how the observer is able to see the image of the coin after the container if filled with water.

25. A trolley is moving at a uniform speed along a track. A piece of plasticine is dropped on the trolley and sticks on it.
Explain why the trolley slows down.

26. The capacitors in the circuit in fig 14 are identical and initially uncharged.

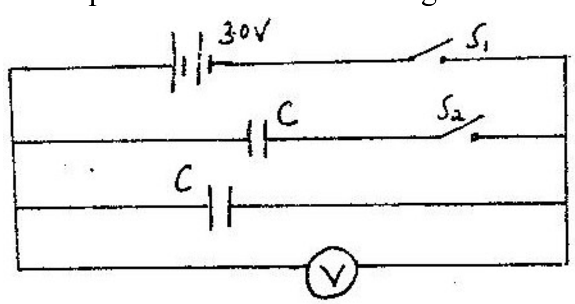


Fig. 14

Switch S_1 is closed while switch s_2 remains open. After sometime, switch s_1 is opened and switch s_2 closed. Determine the final reading of the voltmeter, V.

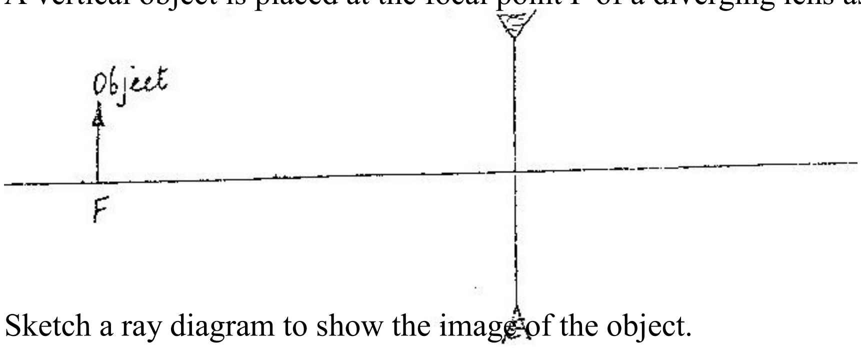
27. A balloon is filled with air to volume of 200ml at a temperature of 293K. Determine the volume when the temperature rises to 353K at the voltmeter, V.

28. State the difference between X-rays and Gamma rays in the way in which they are produced.
29. A body mass 0.50kg is attached to the end of a string of length 50cm and whirled in a horizontal circle. If the tension in the string is 81N, determine the velocity of the body.

30. Fig. 15 shows water waves of different wavelengths incidentical apertures A and B.

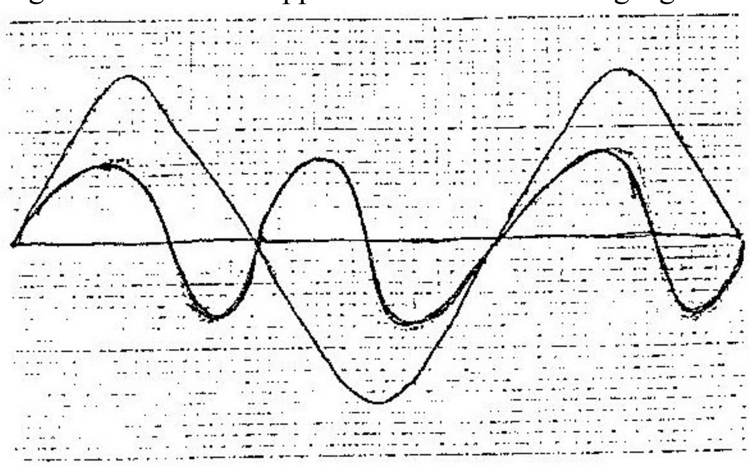
Complete the diagram to show the pattern of the waves beyond the aperture in each case.

31. A vertical object is placed at the focal point F of a diverging lens as shown in Figure 16.



Sketch a ray diagram to show the image of the object.

32. Figure 17 shows the appearance of an alternating signal on a screen of a cathode ray oscilloscope.



On the same diagram, sketch the appearance of the signal when the frequency is doubled and the voltage halved.

33. State the difference between hard X-ray and soft X-rays.

34. The work function of a certain material is 3.2 3V. Determine the threshold frequency for the material. (1 electron Volt (eV)= 1.6 x10^{-19}) and planks Constant h=6.62 x 10^{-34}Js)

Figure 18 shows the circuit of a npn-n transistor amplifier in common –emitter mode. Use the information on the figure to answer question 35 and 36

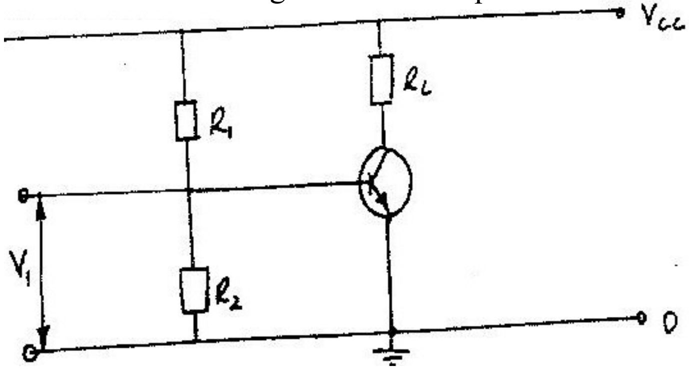


Fig 18

35. On the diagram
   a) Label the collector current, I_c and I_B
   b) Indicate the directions of 1_c and 1_B you have labeled in (a) above.

36. Indicate on the diagram, the position where the output V_0 would be tapped.

PHYSICS PAPER II 2004 QUESTIONS
SECTION 1 (65 MKS)

1. a) A test tube of uniform cross-section loaded so that it can float upright in water. With the aid of a labeled diagram, describe how the test tube may be calibrated to measure the density of liquid.

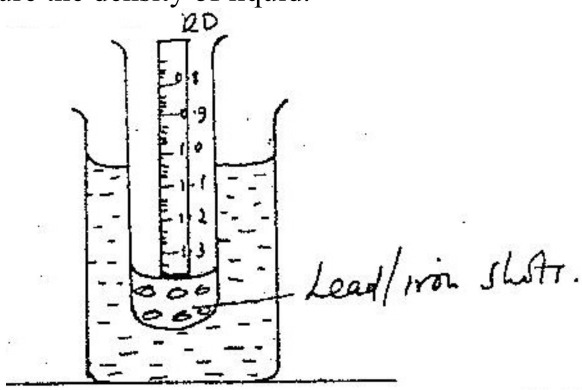
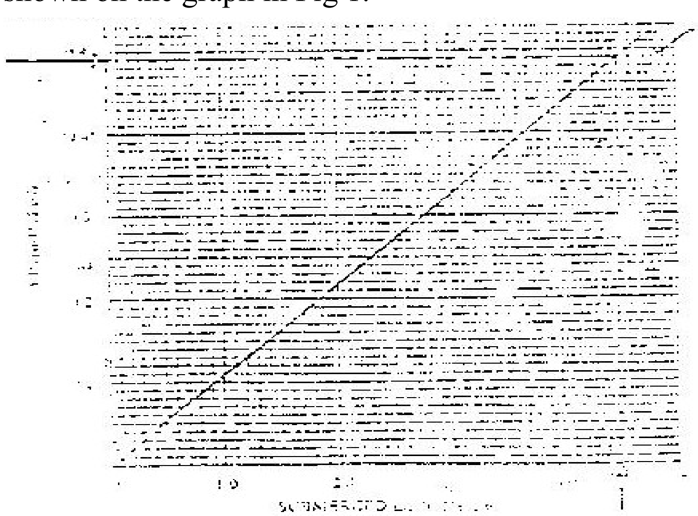


Fig. 1

b) In an experiment to determine the density of a liquid, a uniform metal cylinder of cross-section area 6.2cm was hang from a spring balance and lowered gradually into the liquid. The up thrust was determined for various submerged lengths. The results obtained are shown on the graph in Fig 1.



Using graph, determine;

(i) The value of the up thrust when the cylinder is fully submerged

(ii) The Density of the liquid

2. a) In an experiment to determine the power of an electric heater, melting ice was place in a container with an outlet and the heater placed in the ice as shown in Fig. 2. The melted ice was collected.

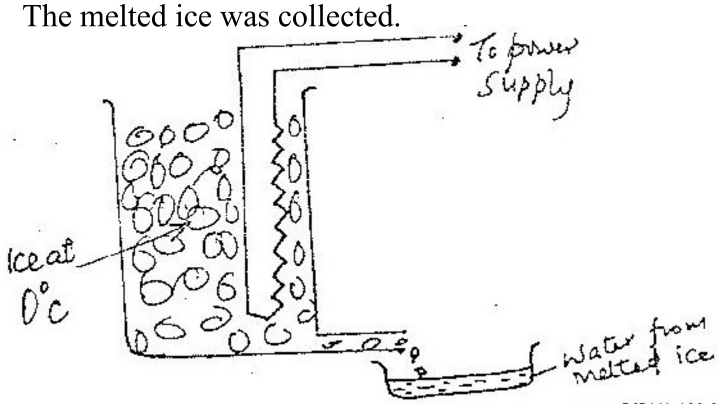


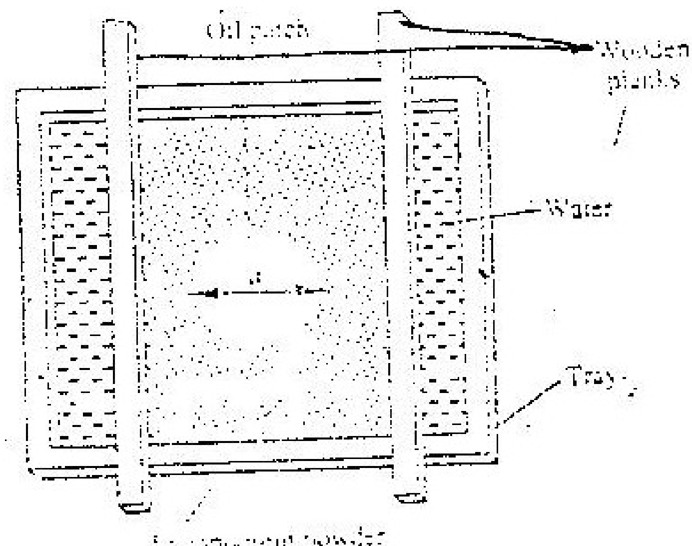
Fig. 2

i) Other than the current and voltage, state the measurement that would be taken to determine the quantity of heat absorbed by the melted ice in unit time.

(ii) If the latent heat of fusion of ice is L, show how measurement in (i) above would be used in determining the power P. of the heater.

(iii) It is found that the power determined in this experiment is lower than the manufacturer's value indicated on the heater.

b) Fig 3 shows part of an experimental set up for estimating the diameter of an oil molecule.



i) Describe how the oil patch is formed

ii) In an experiment the diameter a, of the patch was measured to be 200mm for an oil drop of radius 0.25mm. Determine the diameter of the molecule of the oil.

3. Figure 4 shows the cross-section of a diffusion cloud chamber used to detect radiation from radioactive sources.

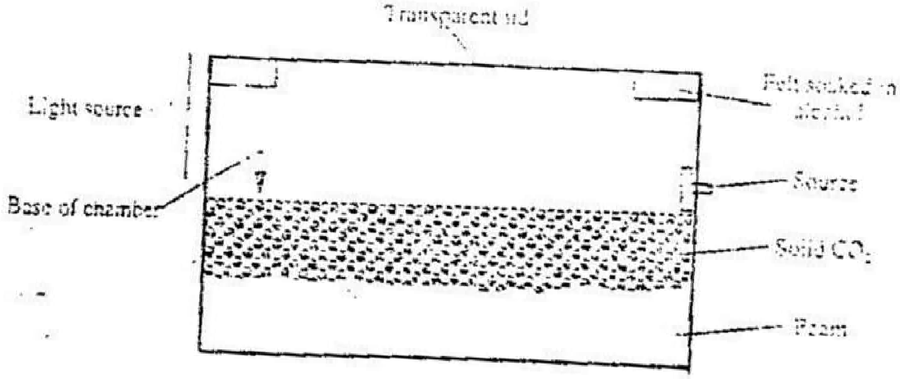


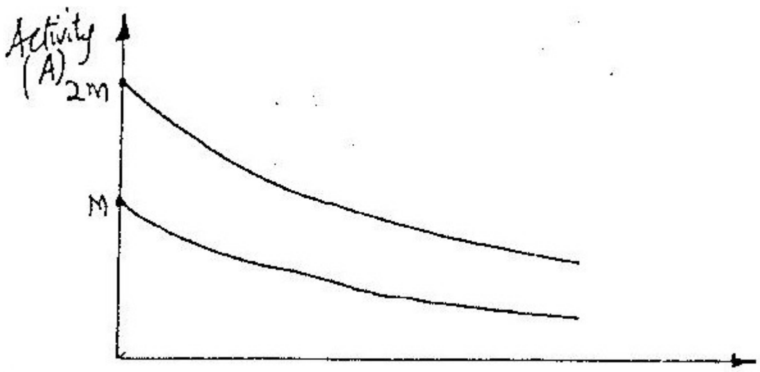
Figure 4

a) i) State one function of each of the following:
Alcohol
solid C_{o2}

ii) When radiation from the source enters the chamber, some white traces are observed. Explain how these traces are formed and state how the radiation is identified.

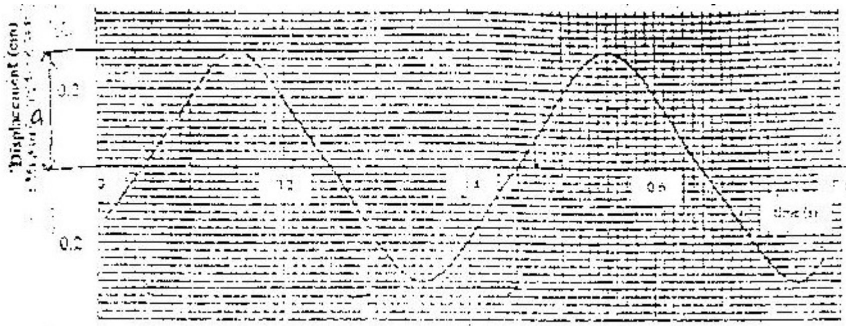
iii) A leaf electroscope can also be used as a detector of radiation. State two advantages of the diffusion cloud chamber over the leaf electroscope as a detector.

b) i) Two samples of the same radioactive material have initial masses M and 2M respectively. On the axes provided, sketch the graph of activity versus time for each sample. Label the graph for each sample.



ii) A radioactive sample of half-life 130 days initially has 1.0×10^{20} radioactive atoms. Determine the number of radioactive atoms that have decayed after 390 days.

a) Fig 5 shows the displacement time graph of a wave traveling at 200cm/s



Determine for the wave the

i) Amplitude

ii) Period

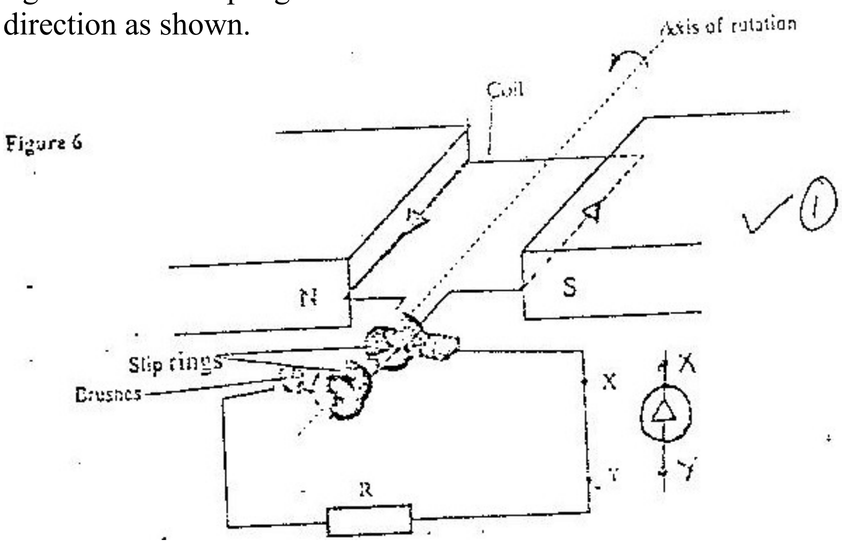
iii) Frequency

iv) Wavelength

b) i) In the space provided below, sketch a labeled diagram to show how pinhole camera forms an image of a vertical object placed in front of the pinhole.

ii) a building standing 200m from a pinhole camera produces on the screen of the camera an image 2.5cm high 5.0cm behind the pinhole. Determine the actual height of the building.

5. a) Fig 6 shows a simple generator. The coils are rotated in the anticlockwise direction as shown.

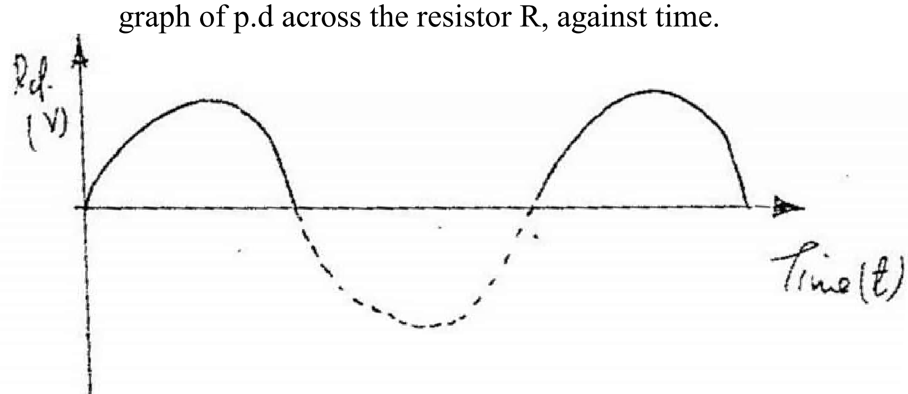


i) Indicate using an arrow on the figure, the direction of the induced current as the coil passes the position shown.

ii State two ways of increasing the magnitude of the induced current in this type of generator.

iii) On the axes provided, sketch the graph of the induced e.m.f with time.

iv) The section marked XY is cut off and a diode inserted. On the axes provided, sketch the graph of p.d across the resistor R, against time.



b) Fig 7 shows pendulum A and pendulum B freely suspended between the poles of identical magnets. Pendulum a is made of thick copper plate while B is made a copper plate with slots

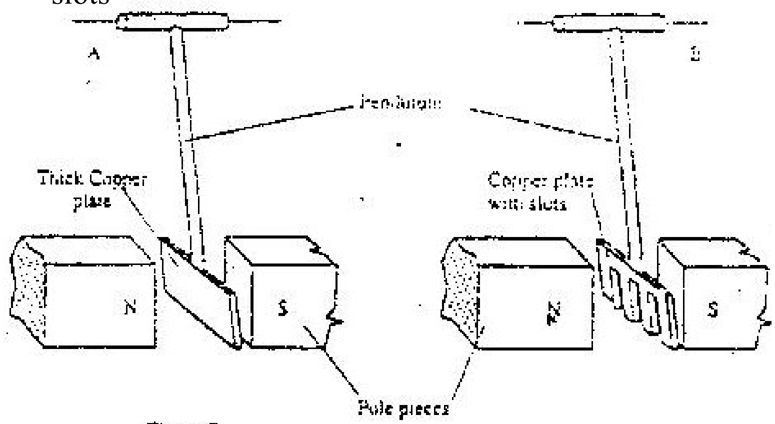


Figure 7

When the two are set to swing, it is observed that A slows down faster then B Explain this observation.

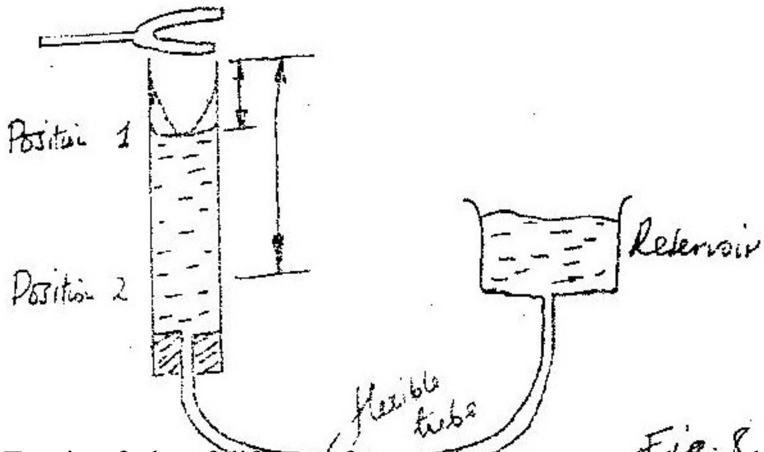
c) An alternating current source has a root-mean-square potential difference of 12,V, Determine the peak value of this potential difference.

SECTION II (15MKS)

Answer ONE question from this section on the spaces provided at the end of question seven.

6. a) You are provided with two identical tuning forks and some plasticine. Describe how you would demonstrate beats in sound.

b) Fig 8 shows a set up that was used in an experiment to determine the speed of sound air



Turning forks of different frequencies were sounded near the mouth of the open tube and by lowering the reservoir, the list two resonant lengthsL_1 L_2 were ensured for each frequency.

Table 1 shows the results obtained.

Frequency, f (HZ)	256	288	341	427	480	512
L_1(cm)	30,8	27.2	22.8	17.9	15.8	14.7
L_2(cm)	95.5	84.5	71.2	56.6	50.2	46.9
$^1/_f$ (HZ^{-1})						
$L_2 - l_{1(m)}$						

(i) Complete the table. On the grid provided, plot the graph of $l_2 - l_1$ (y-axis) against $^1/_f$

(ii) From the graph determine the speed V of sound in air given that 1_2-1_1 = v/2r. Therefore V= 2f($1_2 - 1_1$)

(iii) Explain how resonance is attained in this set up.

7. a) i) What is photoelectric effect?

ii) You are provided with the following: a photocell, a source uv light, a rheostat, a source of e.m.f, a milliammeter, a voltmeter and connecting wires. Draw a circuit diagram to show how photoelectric effect may be demonstrated in the laboratory.

b) In a photoelectric effect experiment, a certain surface was illuminated with radiation of different frequencies and the stopping potential determined for each frequency.

Table 2 shows the results obtained.

Table 2.

Frequency, f ($x10^{14}$ HZ)	7.95	7.41	6.88	6.10	5.49
Stopping Potential, V_s (V)	1.35	1.15	0.93	0.62	0.36

(i) Plot the graph of the graph of stopping potential (y-axis) against frequency.

(ii) Determine Planks Constant, h, and the work function, θ,of the surface given that

$eV_s = hf - hf_o$

where e= 1.6×10^{-19} coulomb and hf = θ

f_o is the lowest frequency that can cause photoelectric effect.

c) A surface whose work functionθ = 6.4×10^{-19} joules is illuminated with light of frequency 3.0 x 10 15Hz

Find the maximum Kinetic energy of the emitted photoelectrons (Use the Value of H obtained in b(ii)

PHYSICS PAPER 232/1 K.C.S.E 2005 QUESTIONS

1. Figure 1 shows the reading on a burette after 55 drops of a liquid have been used.

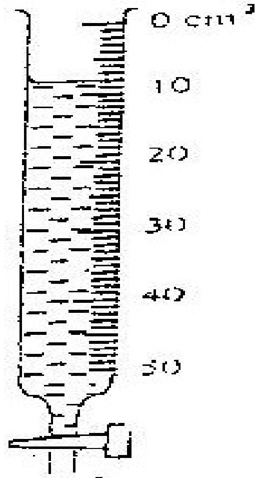


Figure 1

If the initial reading was at Zero mark, determine the volume of one drop.

(2mks)

2. Fig 2 shows a solid cylinder standing on a horizontal surface. The cylinder is in stable equilibrium.

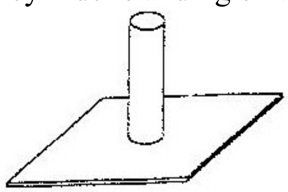


Fig 2

On the horizontal space provided, sketch the cylinder in neutral equilibrium.

(1mk)

3. The light uniform bar in Fig 3 is equilibrium. The two beakers A and B contain water at the same temperature. The two blocks are made of the same material.

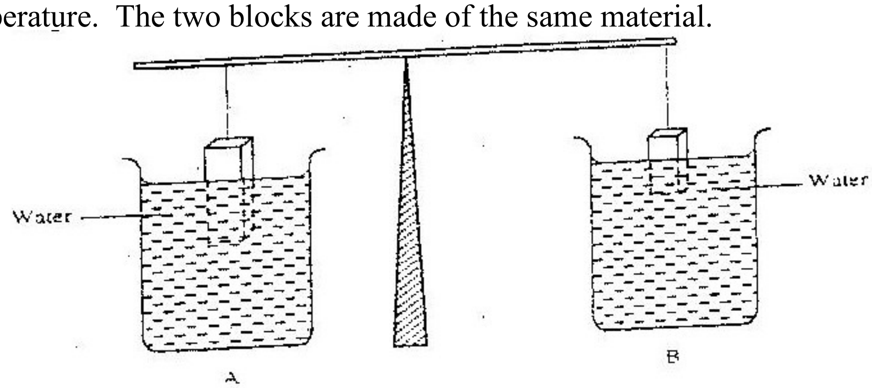
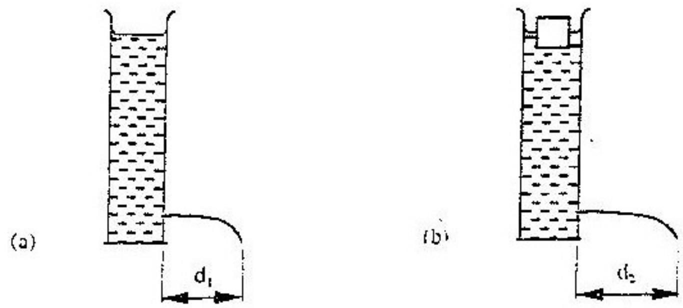


Figure 3

If the temperature of the water in beaker A is now raised, explain why the beam tips to side A. Assume the solid does not expand.

4. A can with a hole on the side is filled with water to a certain height. Water jets out as shown in Fig. 4(a). a second identical can is filled with water to the same height and a block of wood floated on the water as shown in Fig. 4 (b)



State the reason why the maximum distance of the jet, d2 is greater than d1 (1mk)

5. In a vacuum flask the walls enclosing the vacuum are silvered on the inside. State the reason for this. (1mk)

6. Fig 5. Shows an arrangement of a source of light, an opaque object and a screen.

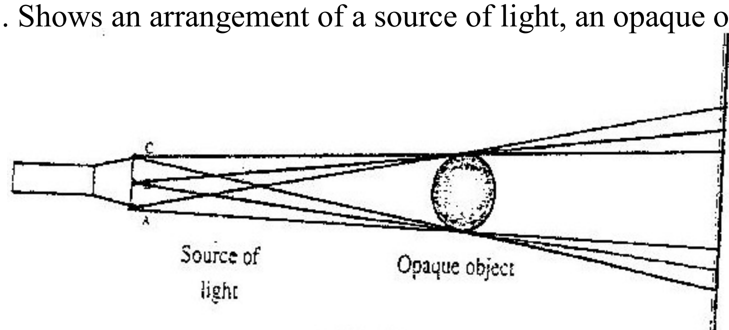


Figure 5

Using A, B and C as point sources, sketch on the same figure labeled ray diagram to show what is observed on the screen. (2mks)

7. Two identical tubes A and B held horizontally contain air and water respectively. A small quantity of coloured gas is introduced at one end of A while a small quantity of coloured water is introduced at one end of B. state with reason the tube in which the colour will reach the other end faster.

8. Sketch the electrostatic field pattern due to the arrangement of the charges shown in Fig 6

+ (1mk)

Fig 6

9. Fig 7 shows the features of a dry cell(Luclache'). Use the information in the figure to answer question 9 and 10

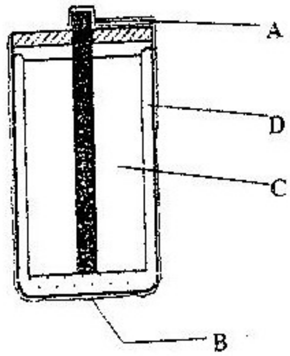


Fig 7

State the polorites of the parts labeled A and B. (1mk)

A……………..

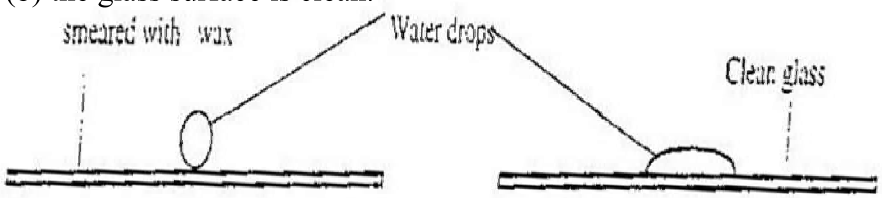
B……………..

10. Name the chemical substance in the parts labelled C and D (2mks)

C……………..

D……………...

11. Fig 8 shows water drops on two surfaces. In 8 (a) the glass surface is smeared with wax while in 8 (b) the glass surface is clean.



a) b)

Fig

Explain the difference in the shapes of the drops. (2mks)

12. Fig 9 shows a current carrying coil in a magnetic field. The direction of the current and the resulting force are shown. Study the figure and answer questions 12 and 13.

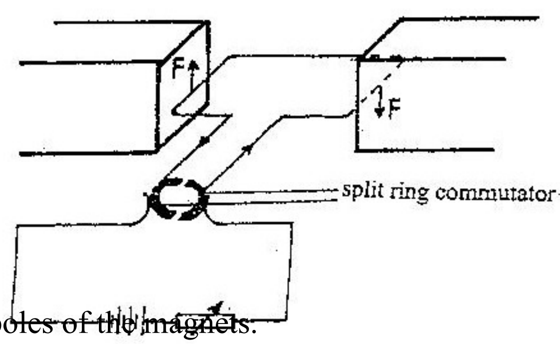


Fig 9

Label the poles of the magnets. (1mk)

13. Explain the purpose of the split ring commutator in the principle of the D.C motor shown in the diagram. (2mks)

14. A bullet is fired horizontally from a platform 15m high. If the initial speed is 300ms^{-1}. Determine the maximum horizontal distance covered by the bullet. (3mks)

15. A certain machine uses an effort of 400N to raise a load of 600N. If the efficiency of the machine is 75%, determine its velocity ratio. (3mks)

16. Fig 10 represents a transverse wave of frequency 5 Hz traveling in the x direction.

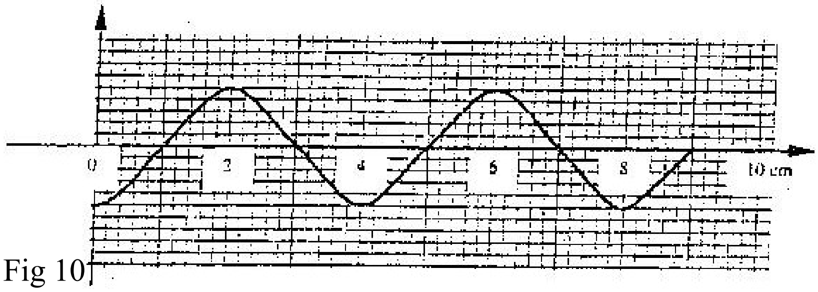


Fig 10

Determine the speed of the wave. (3mks)

17. An electronic siren producing sound continuously at a certain frequency is dropped from the top to a deep hole. State and explain what is observed about the pitch of the sound reaching the observer at the top. (3mks)

18. A student wishes to investigate the relationship between current and voltage for certain device X. In the space provided, draw a circuit diagram including two cells, rheostat, ammeter, voltmeter ad the device X that would be suitable in obtaining the desired results. (1mk)

19. A hair drier is rated 2500W, 240V. Determine its resistance. (3mks)

Fig 11 shows the variation of temperature,θ, with time t, when an immersion heater is used to heat a certain liquid. Study the figure and answer questions 20 and 21.

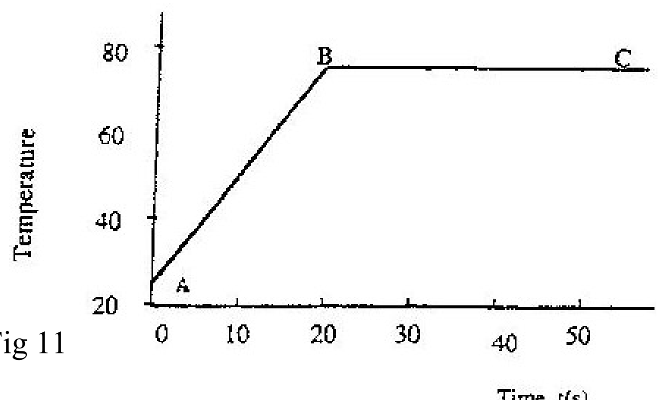


Fig 11

20. State the reason for the shape of graph in the section labeled BC (1mk)

21. Sketch on the same axes the graph for another liquid of the same mass but higher specific heat capacity when heated from the same temperature. (1mk)

22. Fig. 12 shows a vertical object, O, placed in front of a convex mirror.

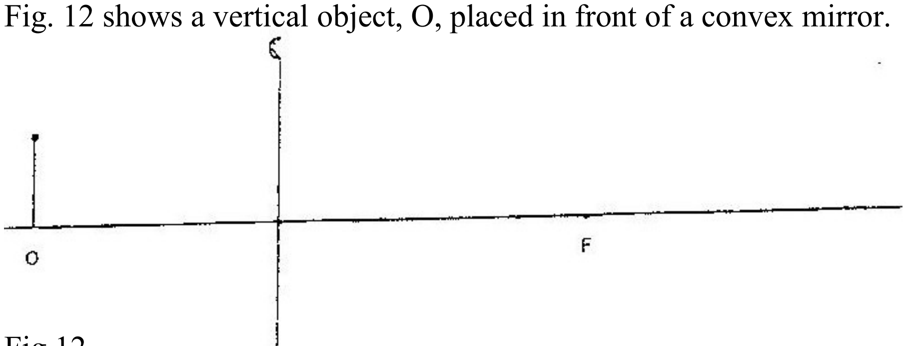


Fig 12

On the same diagram draw the appropriate rays and locate the image formed (3mks)

23. Fig 13 shows rays of light AO,BO, and CO incident on a glass-air interface. OA' OB' and OC' are the corresponding emergent rays. Study and answer questions 23 and 24.

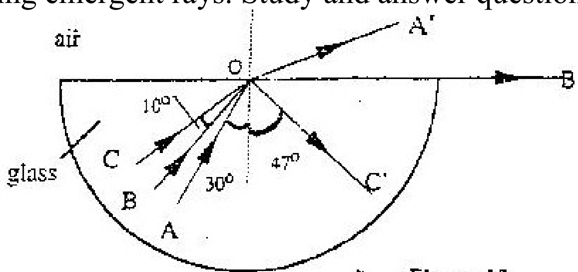
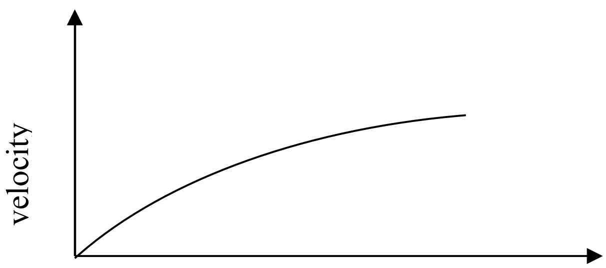


Figure 13

Determine the critical angles of the glass material

24. Determine the refractive of index of the glass material. (3mks)

25. Fig 14 shows the velocity- time graph for a small metal sphere falling through a viscous fluid.



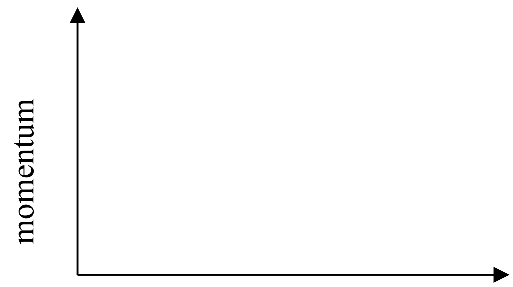


Fig 14 . time Time.

On the axes provided sketch the graph of momentum against time for the same mass. (1mk)

26. State Bernoulli's principle. (1mk)

27. The melting point of oxygen is given as -281.3^{0}C. Covert this temperature to Kelvin (K) (1mk)

28. Fig 15 shows an arrow which indicates the direction of travel of a wave in a medium. P is a particle of the medium that is in path of the wave.

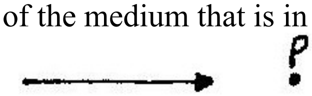


Fig 15

In the space provided sketch diagram to show how the particles P moves when the wave is

(i) A transverse wave

(ii) A longitudinal wave. (1mk)

29. A car of mass 800kg moves on a circular track of radius 20m. The force of friction between the tyres and the tarmac is 4800N Determine the maximum speed at which the car can be driven on the track without skidding.

30. An illuminated vertical object is initially placed on the principal axis of a converging lens and 32cm from it. The focal length of the lens 15cm. The object is new placed at a point 12cm from the lens and on the same side. State two changes other than magnification than magnification that that are observed on the image formed due to this change.

31. Explain how an "excited' hydrogen atom is able to emit radiations of different wavelengths.

32. Fig 16 shows wave fronts in a ripple tank approaching a shallow region in the tank.

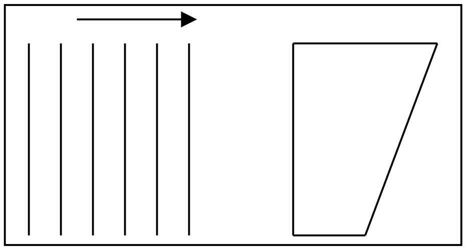


Figure 16
Complete the diagram to show the wave front as they pass over the shallow region and after leaving the regions. (1mk)

33. The target of X-ray tube s made of melting point. Give a reason for this (1mk)

34. Explain why a drop of methylated spirit on the back of the hand feels colder than a drop of water at the same temperature.

35. Draw appropriate symbols the circuit diagram of a junction diode in reverse bias. (1mk)

36. The following represents a nuclear reaction involving the nuclide polonium Po

$$ {}^{218}_{84}Po \xrightarrow{m} {}^{214}_{82}Pb \xrightarrow{n} {}^{214}_{83}Bi \longrightarrow {}^{214}_{84}X $$

(3mks)

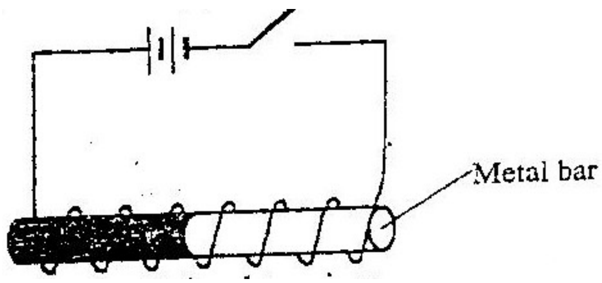
Identify m, n and X

m

n

X

37. In the set up Fig 17 the metal rod is made up of steel and iron pieces joined end. Your are provided with two iron nails.



Explain how you would use two nails provided to determine which side is iron (2mks)

38. Fig 18 shows two spherical materials one an insulation conductor, the other a conductor, Negative charge are introduced at point A in each case.

Figure 18

One the same figure indicate the final position of the charges. Explain your answer. (2mks)

PHYSICS PAPER 232/2 K.C.S.E 2005 QUESTIONS

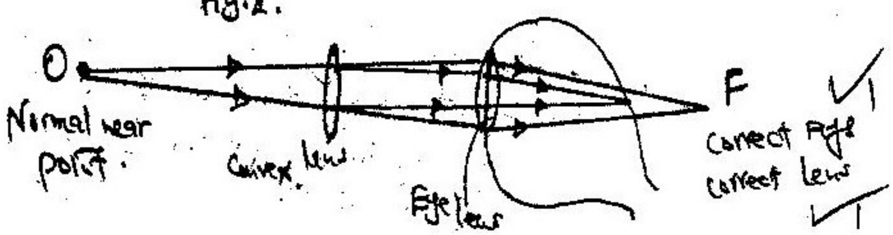
1. a) Describe with aid of a labeled diagram an experiment to determine the focal length of the lens when provided with the following; an illuminated object, convex lens, a lens, a lens holder, a plane mirror and a metre rule. (5mks)

   b) A small vertical object is placed 28cm in front of a convex lens of focal length 12cm. On the grid provided, draw a ray diagram to locate the image. The lens position is shown. (Use a scale; 1cm rep re 4cm) (5mks)

   Determine the image distance.

   c) Fig 1 shows a human eye with a certain defect

Fig.1.



   (i) Name the defect
   (ii) On the same diagram, sketch the appropriate lens to correct the defect and sketch rays to show the effect of the lens. (2mks)

2. a) Fig 2. Shows a wheel and axle being used to raise a load W by applying an effort F The radius of the large wheel is R and of the small wheel r as shown.

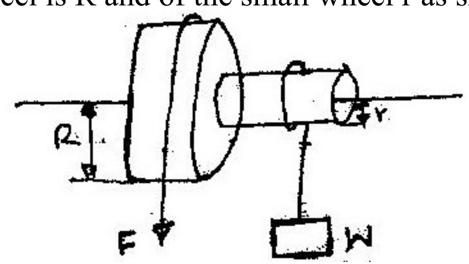


Fig.2.

   (i) Shows that the velocity ratio (V.R) of this machine is given by R/r (3mks)
   (ii) Given that r= 5cm, r=8cm, determine effort required to raise a load of 20N if the efficiency of the machine is 80% (4mks)
   (iii) It is observed that the efficiency of the machine increases when it is used to lift large loads. Give a reason for this. (1mk)

3 When the switch is closed determine the:
   (i) Ammeter reading
   (ii) Charge on each conductor (3mks)

4. Explain how doping producers an n-type semi-conductor for a pure semi-conductor material. (3 marks)

b) Fig 5. Shows the circuit of a rectifier using four diodes D1, D2, D3 and d4.

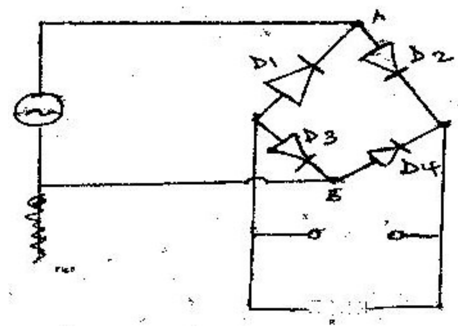


Fig 5.

(i) Explain how a rectified output is produced from the set – up when an a.c input is connected across AB (4 marks)

(ii) On the axis provided sketch the graph of output voltage against time for rectifier (1 mark)

(iii) A capacitor is now connected across XY. Explain the effect of the capacity on the output. (2 marks)

(c) A transistor in a common – emitter amplifier has life = 120. A signal in the input causes the base corresponding change in the output voltage if the load resistance is 100n. (4 marks)

5. (a) State Hooke's law (1 mark)

(b) One of a piece of a rubber was fixed to a rigid support and the other end pulled with a force of varying magnitude. The graph in fig 6 shows the relationship between the force (N) and the extension (cm)

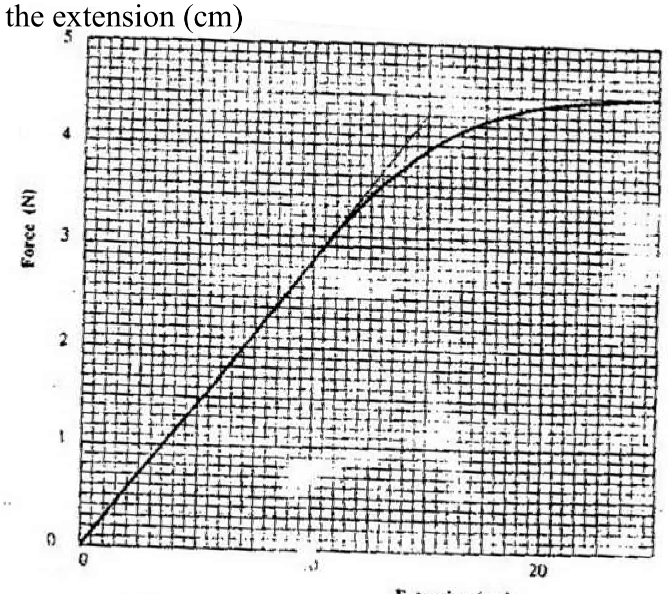


Figure 6

Using the graph, determine

(i) The stretching force at the elastic limit

(ii) The tensile stress in the rubber at an extension of 5 cm if the cross-section of the rubber is $0.25cm^2$

(iii) The tensile in the rubber at an extension of 5cm if the original length was 2 m (3 marks)

(c) In Fig 7. girders AB, BC, CD, ED, EB and BD were joined to make the rigid structure shown. The load W hangs from the structure as shown.

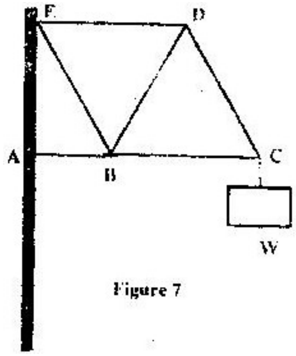


Figure 7

Which of the girders can be replaced with strings without affecting the structure? (2 marks)

SECTION II (15 MARKS)

Answer ONE question from this section in the spaces provided at the end of questions seven

6. (a) Define the term angular velocity (1 mark)

(b) A body moving with uniform angular velocity is found to have covered an angular distance of 170 radians in t seconds. Thirteen seconds later it is found to have covered a total angular distance of 300 radians. Determine t. (3 marks)

(c) Fig 8 shows a body of mass m attached to the centre of a rotating table with a string whose tension can be measured. (The device for measuring the tension is not shown in the figure)

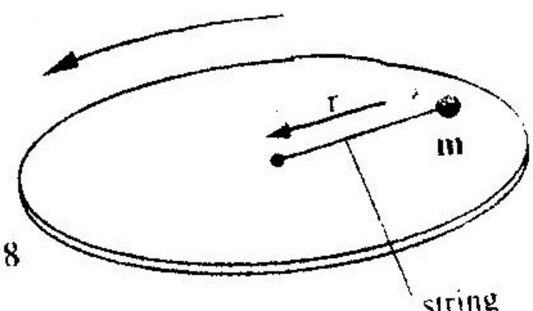


Figure 8

The tension, T on the string was measured for various values of angular velocity, w. The distance r of the body from the centre was maintained at 30cm. Table 1 shows the results obtained.

Table 1

W^2	4.0	9.0	16.0	25.0	36.0
Angular velocity w (radi^{-1})	2.0	3.0	4.0	5.0	6.0
Tension T (N)	0.04	0.34	0.76	1.30	1.96

(i) Plot the graph of T (y- axis against w^2) (5 marks)

(ii) From the graph, determine the mass, m of the body given that
$T = mw^2 - C$
Where C is a constant (4 marks)

(iii) Determine the constant C and suggest what it represents in the set up. (2 marks)

7. (a) What is meant by radioactivity (1 mark)

(b) With an aid of a labeled diagram explain the working of Geiger Muller tube as a detector of radiation (5 marks)

(c) In an experiment to determine the half of a certain radioactivity substance, the activity in disintegrations per minute was measured for sometime. Table 1 shows the results obtained

Time in Minutes	0	10	20	30	40	50	60	70	80
Activity indisintergrations	152	115	87	66	50	38	20	12	6

On the grid plot a suitable graph and sue it to determine the half life t ½ of the substance (7 marks)

(d) At time t = 40 minutes, the activity of a sample of a certain radioactive isotope with a half life 12 minutes if found to be 480 disintegration per minute.
Determine the time which activity was 3840 disintegrations per minute (2 marks)

K.C.S.E 2006 PHYSICS PAPER 1
SECTION A (25 MARKS)
Answer all questions in this section in the spaces provided

1. Figure 1 shows the change in volume of water in a measuring cylinder when an irregular solid is immersed in it.

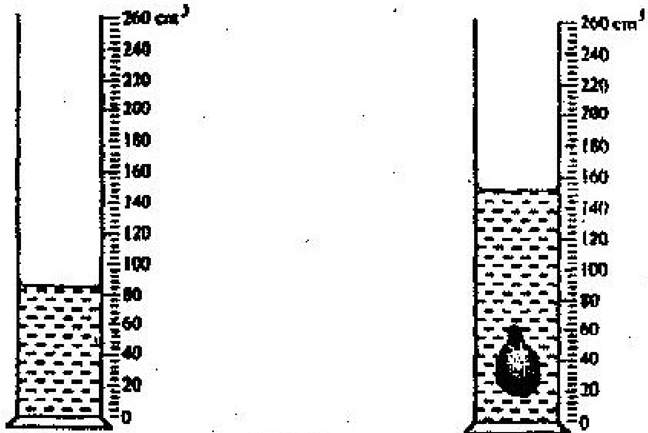
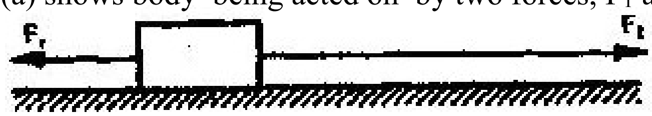


Figure 1

Given that the mass of the solid is 567 g, determine the density of the solid in gcm^{-3} (Give your answer correct to 2 decimal places) (3 marks)

2. Figure 2 (a) shows body being acted on by two forces, F_1 and F_2



On figure 2 (b) draw the force F_3 that has same effect on the body as the two forces (1 mark)

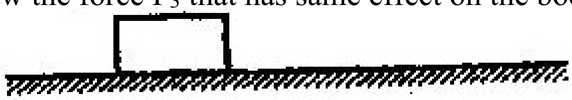


Figure 2

3. State Pascal's principle of transmission of pressure in fluids (1 mark)

4. Figure 3 shows a bimetallic strip with a wooden handle, suspended horizontally using a thin thread.

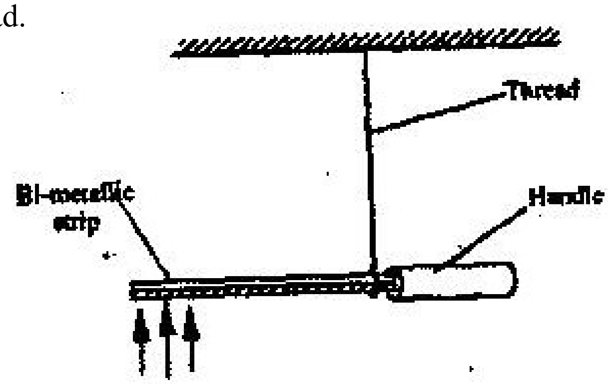
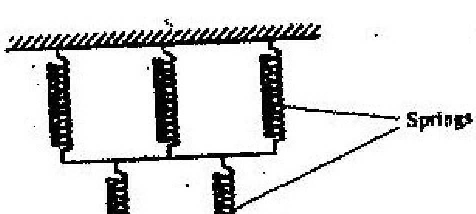


Figure 3

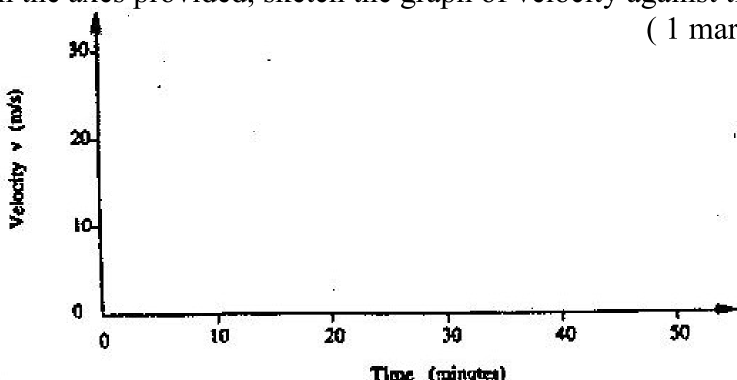
The strip is heated at the point shown. Explain why the system tips to the right

5. The spiral springs shown in figure 4 are identical. Each spring has a spring constant k= 300N/m

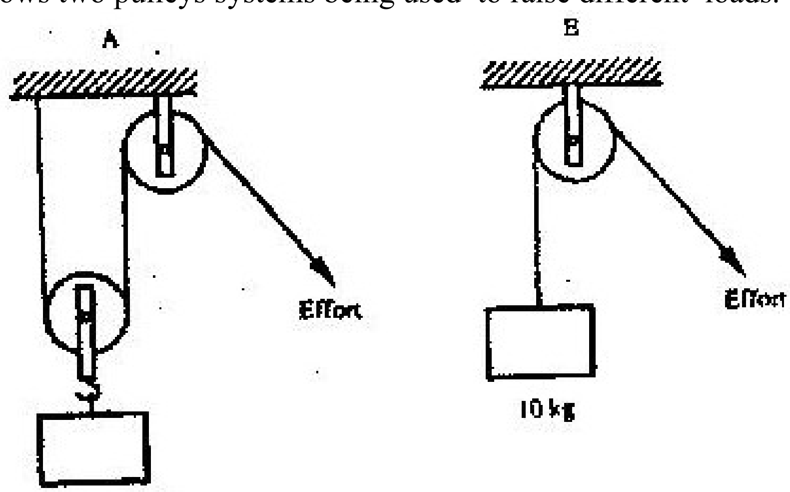


Determine the total extensions caused by the 90N weight. (ignore the weight of the spring and connecting roots) (3 marks)

6. A car starting from rest accelerates uniformly for 5 minutes to reach 30m/s. It continues at this speed for the next 20 minutes and then decelerates uniformly to come to stop in 10 minutes. On the axes provided, sketch the graph of velocity against time for the motion of the car. (1 mark)



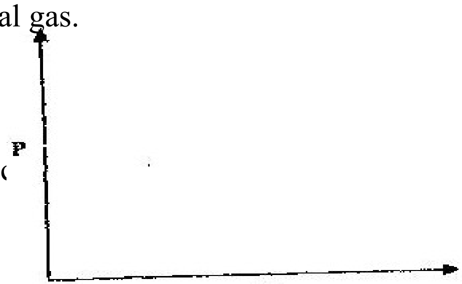
7. Figure 5 shows two pulleys systems being used to raise different loads. The pulleys identical.



State one reason why system B may have a higher efficiency than system A. (1 mark)

8. Beaker A contains 200g of water at 0^0 C while beaker B contains 200g of a mixture of ice and water at 0^0C. Two identical metal blocks are removed from a hot furnace. One block is dropped into beaker A while the other is dropped into beaker B at the same time. Explain why more water evaporates from beaker A than from beaker B (2 marks)

9. On the axes provided sketch the graph of pressure P against volume V for a fixed mass of an ideal gas. (1 mark)



10. Figure 6 shows the path taken by a matatu traveling on a horizontal ground (a winding road)

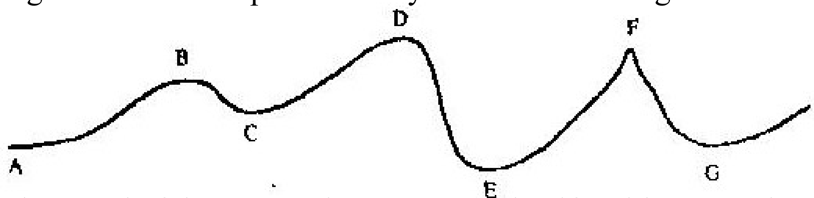
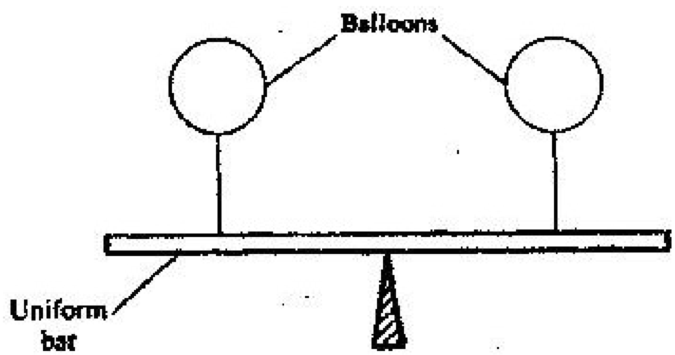


Figure 6

The speed of the matatu is constant. Identify with reason the point along the path which a load placed loosely on the rack (carrier) of the matatu is most likely to roll off.
(2 marks)

11. A pipe of radius 6 mm is connected to another pipe of radius 9 mm. If water flows in the wider pipe at the speed of 2 ms^{-1}, what is the speed in the narrower pipe?
(3 marks)

12. The uniform bar in figure 7 is provided at its midpoint. It is in equilibrium under the action of two identical balloons filled with equal volumes of different light gases at the same temperature.



Explain why the bar may not remain in equilibrium if the temperature of the surrounding changes.
(2 marks)

13. A footballer kicks a ball of mass 0.6 kg initially at rest using a force of 720N. If the foot was in contact with the ball for 0.1 seconds, what was the take off speed of the ball?
(3 marks)

SECTION B (55 MARKS)

Answer ALL questions in this section in the spaces provided

14. (a) Distinguish between solid and liquid states of matter in terms of intermolecular forces
(1 mark)

(b) In an experiment to estimate the diameter of an oil molecule, an oil drop of diameter 0.05 cm spreads over a circular patch whose diameter is 20 cm

Determine

(i) The volume of the oil drop (2 marks)

(ii) The area of the patch covered by the oil (2 marks)

(iii) The diameter of the oil molecule (3 marks)

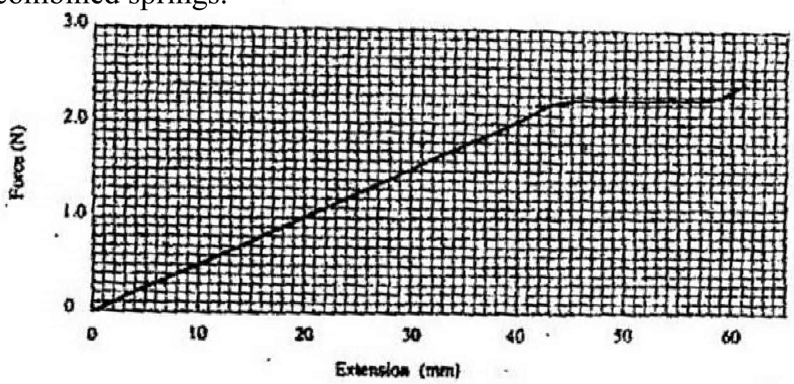
(c) State

(i) Any assumption made in (b) (iii) above (1 mark)

(ii) Two possible sources of errors in this experiment (2 marks)

15. (a) You are provided with two wires of same material and same thickness. Describe how you would make two spiral springs of different springs constants (assume that other apparatus to make springs are available). (2 marks)

(b) In an experiment, two identical springs are attached end to end. One end of the combined springs is fixed to a rigid support such that the spring hangs vertically. Masses are then hang from the lower end.
The graph in figure 8 shows the relation between the force (weight) and the extension for the combined springs.



From the graph determine
(i) The elastic limit for the combined springs (1 mark)
(ii) The springs constant of the combined spring and hence for each spring (4 marks)
(iii) The work done in stretching the combined spring from 15 mm to 32 mm (3 marks)

16. (a) State what is meant by an ideal gas (1 mark)
(b) The pressure acting on a gas in a container was changed steadily while the temperature of the gas maintained constant. The value of volume V of the gas was measured for various values of pressure. The graph in figure 9 shows the relation between the pressure, p and the reciprocal of volume $\frac{1}{V}$

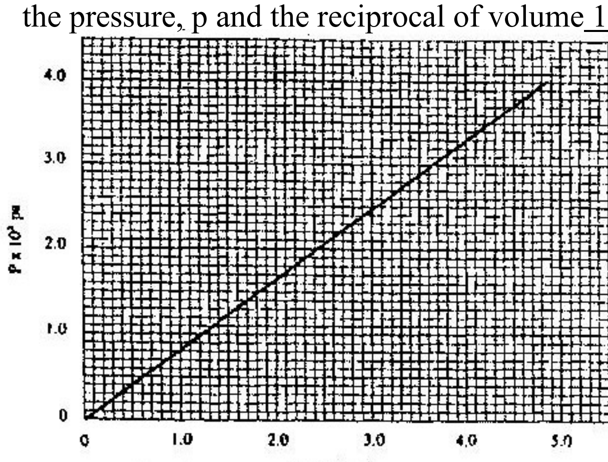


Figure 9

(i) Suggest how the temperature of the gas could be kept constant
(ii) Given that the relation between the pressure P_1 and the volume, V_1 of the gas is given by
$PV = k$
When k is a constant, use the graph to determine the value of k.
(iii) What physical quantity does k represent? (4 mark)

(iv) State one precautions you would take when performing such an experiment (1 mark)

(c) A gas occupies a volume of 4000 litres at a temperature of 37^0C and normal atmospheric pressure. Determine the new volume of the gas if it heated at constant pressure to a temperature of 67^0C (normal atmospheric pressure P= 1.01 x 10^5 pa)

17. (a) state Archimedes principle (4 marks)
(b) in an experiment to determine the relative density of methylated spirit applying Archimedes Principal, the following were provided, a spring balance, some masses, a piece of thread, water in a beaker and methylated spirit in a beaker. The table below shows the results obtained.

Mass (g)	100	150	200
Weight in air (N)	1.00	1.50	2.00
Weight in water (N)	0.88	1.32	1.76
Weight in spirit (N)	0.91	1.36	1.82

(i) Draw labeled sketch diagrams to show how the readings in the table were obtained (1 mark)
(ii) For each mass, determine the upthrust in water and the upthrust in the spirit (2 marks)
(iii) Determine the average relative density of the spirit (3 marks)

(c) A weather balloon of volume $1.2m^3$ is tied to a rigid support while being filled with helium gas. The mass of the fabric making the balloon is 0.30kg.
Determine the maximum tension on the string trying the balloon to the rigid support

18. (a) Define specific latent heat of fusion of a substance (1 mark)
(b) Water of mass 200 g at a temperature of 60^0C is put well lagged copper calorimeter of mass 80g. A piece of ice at 0^0 C and mass 20 g is placed in the calorimeter and the mixture stirred gently until all the ice melts. The final temperature, T of the mixture is then measured.

Determine
(i) The heat absorbed by the melting ice at 0^0 C. (2 marks)
(ii) The heat absorbed by the melted ice (water) to rise to temperature T
(answer may be given in terms of T) (2 marks)

(iii) The heat lost by the warm water and the calorimeter (2 marks)
(answer may be given in terms of T) (2 mark)
(iv) The final temperature T of the mixture
(specific latent heat of fusion of ice = 334 000 J kg^{-1}
(specific heat capacity of water = 4 200 Jkg^{-1} k^{-1}
Specific heat capacity of copper = 900 J kg^{-1}) (4 marks)

K.C.S.E 2006 PHYSICS PAPER 2
SECTION A (25 marks)
Answer ALL the questions in this section in the spaces provided

1. Figure 1 shows two bar magnets placed with the south poles close together

Figure 1

In figure 1 sketch the magnetic field pattern between the two south poles (1 mark)

2. In a certain pinhole camera, the screen is 10cm from the pinhole. When the camera is placed 6m away from a tree, a sharp image of the tree 16cm high is formed on the screen. Determine the height of the tree.
3. A metallic body shaped as shown in figure 2 is positively charged and insulted from the ground as shown in the figure.

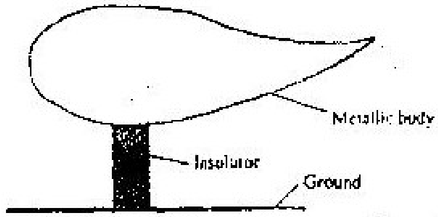


Figure 2

On the figure show the charge distribution (1 mark)

4. State a reason why the caps of the cells of a lead- acid battery are opened when charging the battery. (1 mark)

5. A long coil is attached to a vibrating blade as shown in figure 3

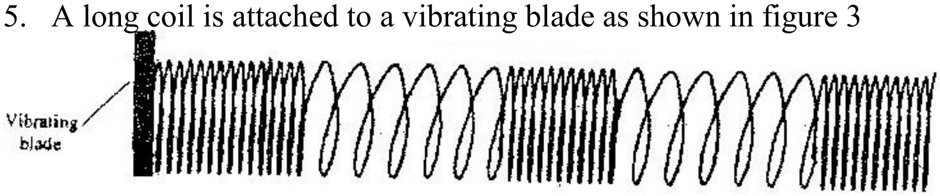


Figure 3

State the type of mechanical wave generated by the set - up and mark alongside the coil, the length corresponding to the wavelength, λ of the wave. (2 marks)

6. Figure 4 shows a solenoid carrying an electric current.

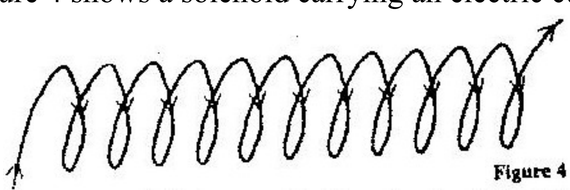


Figure 4

Sketch the magnetic field pattern inside and at the ends of the solenoid (1 mark)

7. Figure 5 shows wave fronts approaching a concave surface

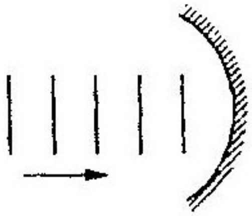


Figure 5

Complete the diagram to show the wave fronts formed after striking the surface. Show how the focal point of the surface is located (2 marks)

8. S soldier standing some distance from a wall, blows a whistle and hears its echo 1 seconds later. How far is the wall from the soldier? (speed of sound in air is 330ms^{-1})
(3 marks)

9. State one condition under which Ohm's law is obeyed in a metal conductor
(1 mark)

Use the information given below to answer questions 10 and 11
The Kinetic energy (K.E) of an electron, ejected from the surface of a metal illuminated by radiation of frequency f is given by

$K.E = hf - Ø$

Where h is Planck's constant and Ø is the work function of the surface

10. What is meant by the term work function? (1 mark)
11. If the frequency of the illuminating radiation is just equal to the threshold frequency of the surface explain why no photoelectric effect is observed
(2 marks)

Figure 6 shows a tube for investing the properties of a beam of electrons. Use the *information in the figure to answer questions 12 and 13*

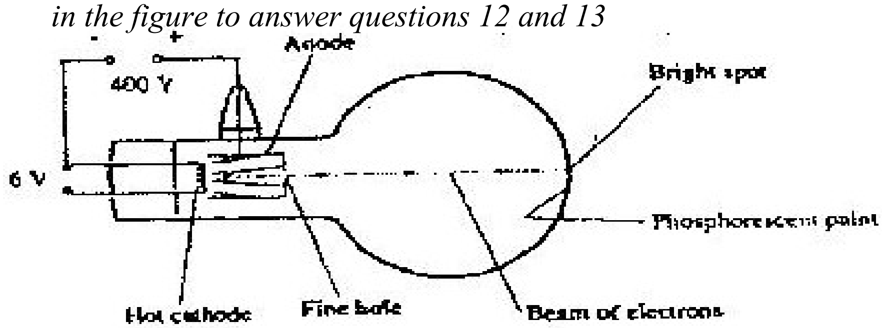


Figure 6

12. What property of the beam of electrons show that the electrons are traveling at a very high speed?
13. The beam of electrons is subjected to a strong magnetic field which is perpendicular to the path and into the paper. Sketch on the same figure, the new path of electrons.
(1 mark)

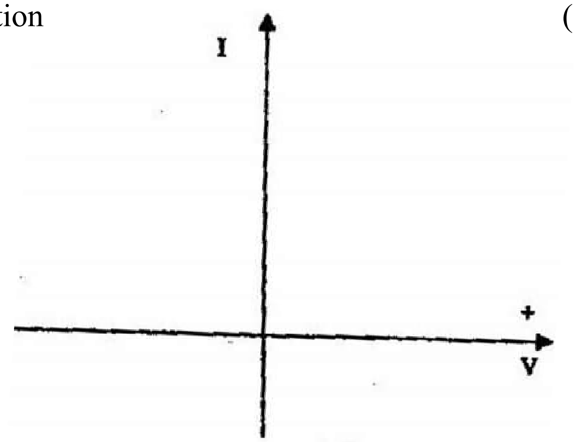
14. State with a reason the effect on the X- rays produced in a n X- ray tube, when the p.d across the tube is increased (2 marks)

15. A nuclear reaction is represented by the following equation

$$^{a}_{92}X \longrightarrow \ ^{234}_{b}Y + \text{Alpha particle}$$

Determine the values of a and b (2 marks)

16. In the axes provided sketch the current – voltage characteristics for reverse – biased p- n junction (1 mark)



SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided

17. Figure 7 shows a circuit where a battery of emf 4.5V, switches A and B, two capacitors C_1 = 0.3μF and C_2 = 0.5 μ F and a voltmeter are connected

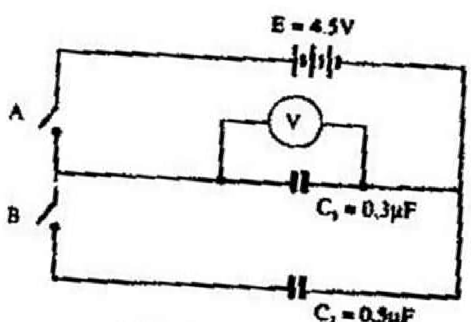


Figure 7

(a) Determine the charge on C_1 when switch A is closed and switch B is open (3 marks)

(b) What is the effective capacitance C_t when both switches A and B are closed?

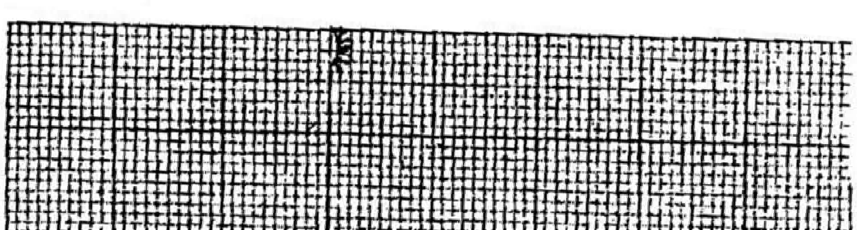
(c) State what is observed on the voltmeter when

(i) switch A is closed and switch B is open (1 mark)

(ii) Switch A is closed and opened, and then B is closed (1 mark)

(iii) Explain the observation made in c (ii) above (2 marks)

18. Figure 8 shows an object placed in front of a concave mirror of focal length 10cm. C is the centre of curvature.



(i) On the same figure draw a ray diagram showing the location of the image (4 marks)

Use the ray diagram drawn in (i) above to determine the

(ii) Image distance (2 marks)

(iii) Magnification (2 marks)

(b) A vertical object is placed 20cm in front of a convex lens of focal length 5 cm

(i) Determine

I. The image distance (3 marks)

II. The magnification (2 marks)

(ii) State two characteristics of the image (2 marks)

19. (a) Define the refractive index of a substance (1 mark)

(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder. A pin was placed at the bottom of the cylinder and another pin was used to locate the apparent position of the first pin. The real depth and apparent depth were measured. The experiment was repeated with other values of real depth. The table below shows the results obtained.

Real depth (cm)	5	10	15	20	25
Apparent depth (cm)	3.3	6.7	10	13.3	16.7

(i) Plot the graph of real depth against apparent depth (5 marks)

(ii) From the graph determine the refractive index of the liquid (4 marks)

(c) Figure 9 shows a ray of light incident on a glass – air interface

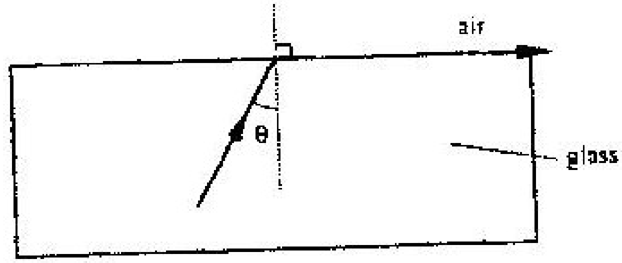


Figure 9

Given that the refractive index of the glass is 1.6. Determine angle θ (3 marks)

20. Figure 10 shows a simple electric generator

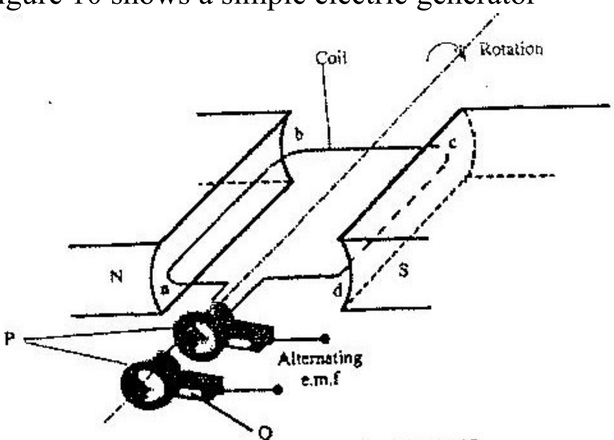


Figure 10

(a) (i) Name the parts labeled P and Q (2 marks)

(ii) The e.m.f generated as the coil rotates is represented in the graph in figure

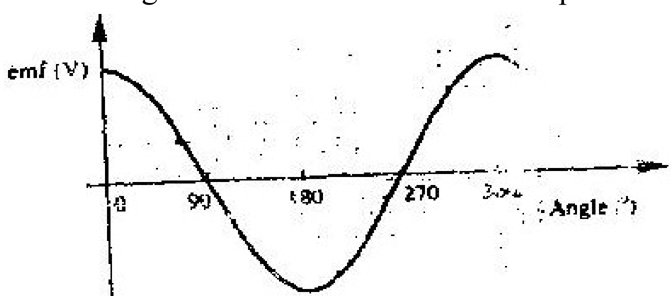


Figure 11

Give reasons for the changes in emf as the coil rotates from 0^0 to 90^0 and 90^0 180^0

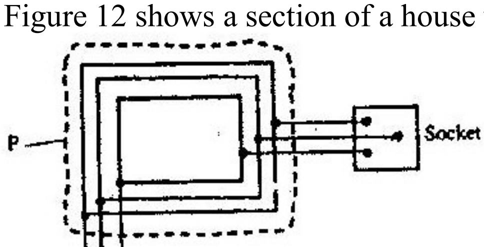
(b) The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V. a.c source.

Determine

(i) The output voltage (2 marks)

(ii) The output current when the primary coil has a current of 0.5A. (Assume there are no energy losses. (3 marks)

21. (a) Figure 12 shows a section of a house wiring system



(i) Name:
The circuit labeled P (1 mark)
The terminals labeled X and Y
X……………………………… Y…………………………… (2 marks)
II Give a reason why R is connected to Y but not to X (1 mark)

(ii) Why is the earthing necessary in such a circuit? (1 mark)

(b) Determine the cost of using an electric iron rated 1500W, for a total of 30 hours given that the cost of electricity per kWh is Kshs 8. (2 mark)

K.C.S.E 2007 PHYSICS PAPER 1
SECTION A (25 Marks)
Answer all questions in this section in the spaces provided

1. Figure 1 shows a metal cube of mass 1.75g placed between the jaws of a micrometer screw gauge. The magnified portion of the scale is also shown. The reading on the gauge when the jaws were fully closed without the cube was 0.012 cm. Use this information and the figure to answer questions 1 and 2

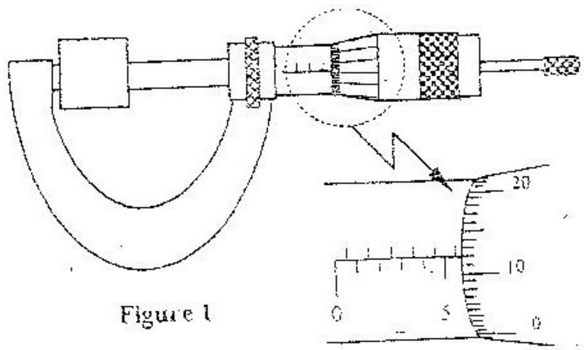


Figure 1

What is the length of the cube? (1 mark)

2. Determine the density of the metal cube giving your answer correct to three significant figures. (3 marks)

3. Figure 2 shows a tube of varying cross sectional area

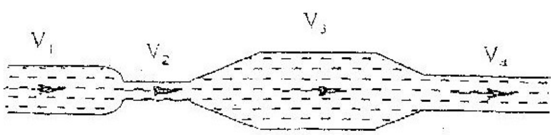
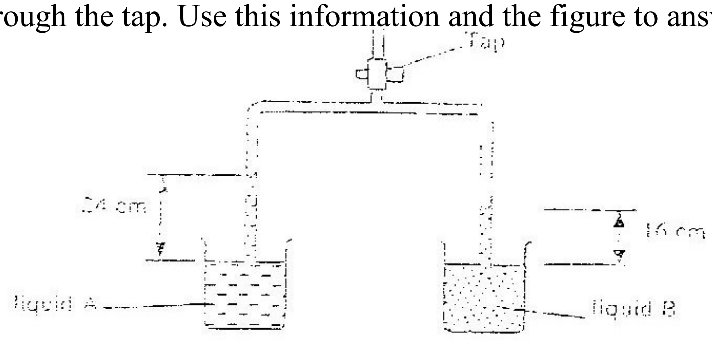


Figure 2

Arrange the speed $V_1V_2V_3$ and V_4 in decreasing order starting with the highest (1 mark)

4. Figure 3 shows the levels of two liquids A and B after some air has been sucked out of the tubes through the tap. Use this information and the figure to answer questions 4 and 5.



State the reason for the rise in the levels of the liquids when air is sucked from the tubes

5. Given that the density of liquid B is 1200 kgm^3, determine the density of liquid A. (3 marks)

6. Figure 4 show two identical balloons A and B. The balloons were filled with equal amounts of the same type of gas. The balloons are suspended at distances X_1 and X_2 from a metal cube filled with

boiling water and placed on an insulating material. Use this information to answer questions 6 and 7.

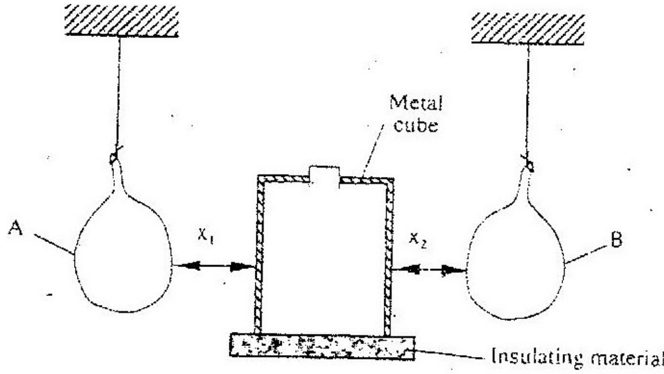


Figure 4

State the mode by which heat travels from the cube to the balloons (1 mark)

7. The face of the cube towards A. is bright and shiny and the face towards B is dull black. State with reason the adjustments that should be made on the distances X_1 and X_2 so that the rate of change of temperature in both balloons is the same. (2 marks)

8. Figure 5 shows a uniform bar of length 1.0 m pivoted near one end. The bar is kept in equilibrium by a spring balance as shown.

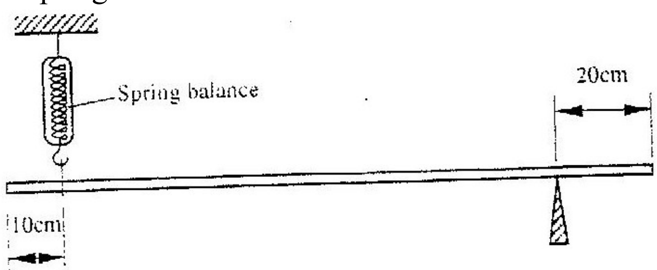


Figure 5

Given that the reading of the spring balance is 0.6 N. Determine the weight of the bar. (3 marks)

9. The graph in figure 6 shows the velocity of a car in the first 8 seconds as it accelerates from rest along a straight line. Use the graph to answer questions 9 and 10.

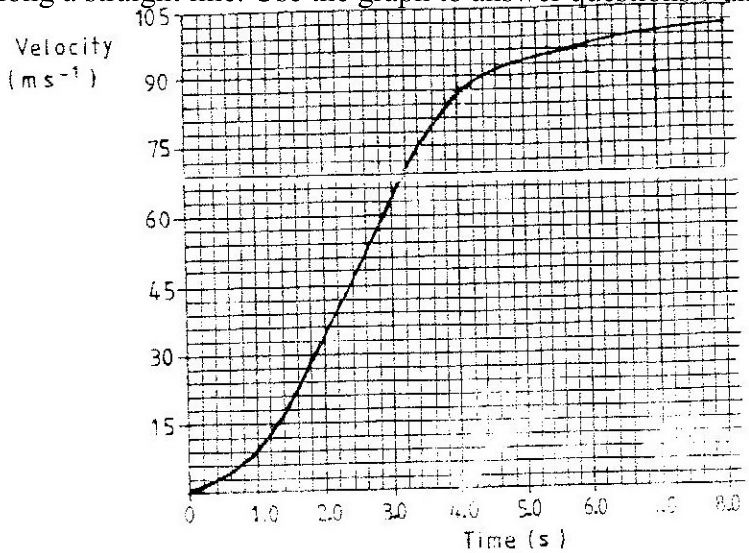


Figure 6

Determine the distance traveled 3.0 seconds after the start

10. Determine the acceleration of the car at 4.0 seconds (2 marks)

11. State two factors that effect the melting point of ice (2 marks)

12. The graph in figure 7 shows the relationship between the pressure and temperature for an ideal gas. Use the information in the figure to answer questions 12 and 13

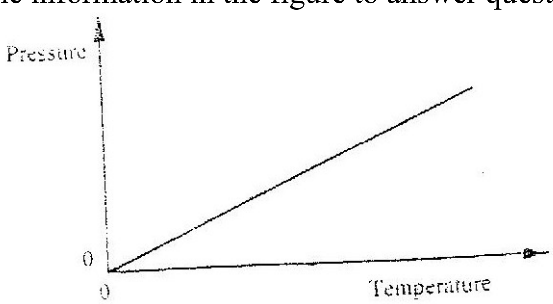


Figure 7

State the unit of the horizontally axis (1 mark)

13. Write a statement of the gas law represented by the relationship (1 mark)

14. Figure 8 shows a uniform light bar resting horizontally on corks floating on water in two beakers A and B.

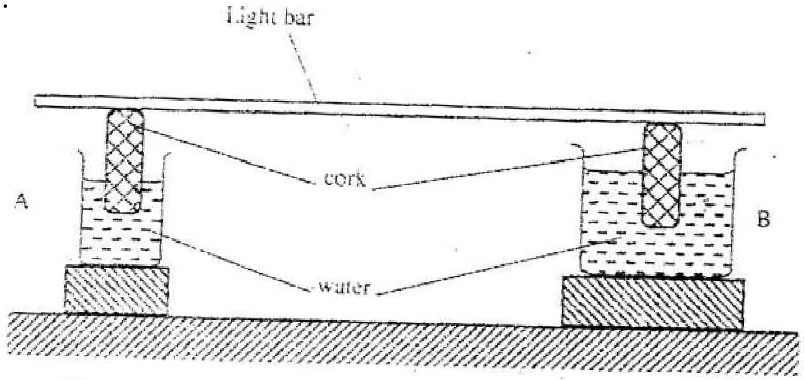


Figure 8

Explain why the bar tilts towards side A when equal amount of heat is supplied to each beaker (2 marks)

SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided

15. Brown motion of smoke particles can be studied by using the apparatus shown in figure 9 to observe the motion, some smoke is enclosed in the smoke cell and then observed through the microscope.

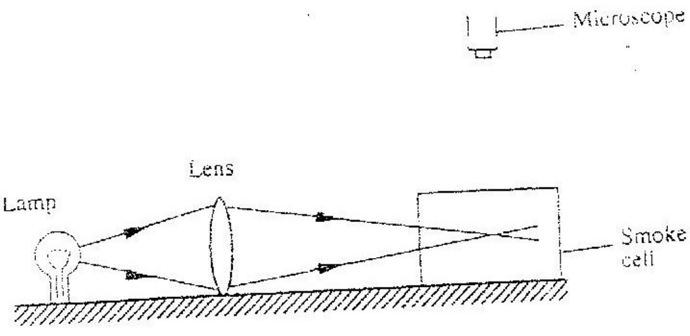


Figure 9

(a) Explain the role of the smoke particle, lens and microscope in the experiment
Smoke particles
Lens

(b) State and explain the nature of the observed motion of the smoke particles (3 marks)

(c) State what will be observed about the motion of the smoke particles if the temperature surrounding the smoke cell is raised slightly. (1 mark)

16. (a) State Newton's first law of motion (1 mark)

(b) A wooden block resting on a horizontal bench is given an initial velocity, u, so that it slides on the bench surface for a distance d, before coming to a stop. The values of d were measured and recorded for various values of initial velocity. Figure 10 shows the graph of u^2 against d.

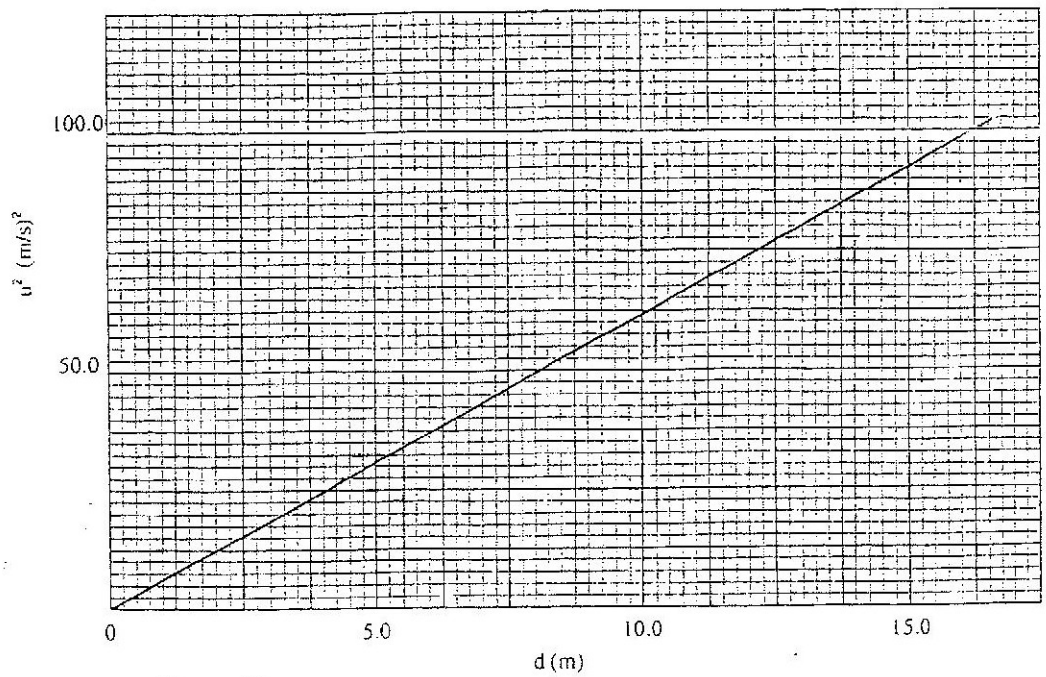


Figure 10

(i) Determine the slope, S of the graph (3 marks)

(ii) Given that $u^2 = 20$ kd, where k is a constant for the bench surface, determine the value of k from the graph (2 marks)

(iii) State how the value of k would be affected by a change in the roughness of the bench surface (1 mark)

(c) A car of mass 800 kg starts from rest and accelerates at 1.2 ms^{-2}. Determine its momentum after it has moved 400 m from the starting point
(4 marks)

17. (a) Define the term specific latent heat of vaporization of a substance

(b) Figure 11 shows the features of a domestic refrigerator. A volatile liquid circulates through the capillary tubes under the action of the compression pump.

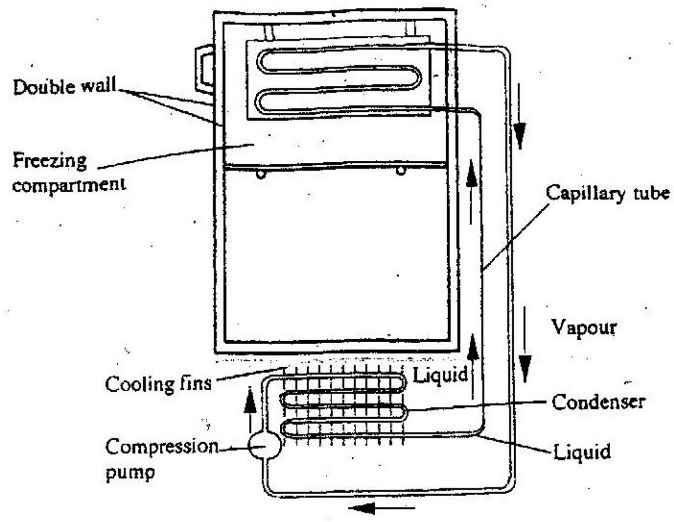


Figure 11

(i) State the reason for using a volatile liquid (1 mark)

(ii) Explain how the volatile liquid is made to vaporize in the cooling compartment and to condense in the cooling fins (2 marks)

(iii) Explain how cooling takes place in the refrigerator (3 marks)

(iv) What is the purpose of the double wall? (1 mark)

(c) Steam of mass 3.0 g at 100^0 C is passed into water of mass 400g at 10^0C. The final temperature of the mixture is T. the container absorbs negligible heat. (Specific latent heat of vaporization of steam = 2260 kJ/ kg, specific heat capacity of water = $4200Jkg^{-1}K^{-1}$)

(i) Derive an expression for the heat lost by the steam as it condenses to water at temperature T. (3 marks)

(ii) Derive an expression for the heat gained by water (2 marks)

(iii) Determine the value of T (2 marks)

18. (a) State what is meant by centripetal acceleration

(b) Figure 12 shows masses, A, B and C placed at different points on a rotating table. The angular velocity, ω, of the table can be varied.

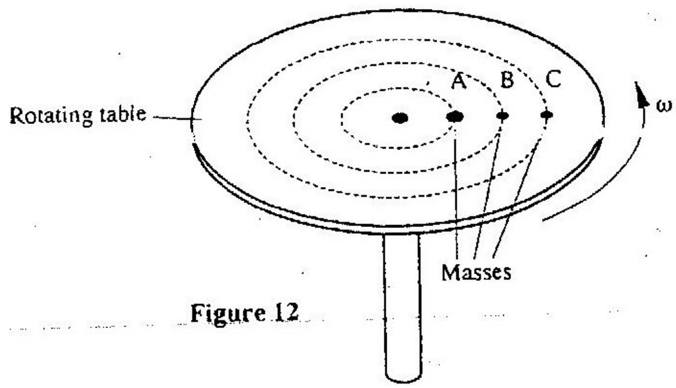


Figure 12

(i) State two factors that determine whether a particular mass slides off the table or not (2 marks)

(ii) It is found that the masses slide off at angular velocities ω_A, ω_B, and ω_C respectively. Arrange the values of ω_A, ω_B, ω_C in decreasing order.

(c) A block of mass 200g is placed on a frictionless rotating table while fixed to the centre of the table by a thin thread. The distance from the centre of the table to the block is 15 cm. If the maximum tension the thread can withstand is 5.6N. Determine the maximum angular velocity the table can attain before the thread cuts. (4 marks)

19. (a) State the law of floating (1 mark)

(b) Figure 13 shows a simple hydrometer

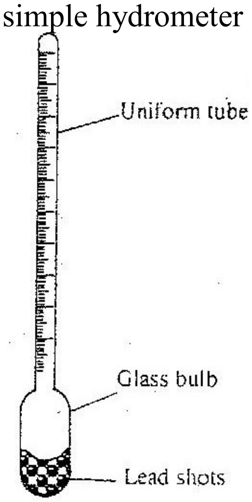


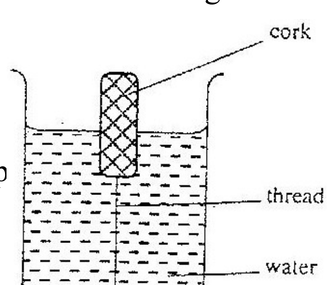
Figure 13

(i) State the purpose of the lead shots in the glass bulb (1 mark)

(ii)How would the hydrometer be made more sensitive? (1 mark)

(iii) Describe how the hydrometer is calibrated to measure relative density

(c) Figure 14 shows a cork floating on water and held to the bottom of the beaker by a thin thread.



(i) Name the forces acting on the cork (3 marks)

(ii) Describe how each of the forces mentioned in (i) above changes when water is added into the beaker until it fills up. (3 marks)

K.C.S.E 2007 PHYSICS PAPER 2
SECTION A (25 MARKS)
Answer all the questions in this section in the spaces provided

1. Figure 1 represents a pinhole camera

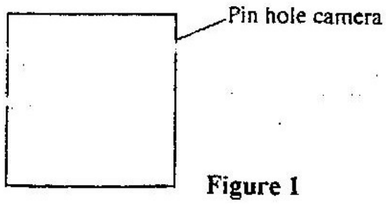


Figure 1

Sketch rays to show the formation of an enlarged image in the camera. Label both the object and the image (2 marks)

2. State one advantage of an alkaline cell over a lead – acid cell (1 mark)
3. Figure 2 shows a horse – shoe magnet whose poles are labeled and two other magnets near it. Iron are attracted to the lower ends of the n\magnets as shown.

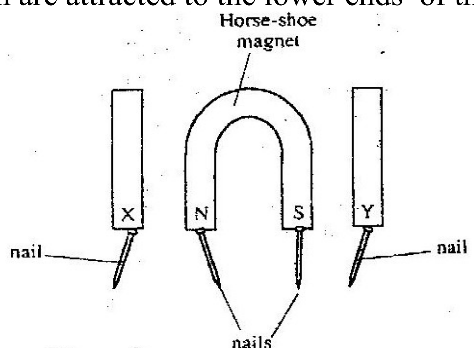


Figure 2

Identify the poles marked X and Y (1 mark)

X ……………………………………Y………………………………………

4. Figure 3 shows an object, O in front of a concave mirror and its image, I formed after reflection.

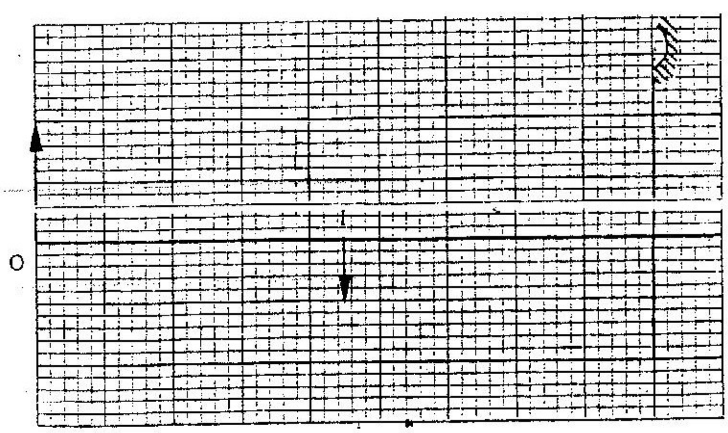


Figure 3

(a) On the same diagram draw appropriate ray (s) to locate the principal focus, F, of the mirror. (2 marks)

(b) Determine the focal length of the mirror (scale 1: 5) (1 mark)

5. Figure 4. shows the displacement – time graph for a certain wave

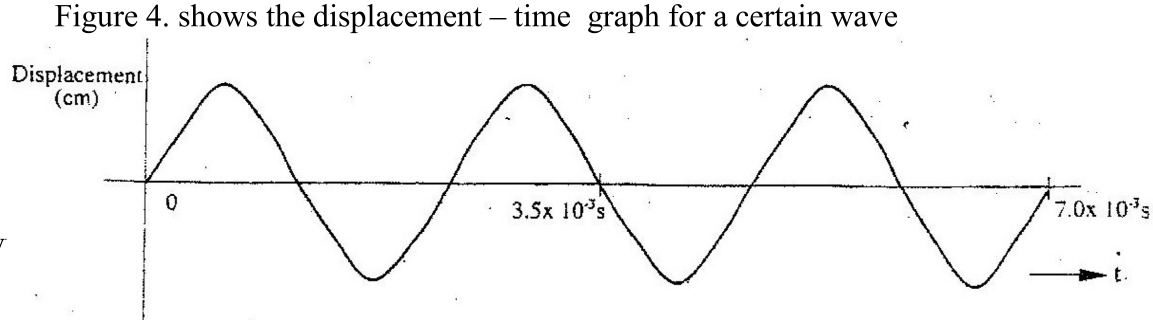


Figure 4

Determine the frequency of the wave (3 marks)

6. Figure 5 (a) and (b), show wavefronts incident on barriers blocking part of the path.

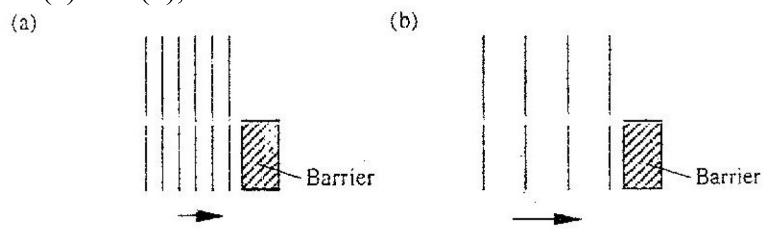


Figure 5

On the same figures sketch the wavefronts to show the behavior of the waves as they pass each barrier and after passing the barrier. (1 mark)

7. Figure 6 shows a ray of light incident on the face of a water prism

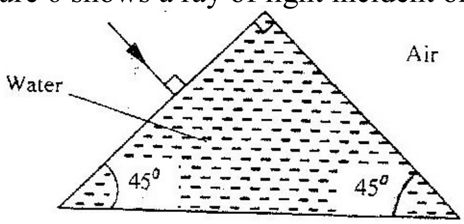


Figure 6

Sketch the path of the ray as it passes though the prism
Critical angle for water is 49^0 (1 mark)

8. In the circuit diagram shown in figure 7, the ammeter has negligible resistance
When the switch S, is closed, the ammeter reads 0.13 A.

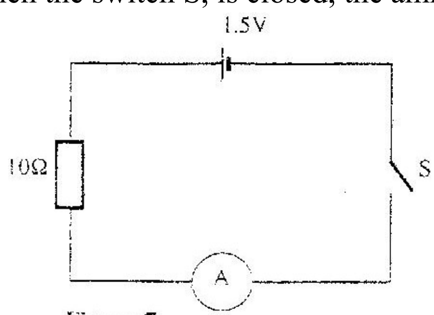


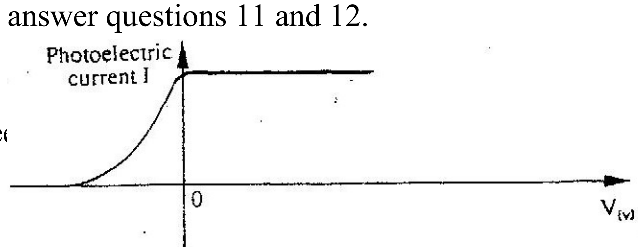
Figure 7

Determine the internal resistance of the cell (3 marks)

9. A heater of resistance R_1 is rated P watts, V volts while another of resistance R_2 is rated 2P watts, $^V/_2$ volts. Determine R_1 / R_2 (3 marks)

10. State what is meant by the term accommodation as applied to the human eye. (1 mark)

11. The graph in figure 8 shows the variation of photoelectric current with applied voltage when a surface was illuminated with light of a certain frequency. Use the information in the figure to answer questions 11 and 12.



On the same axes, sketch the graph when light of higher intensity but same frequency is used to illuminate the surface. (1 mark)

12. Explain your answer in 11 above (1 mark)

13. The following is part of radioactive decay series

$$ {}^{234}_{83}Bi \xrightarrow{\beta} {}^{a}_{84}X \longrightarrow {}^{230}_{b}Y $$

Determine the values of a and b (2 marks)

a = ……………………………………. b= …………………………………

14. You are provided with a diode, a resistor R, an a.c source of low voltage and connecting wires. In the space provided, sketch the circuit diagram for a half – wave rectifier and indicate the terminals where the output voltage V_0 may be connected. (2mks)

SECTION B (55 MARKS)

Answers ALL the questions in this section in the spaces provided.

15. (a) State Ohm's Law (1 mark)

(b) The graph in figure 9 shows the current – voltage characteristics of a certain device, X

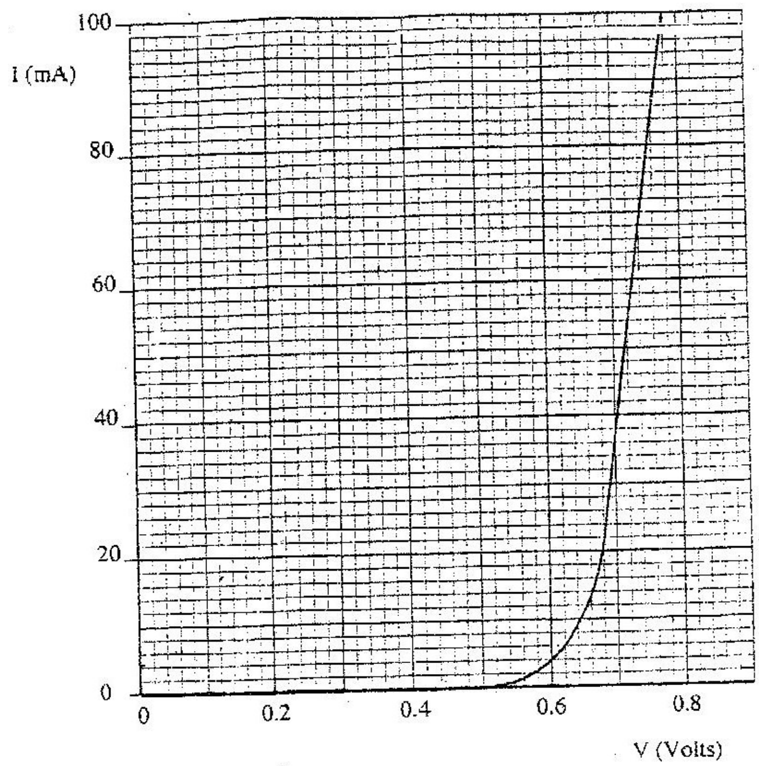
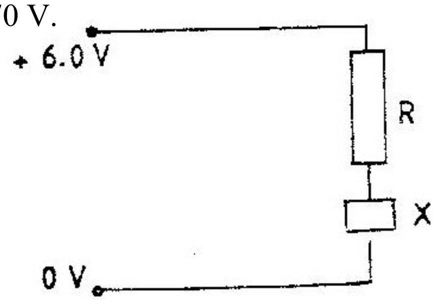


Figure 9

(i) State with a reason whether the device obeys Ohm's law (2 marks)

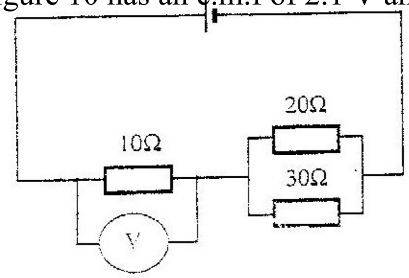
(ii) Determine the resistance of the device, X, when the current through it is 60 mA.

(iii) When the device, X is connected in the circuit below, the voltage across it is 0.70 V.



Calculate the value of the resistance R. (3 marks)

(c) The cell in figure 10 has an e.m.f of 2.1 V and negligible internal resistance.



Determine the

Figure 10

(i) Total resistance in the circuit (2 marks)

(ii) Current in the circuit (1 mark)

(iii) Reading of the voltmeter (2 marks)

16. (a) Figures 11 (a) and (b) show diagrams of the human eye

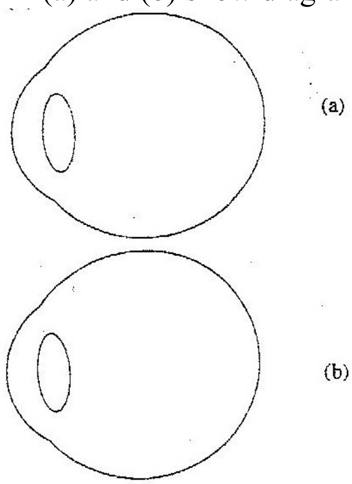


Figure 11

(i) Sketch in figure 11 (a) a ray diagram to show shortsightedness (1 mark)

(ii) Sketch in figure 11 (b) a ray diagram to show how a lens can be used to correct the shortsightedness (2 marks)

(b) Figure 12 shows the features of a simple camera

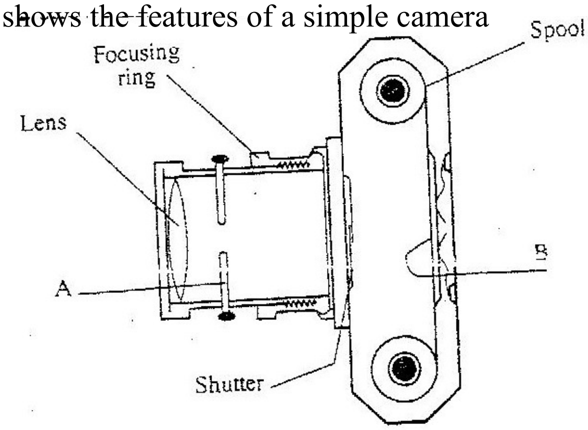


Figure 12

(i) Name the parts labeled A and B (2 marks)

A ………………………………………..

B ……………………………………….

(ii) A still object is placed at a certain distance from the camera. Explain the adjustments necessary for a clear image of the object to be formed.

(iii) State the functions of the shutter and the parts labeled A and B (3 marks)

Shutter …………………………………………………………………….

A…………………………………………………………………………

B ……………………………………………………………………..

(c) A lens forms a clear image on a screen when the distance between the screen and the object is 80cm. If the image is 3 times the height of the object, determine.

(i) The distance of the image from the lens (3 marks)

(ii) The focal length of the lens (2 marks)

17. (a) State Lenz's Law of electromagnetic induction (1 mark)

(b) Figure 13 shows a simple microphone in which sound waves from the person talking cause the cardboard diaphragm to vibrate

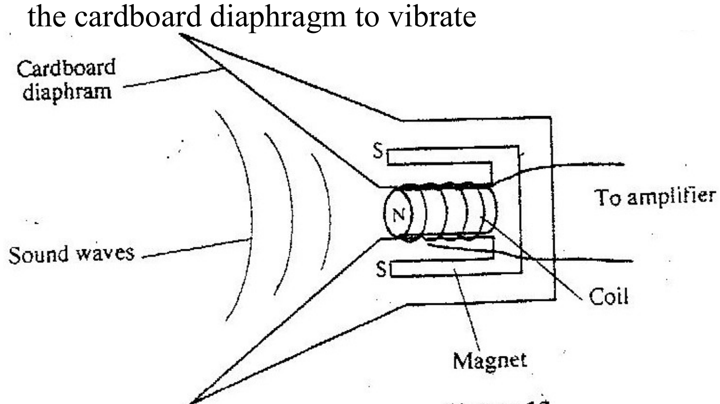


Figure 13

(i) Explain how a varying current is induced in the coil when the diaphragm vibrates (3 marks)

(ii) State two ways in which the induced current in (i) above can be increased

(c) A transformer with 1200 turns in the primary circuit and 120 turns in the secondary circuit has its primary circuit connected to a 400V a.c source. It is found that when a heater is connected to the secondary circuit, it produces heat at the rate of 600w. Assuming 100% efficiency, determine the:

(i) Voltage in the secondary circuit (2 marks)

(ii) Current in the primary circuit (2 marks)

(iii) The current in the secondary circuit (1 mark)

18. (a) Figure 14 shows the features of a cathode ray tube

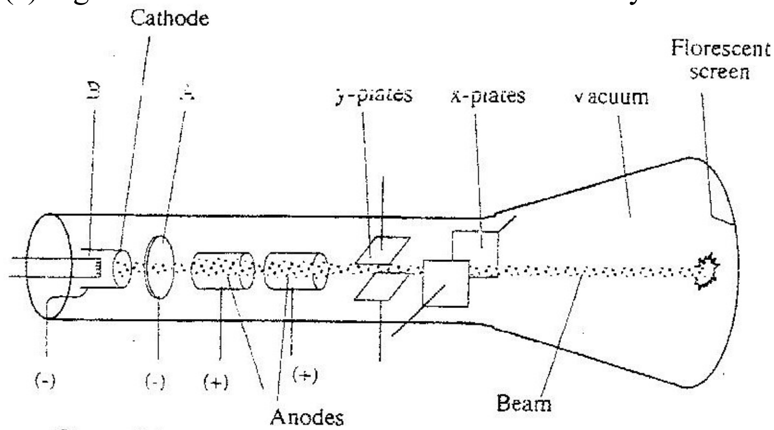


Figure 14

(i) Name the parts labeled A and B (2mks)

A ………………………………… B……………………………

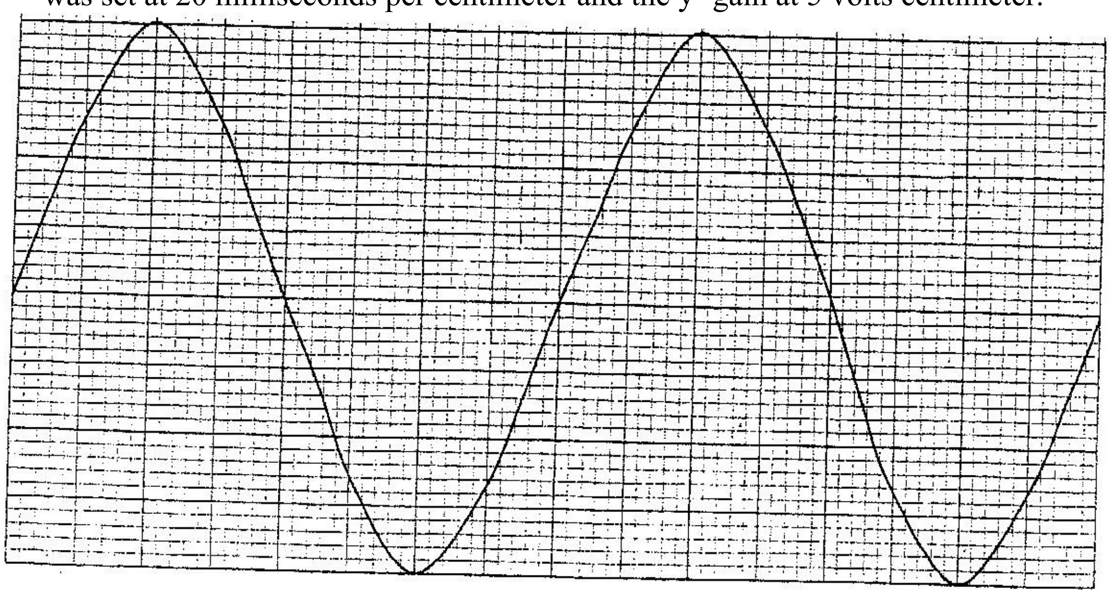
(ii) Explain how the electrons are produced in the tube (2 marks)

(iii) State two functions of the anodes (2 marks)

(iv) At what part of the cathode ray tube would the time be connected?

(v) Why is a vacuum created in the tube? (1 mark)

(b) The graph in figure 15 was obtained on a cathode ray oscilloscope (CRO) screen when the output of an a.c generator was connected to the input of the CRO. The time- base calibration of the CRO was set at 20 milliseconds per centimeter and the y- gain at 5 volts centimeter.



(i) Determine the pick voltage of the generator **Figure 15** (2mks)

(ii) Determine the frequency of the voltage (3 marks)

On the same grid, redraw the graph for the same voltage when the time base calibration is set at 40 milliseconds per centimeter and y- gain at 10 volts per centimeter. (Show at least one complete cycle) (2 marks)

PHYSICS K.C.SE. YEAR 2008
PAPER 1
SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided.

1. A drug manufacturer gives the mass of the active ingredient in a tablet as 5 mg. Express this quantity in kilogramme and in standard form. (1mk)

2. The masses of equal volumes of a certain liquid and of water were found to be m_v and m_w respectively. Given that the density of water is $1gcm^{-3}$, express the density, p, of the liquid in terms of m_v m_w (show your work) (2mks)

3. Fig. 1 shows a brick placed on a plane inclined at an angle θ to the horizontal. The weight, W, of the brick is shown.

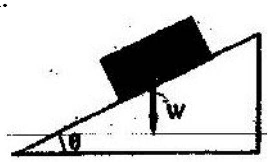


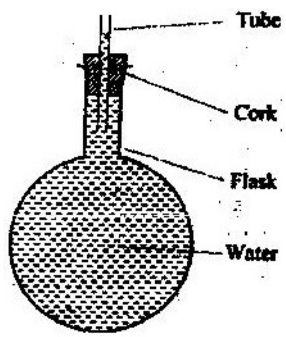
Figure 1

 a) On the same diagram show with arrows the other two forces acting on the brick and name them. (1mk)

 b) State how each of the two forces named (a) above is affected when the angle θ is reduced. (1mk)

4. Water is known to boil at 100^0C. A student heated some water and noticed that it boiled at 101^0C. State two possible reasons for this observation. (2mks)

5. Fig: 2 shows a flask filled with water. The flask is fitted with a cork through which a tube is inserted. When the flask is cooled, the water level rises slightly, then falls steadily.



Explain observation. (3mks)

Figure 2

6. Fig. 3 shows a hot water bath with metal rods inserted through one of its sides. Some wax is fixed at the end of each rod. Use this information to answer questions 6 and 7.

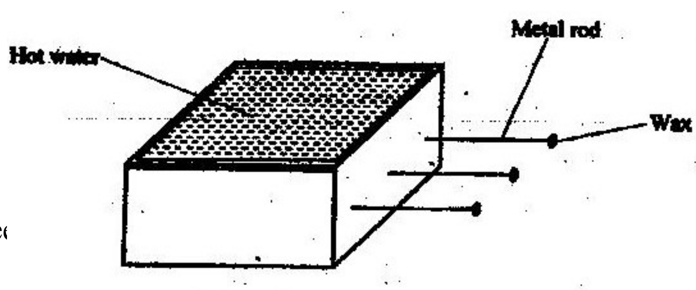


Figure 3

What property of metals could be tested using this set-up? (1mk)

7. Besides the length of the rods that is kept constant, what else should be kept constant when comparing the property for the different metal rods? (1mk)

8. Fig. 4 shows a conical flask 15cm high, filled with a liquid of density $1200kgm^{-3}$. The atmospheric pressure of the surrounding is 8.4×10^4 Pa.

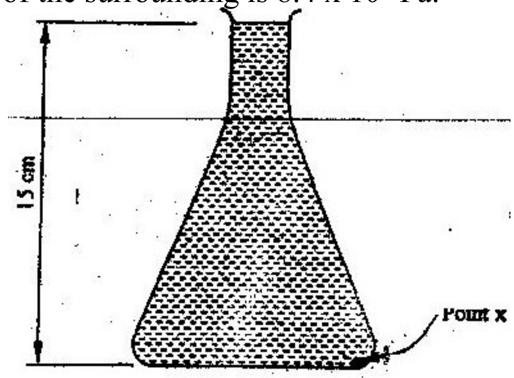


Figure 4

Determine the pressure at the point marked X, at the bottom of the flask. (3mks)

9. Explaining the difference between a liquid and a gas in terms of intermolecular distances and forces. (2mks)

10. Fig. 5 shows a toy resting on top of a closed bottle. Use the information on the figure to answer questions 10 and 11.

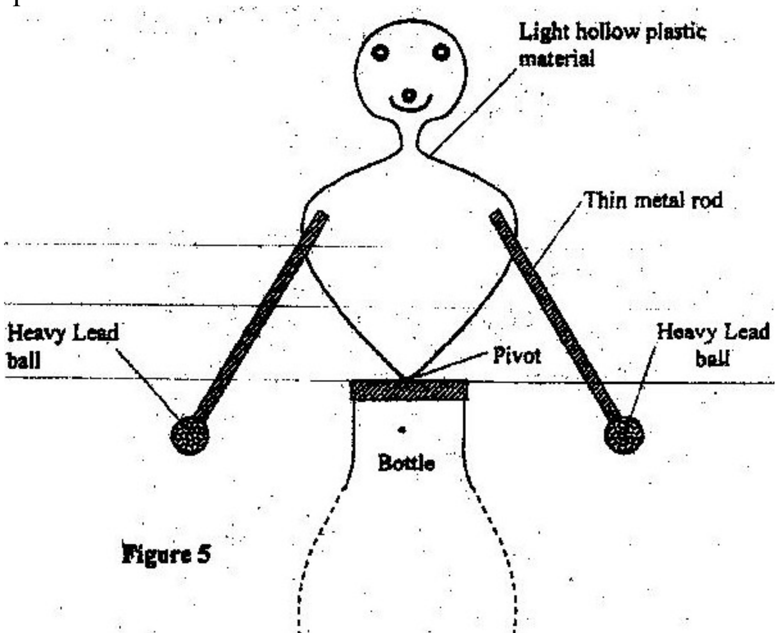


Figure 5

Mark on the diagram, point Q, the approximate centre of gravity of the toy. (1mk)

11. Giving a reason, name the state of equilibrium of the toy. (2mks)

12. Fig. 6 shows a sheet of paper rolled into a tube.

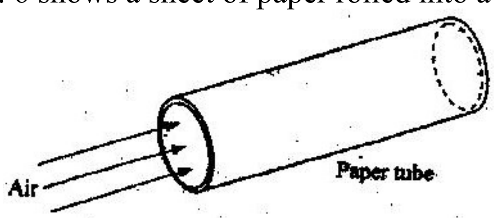


Figure 6

When a fast stream of air is blown into the tube as shown in the diagram the paper tube collapses. Explain the observation. (2mks)

13. The graphs in Fig. 7 represent the relations between extension e and mass m added on two springs x and y.

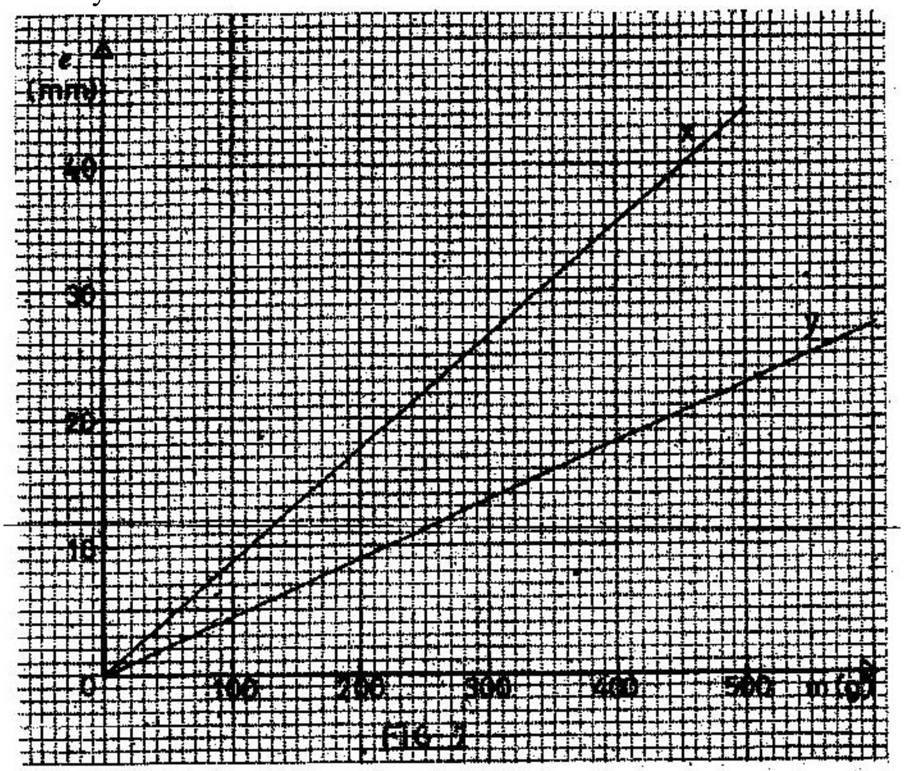


FIG 7

Given that the two springs are made of same materials, give a reason why the graphs are different. (1mk)

14. The system in Fig. 8 is in equilibrium

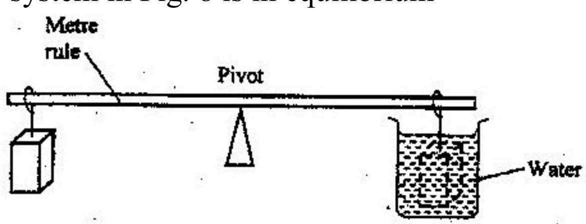


Figure 8

When the temperature of the water is raised the system is observed to tilt to the right, state the reason for this observation. (2mks)

SECTION B (55 MARKS)

Answer all questions in this section in the spaces provided.

15. a) State Newton's second law of motion. (1mk)

b) A matatu starts from rest and accelerates to cover a distance of 49m in 7 seconds. Determine

(i) Its acceleration; (3mks)

(ii) Its velocity, after 7seconds (2mks)

c) A trolley moving on a horizontal bench of height 1.2m, strikes a barrier at the edge of the bench. The brass mass on the top of the trolley flies off on impact and lands on the ground 2.5m from the edge of the bench.

Determine:

(i) The time taken by the brass mass to reach the ground; (2mks)

(ii) The speed at which the trolley struck the barrier. (2mks)

16. a) Define the term heat capacity. (1mk)

b) You are provided with the apparatus shown in Fig. 9 and a stop watch.

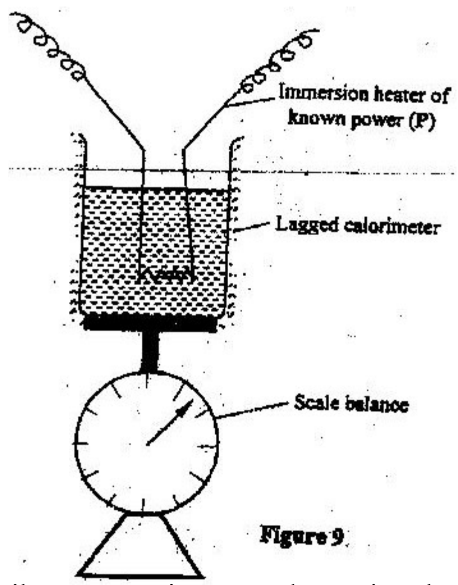


Figure 9

Describe an experiment to determine the specific latent heat of steam, l, using the set up. In your answer clearly explain the measurements to be made and how these measurements could be used to determine l. (6mks)

c) A block of metal of mass 150g at 100^0C is dropped into a lagged calorimeter of heat capacity $40JK^{-1}$ containing 100g of water at 25^0C. The temperature of the resulting mixture is 34^0C. (Specific heat capacity of water=$4200JK^{-1)}$.

Determine:

(i) Heat gained by calorimeter; (2mks)

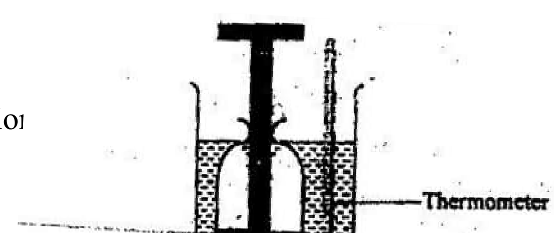
(ii) Heat gained by water; (1mk)

(iii) Heat lost by the metal block; (1mk)

(iv) Specific heat capacity of the metal block (3mks)

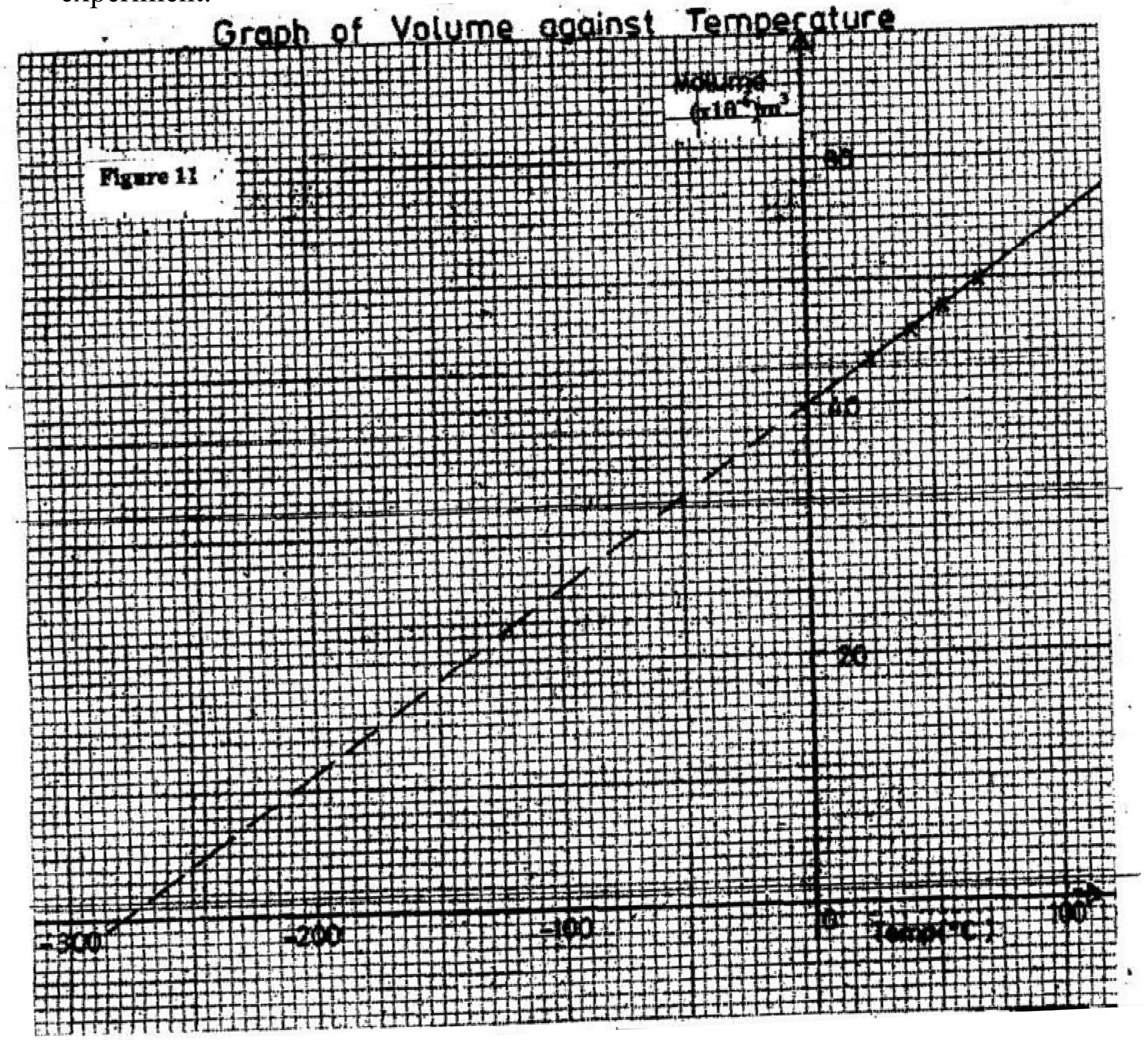
17. a) What is meant by absolute zero temperature? (1mk)

Fig. 10 shows a set up to investigate the relationship between temperature and volume for a certain gas.



b) State two factors that are kept constant, in order to determine the relationship. (2mks)

c) The graph in Fig. 11 shows the relationship between volume and temperature for the experiment.



(i) What was the volume of the gas at 0^0C? (1mk)

(ii) At what temperature would the volume of the gas be zero? (1mk)

(iii) Explain why the temperature in part (ii) above cannot be achieved. (2mks)

d) A sealed gas cylinder contains $300cm^3$ of certain gas at a temperature of 25^0C, and at a pressure of $9.5x\ 10^4pa$. the gas in the cylinder was then cooled to 10^0C.

Determine the new pressure of the gas in the cylinder. (4mks)

18. (a) Define the term velocity ratio of a machine. (1mk)

(b) Fig. 12 shows part of a hydraulic press. The plunger is the position where effort is applied while the Ram piston is the position where load is applied. The plunger has cross-section area, a m^2 while the Ram piston has cross-section area, a m^2.

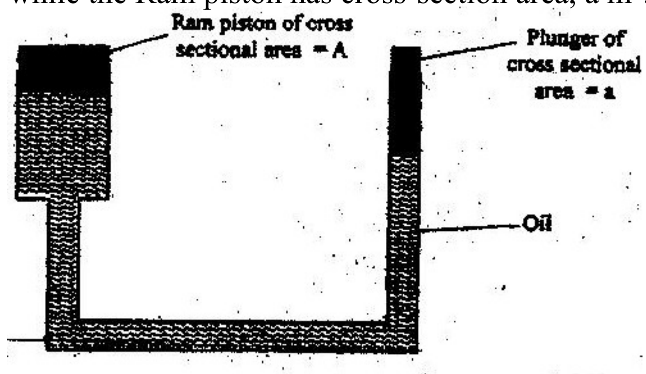


Figure 12

When the plunger moves down a distance d the Ram piston moves up a distance D.

(i) State the property of liquid pressure on which the working of the hydraulic press works. (1mk)

(ii) Derive an impression for the velocity ratio (V.R) in terms of A and a. (4mks)

c) A machine of velocity ratio 45, overcomes a load of 4.5×10^3N when an effort of 135N is applied.

Determine:

(i) The mechanical advantage of the machine; (2mks)

(ii) Efficiency of the machine; (2mks)

(iii) The percentage of the work that goes to waste. (1mk)

19 a) State the principle of moments. (1mk)

b) A uniform metal strip is 3.0cm wide, 0.6cm thick d 100cm long. The density of the metal is 2.7 g/cm^3.

(i) Determine the weight of the strip. (3mks)

The strip placed n a pivot and kept in equilibrium by forces as shown in fig. 13

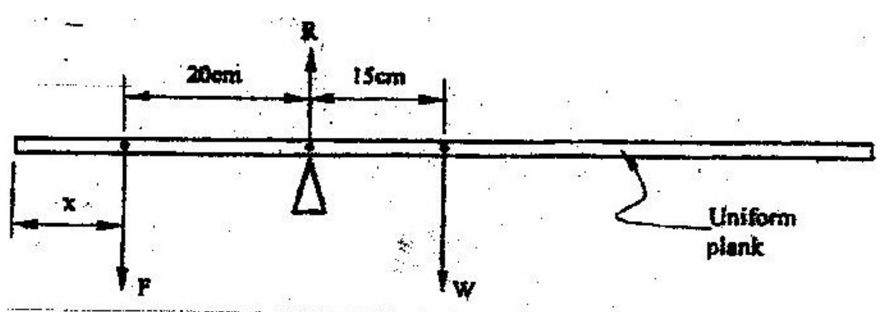
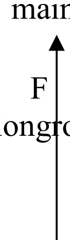


Figure 13

(ii) Determine the value of F and R (3mks)

(iii) X is the distance from the end of the plank to the point of application of force F. Force F is now applied at various points nearer to the pivot so that x increases. Equilibrium is maintained all the time. On the axes provided sketch the relation between force F and x.



(iv) Give a reason for the answer in (iii) above (1mk)

PHYSICS K.C.S.E YEAR 2008
PAPER 2
SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided.

1. Figure 1 shows three point sources of light with an opaque object placed between them and the screen.

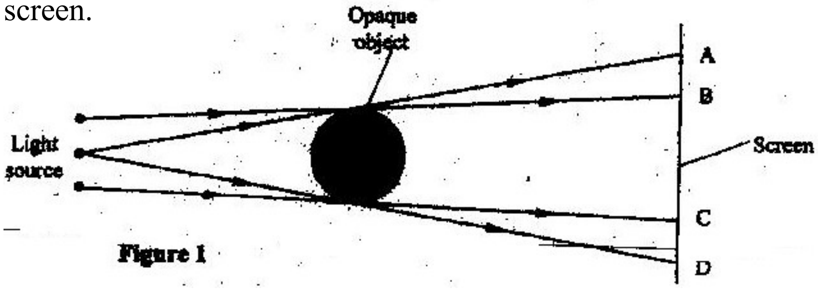


Figure 1

Explain the nature of the shadow formed along B and C. (2mks)

2. A leaf electroscope A is charged and placed on the bench. Another uncharged leaf electroscope B is placed on the same bench and moved close to A until the caps touch. State and explain what is observed on the leaves of A and B. (2mks)

3. You are provided with the following;
A cell and holder, a switch, a rheostat, an ammeter, a voltmeter and connecting wires. Draw a diagram for a circuit that could be used to investigate the variation of the potential difference across the cell with the current drawn from the cell. (1mk)

4. An un-magnetized steel rod is clamped facing North-South direction and then hammered repeatedly for some time. When tested, it is found to be magnetized. Explain this observation. (2mks)

5. The diagram in figure 2 shows an object O placed in front of a converging lens. F and F are the principal foci for the lens.

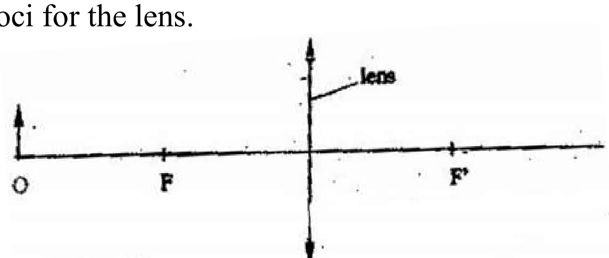
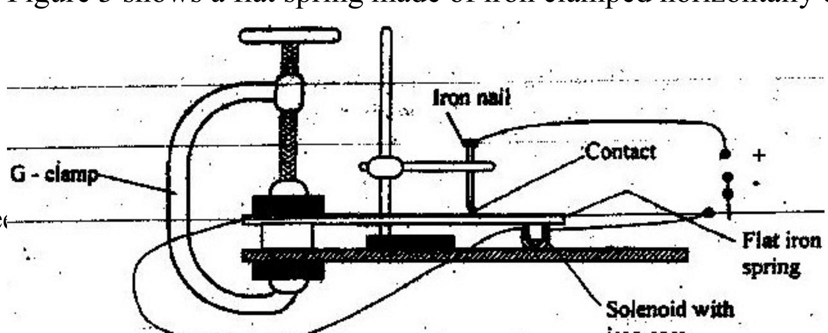


Figure 2

The object is now moved along the principal axis until a virtual image is produced.
On the same diagram:
(i) Draw the object O in the new position along the principal axis;
(ii) Sketch rays to show formation of the virtual image (1mk)

6. Figure 3 shows a flat spring made of iron clamped horizontally on the bench over a solenoid.



When the switch is closed, the spring vibrates. Explain this observation. (3mks)

7. Figure 4 shows a hack-saw blade clamped horizontally on a bench and the free end is made to vibrate about the rest position.

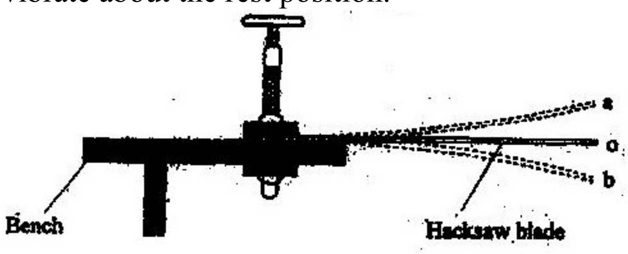


Figure 4

The movement o $\rightarrow$ a $\rightarrow$ 0 $\rightarrow$ b $\rightarrow$ 0 $\rightarrow$ a $\rightarrow$ 0 $\rightarrow$ b takes 0.7 seconds. Determine the frequency of vibration of the blade. (2mks)

8. Figure 5 shows wavefronts approaching the boundary between two media.

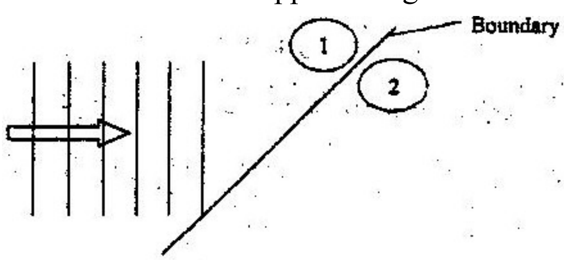


Figure 5

The speed of the waves in medium (2) is higher than that in medium (1). On the same diagram complete the figure to show the wavefronts after crossing the boundary.
(2mks)

9. Figure 6 shows a circuit in which a battery of negligible internal resistance, two resistors, a capacitor, a voltmeter and a switch are connected.

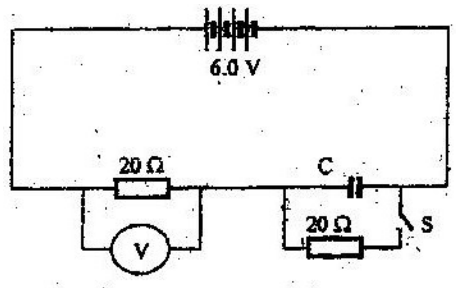


Figure 6

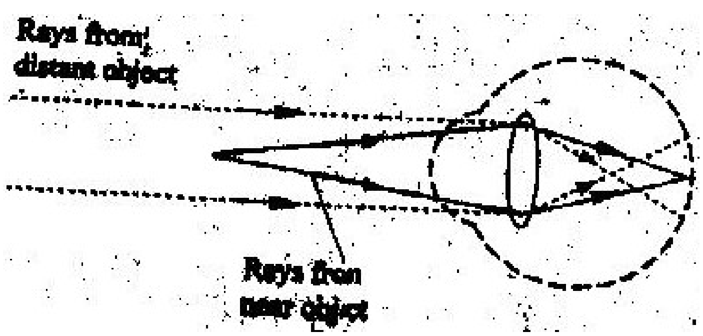
Giving a reason for your answer in each case, state the reading of the voltammeter, V, when the switch is (2mks)

(i) Open
V=…………………………………………………………………..
Reason…………………………………………………………..

(ii) Closed
V=………………………………………………………………….
Reason………………………………………………………….

10. A heating coil is rated 100W, 240V. At what rate would it dissipate energy if it is connected to a 220V supply? (3mks)

11. Figure 7 shows how rays from a distant and a near object are focused inside a human eye with a certain defect.



Name the defect and state the cause of this defect. (1mk)
Defect……………………………………………………………………..
Cause of defect…………………………………………………………………

12. A narrow beam of electrons in a cathode ray oscilloscope (CRO) strike the screen producing a spot. State what is observed on the screen if a low frequency a.c source is connected across the y-input of the CRO (1mk)

13. The accelerating potential of a certain X-ray tube is increased. State the change observed on the X-rays produced. (1mk)

14. A radioactive isotope of copper decays to form an isotope of Zinc as shown below

$$^{69}_{29}Cu \longrightarrow {}^{69}_{30}Zn + \text{radiation}$$

(2mks)

Name the radiation emitted and give a reason for your answer

Radiation…………………………………………………………………………

Reason……………………………………………………………………………

SECTION B (55 MARKS)

Answer ALL the questions in this section in the spaces provided.

15. a) State one factor that affects the speed of sound in a solid. (1mk)

b) An observer stands half-way between two vertical cliffs that are L metres apart. He moves directly towards one cliff and after a distance x=10cm from the centre, he strikes a gong and measures the time interval, t, between the echoes heard from the two cliffs. He moves a further 10m and again strikes the gong and measure the time interval between the echoes. The process is repeated several times. The graph in Figure 8 shows the relation between the time interval, t and the distance, x from the centre.

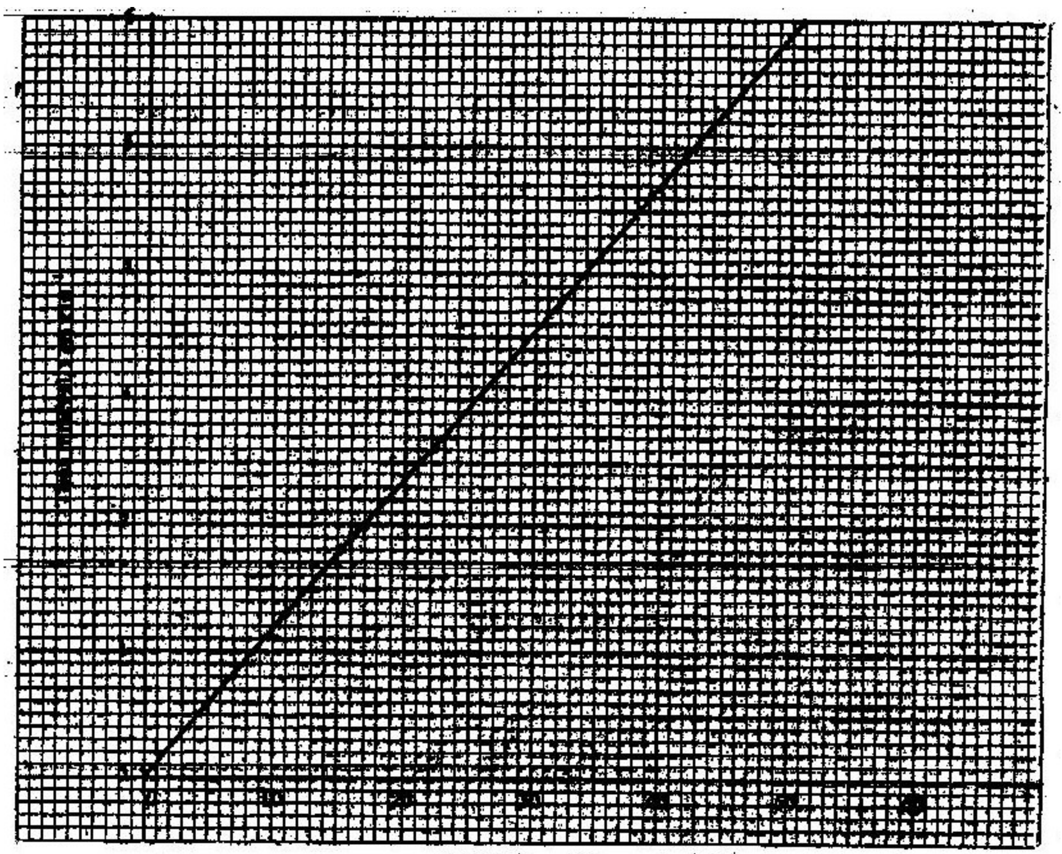


Figure 8

(i) From the graph, determine the value of x for which the time interval was 0.55.

(1mk)

(ii) Given that $t = \frac{4}{v}x$ where v is the speed of sound in air, determine the value of v from the graph. (3mks)

(iii) If the maximum time measured by the observer was t=4.7s, determine the distance L between the cliffs. (3mks)

(c) A search boat uses a signal of frequency 6.0×10^4 H_z to detect a sunken ship directly below. Two reflected signals are received; one after 0.1 seconds from sunken boat and the other after 0.14 seconds from the sea bed. If the sea bed is 98 m below the boat, determine:-

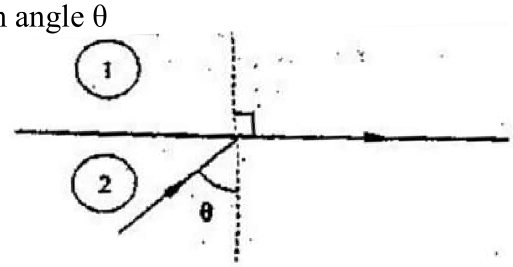
(i) The speed of the signal in water. (3mks)

You may use the value of v from (ii) above.

(ii) The depth of the sunken ship below the boat (2 mks)

16. (a) State two conditions necessary for total internal reflection to occur (2 mks)

(b) Figure 9 shows a ray of light incident on the boundary between two media 1 and at an angle θ



Igure 9

Show that the refractive index for a ray of light traveling from medium 1 to medium 2 is given by:

$$M_2 = \frac{1}{\text{Sin } \theta}$$

(2 mks)

(c) Figure 10 shows a ray of light incident on one face of a block of ice of refractive index 1. 31 and totally reflected at the adjacent face

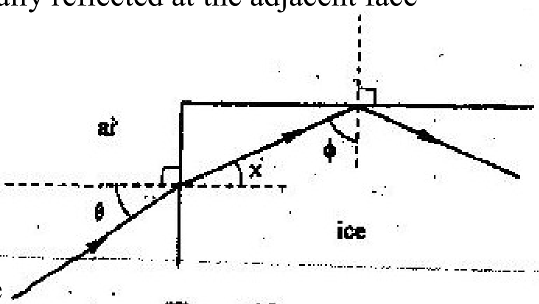


Figure 10

Determine

(i) Angle Φ (2 mks)

(ii) Angle x (1 mk)

(iii) Angle θ, the greatest angle for which the total internal reflection is possible (2 mks)

17. (a) Three resistors of resistance 2.0 Ω, 4.0 Ω and 6.0 Ω are connected together in a circuit.
Draw a circuit diagram to show the arrangement of the resistor which Gives

(i) Effective resistance of 3.0 Ω (1 mk)

(ii) Minimum resistance (1 mk)

(b) In figure 11 the voltmeter reads 2.1 V when the switch is open. When the switch is closed, the voltmeter reads 1.8 V and the ammeter reads 0.1A.

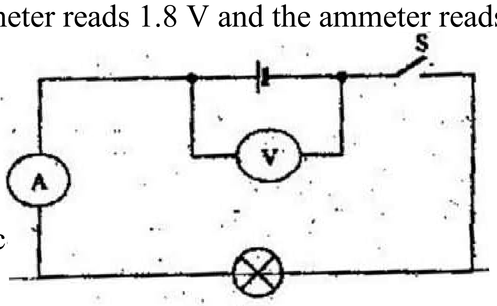


Figure 11

Determine:
(i) The e.m.f of the cell (1 mk)
(ii) The internal resistance of the cell (3 mks)
(iii) The resistance of the lamp (2 mks)

18. (a) Figure 12 shows two circuits close to each other

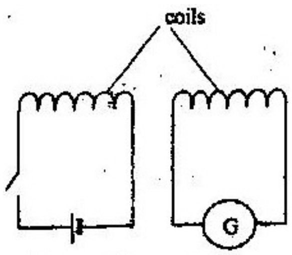


Figure 12

When the switch is closed, the galvanometer shows a reading and then returns to zero. When the switch is then opened, the galvanometer shows a reading in the opposite direction and then returns to zero. Explain these observations.
(3 mks)

(b) Explain how energy losses in a transformer are reduced by having:
(i) A soft- iron core (2 mks)
(ii) A laminated core (2 mks)

(c) An ideal transformer has 2000 turns in the primary circuit and 200 turns in the secondary circuit. When the primary circuit is connected to a 400V a.c. source, the power delivered to a resistor in the secondary circuit is found to be 800W. Determine the current in:
(i) The secondary circuit
(ii) The primary circuit

19. (a) X- rays are used for detecting cracks inside metal beams
(i) State the type of the X- rays used (1 mk)
(ii) Give a reason for your answer in (i) above (1 mk)

(b) Figure 13 shows the features of an X- ray tube

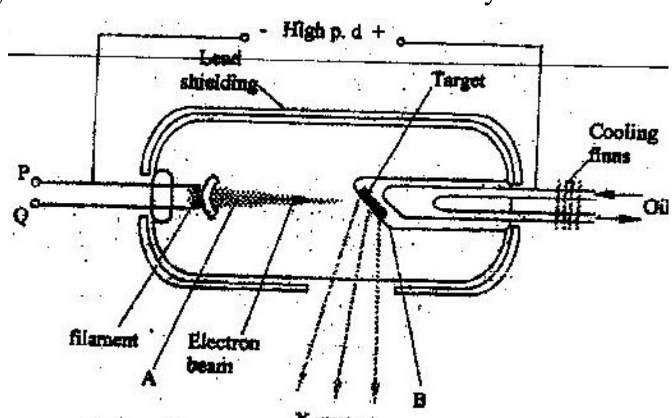


Figure 13

(i) Name the parts labeled A and B (2 mks)
A

B

(ii) Explain how a change in the potential across PQ changes the intensity of the X- rays produced in the tube. (2 mks)

(iii) During the operation of the tube, the target becomes very hot. Explain how this heat is caused (2 mks)

(iv) What property of lead makes it suitable for use as shielding material? (1 mk)

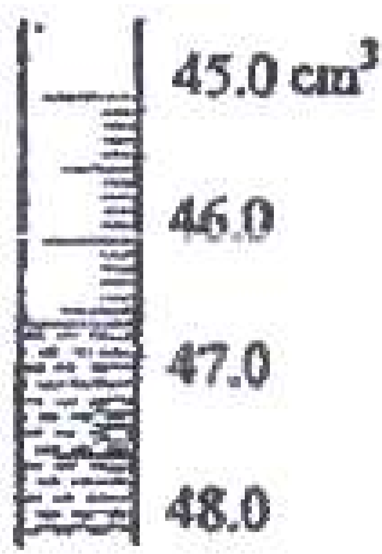
(c) In a certain X- ray tube, the electrons are accelerated by a Pd of 12000V. Assuming all the energy goes to produce X- rays, determine the frequency of the X- rays produced. (Plank's constant h= 6.62×10^{-34} Js and charge on an electron, e = 1.6×10^{-19}C). (4 mks)

PHYSICS PAPER 1 YEAR 2009

SECTION A (25 marks)

Answer all questions in this section in the spaces provide

1. In an experiment to measure the density of a liquid, a student filled a burette with a liquid to the 0 cm^3 mark. Figure 1 shows a section of the burette showing the level of the liquid after 54.5 g of the liquid had been run out



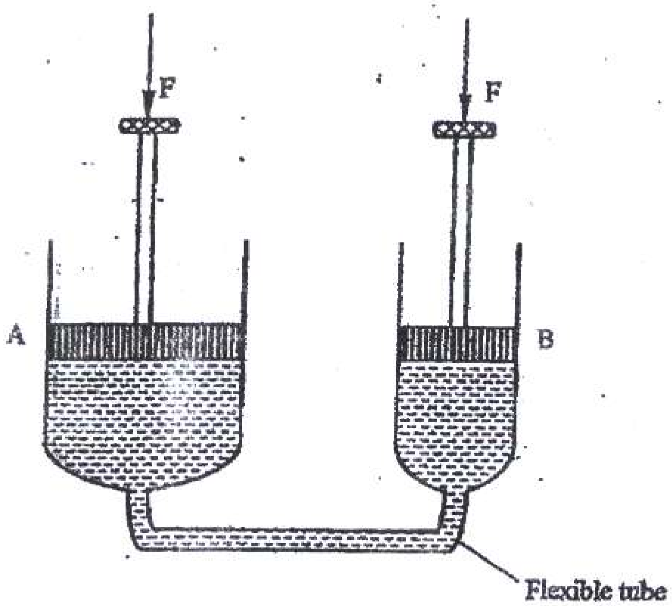
Determine the density of the liquid (3 mks)

2. In an experiment to determine the acceleration due to gravity g, a student measured the period, T and length L, of a simple pendulum. For a length L = 70.5 cm, the period T obtained as 1.7s. Given that $T = 2\pi \sqrt{L/g}$, determine the value of g correct to two significant figures

(2 mks)

3. A steel needle when placed carefully on water can be made to float. When a detergent is added to the water it sinks. Explain this observation

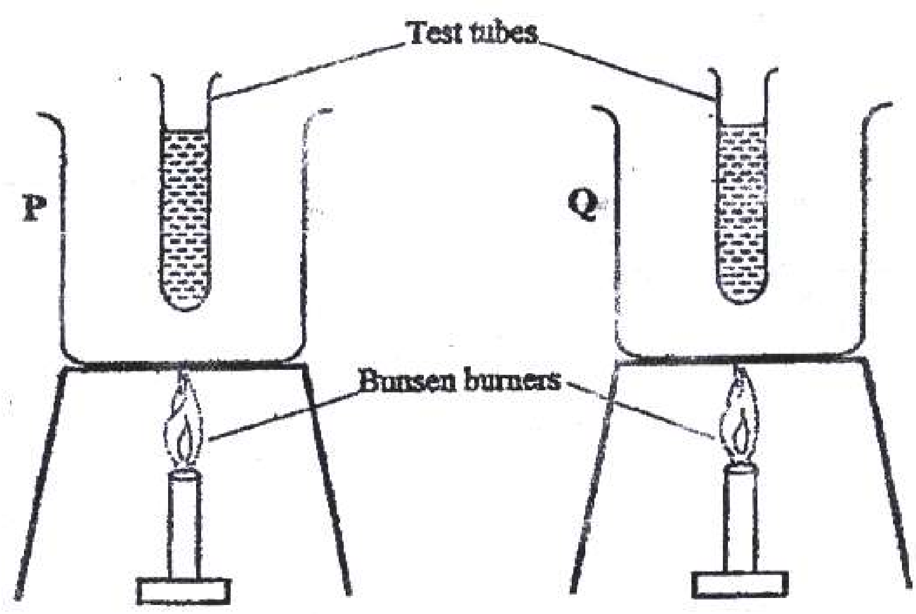
4. Figure 2 shows two cylinders containing a liquid and connected with a tight – fitting flexible tube. The cylinders are fitted with air- tight pistons A and B as shown



5. When equal forces, F are applied on the pistons as shown it is observed that piston A moves up while B moves down. Explain this observations (2 mks)

6. Two identical beakers A and B containing equal volumes of water are placed on a bench. The Water in A is cold while in B it is warm. Identical pieces of potassium permanganate are placed gently at the bottom of each beaker inside the water. It is observed that the spread of colour in B is faster than in A. Explain this observation. (2 mks)

7. A clinical thermometer has a constriction in the bore just above the bulb. State the use of this constriction.



Use the following information to answer questions 7 and 8

8. Two identical empty metal containers P and Q are placed over

identical Bunsen burners and the burners lit. P is dull black while Q is shiny bright. After each container attains a temperature of 100^0C the burners are turned off. Identical test tubes containing water are suspended in each container without touching the sides as shown in figure 3

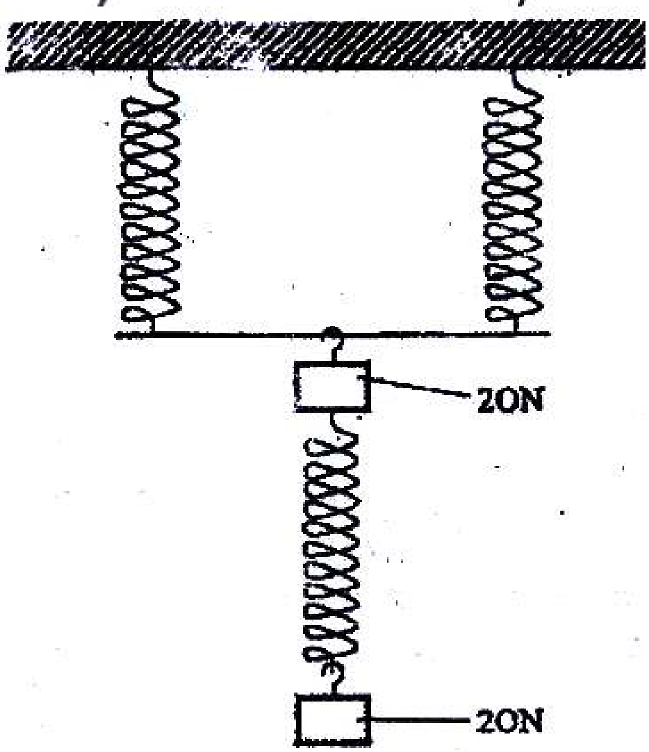
Explain why the container Q may become hot faster than P. (2 mks)

Explain why the water in test- tube in P becomes hot faster than in Q (2 mks)

9. Figure 4 shows a uniform cardboard in the shape of parallelogram

Locate the centre of gravity of the cardboard (1 mks)

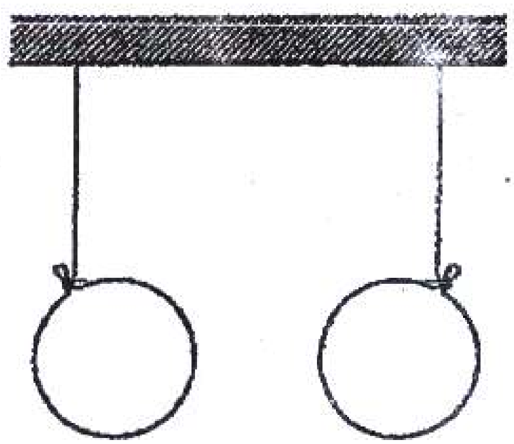
10. The three springs shown in figure 5 are identical and have negligible weight. The extension



produced on the system of springs is 20 cm.

Determine the constant of each spring (2 mks)

11. Figure 6 shows two inflated balloons hanging vertically on light threads



When a strea he space between the balloons, they are observed to move

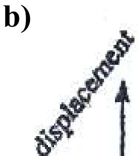
Figure 6

towards each other. Explain this observations (1 mk)

12. Figure 7 (a) shows the acceleration – time graph for a certain motion

a)

b)



On the axes provided in figure 7 (b), sketch the displacement – time graph for the same motion

(1 mks)

13. State what is meant by absolute zero temperature (zero Kelvin or 273^0C)
14. A turntable of radius 8 cm is rotating at 33 revolutions per second. Determine the linear speed of a point on the circumference of the turntable

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided

15. (a) State two factors that affect the boiling point of a liquid (2 mks)

(b) 100g of a liquid at a temperature of 10^0 C is poured into a well lagged calorimeter .

An electric heater rated 50W is used to heat the liquid. The graph in figure 8 shows the variation of the temperature of the liquid with time.

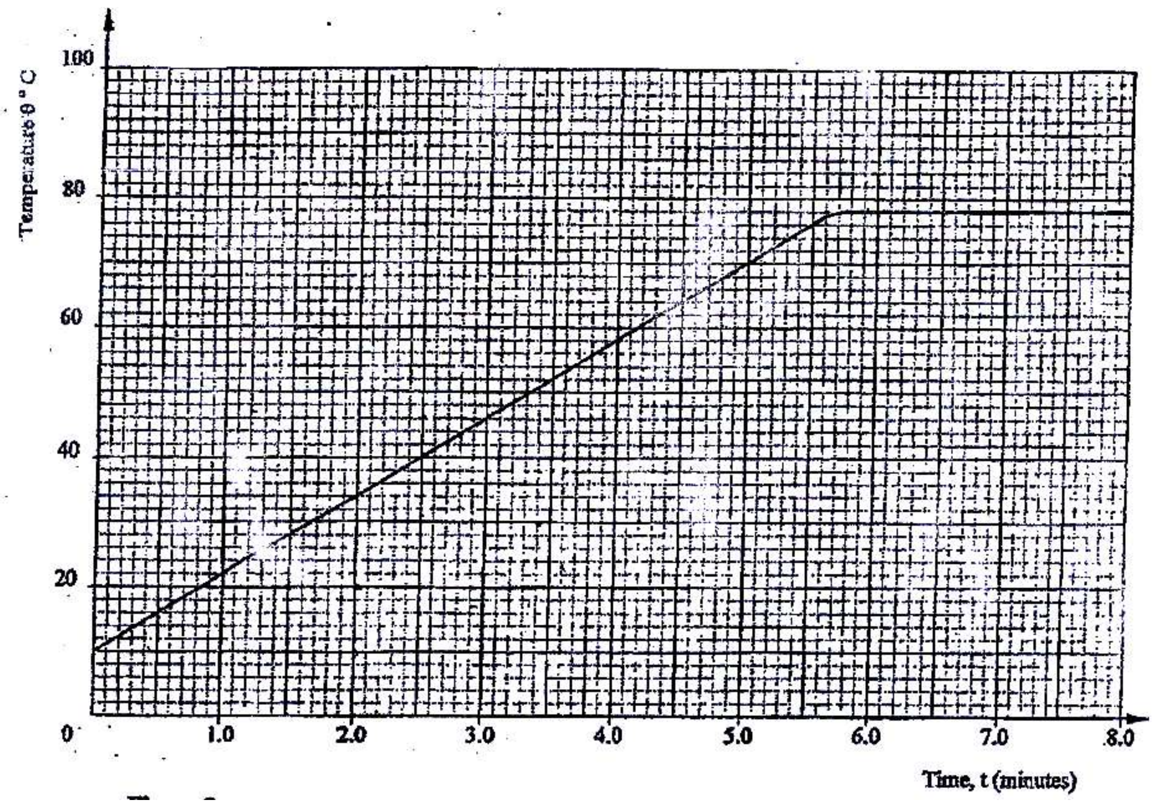


Figure 8

(i) From the graph, determine the boiling point of the liquid (1 mk)

(ii) (I) Determine the heat given out the by the heater between the times

t= 0.5 minutes and t= 5.0 minutes (2 mks)

(II) From the graph determine the temperature change between the times t = 0.5 minutes and t= 5.0 minutes (1 mk)

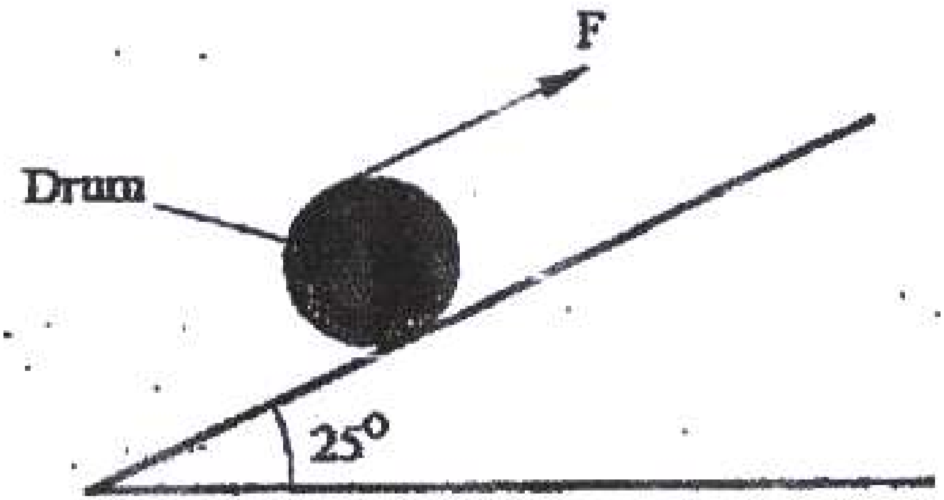
(III) Hence determine the specific heat capacity of the liquid (2 mks)

(iii) 1.8 g of vapour was collected from above the liquid between the times t= 6.8 minutes and t= 7.3 minutes. Determine the specific latent heat of vaporization of the liquid

(4 mks)

16. (a) Define the term efficiency of a machine (1 mk)

(b) Figure 9 shows a drum of mass 90 kg being rolled up a plane inclined at 25^0 to the horizontal. The force F applied is 420N and the distance moved by the drum along the plane is 5.2 m



Determine:

(i) The work done by the effort (3 mks)

(ii) The work done in raising the drum (3 mks)

(iii) The efficiency of the inclined plane as a machine (2 mks)

17. (a) State the law of flotation (1 mk)

(b) Figure 10 shows a rectangular metal block of density 10500 kgm^{-3} and dimensions 30 cm x 20 cm x 20 cm suspended inside a liquid of density 1200 kgm^{-3} by a string attached to a point above the liquid. The three forces acting on the block are the tension T, On the string, the weight W, of the block and the upthrust, U due to the liquid.

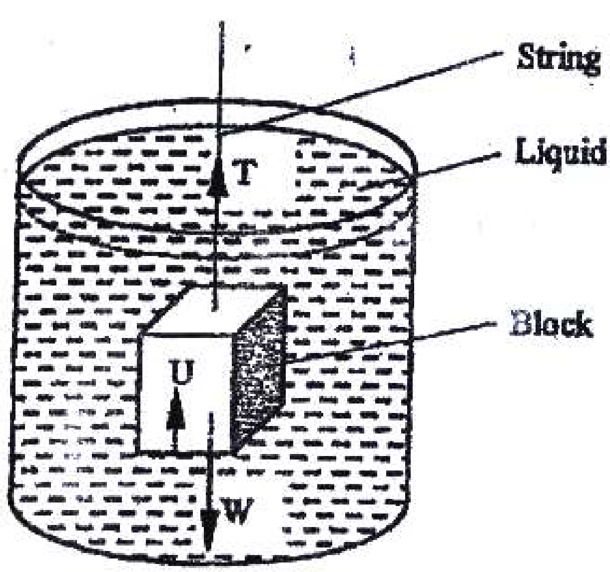


Figure 10

(i) Write the expression relating T, W and U when the block is in equilibrium inside the liquid

(1 mks)

(ii) Determine the weight, W of the block (3 mks)

(iii) Determine the weight of the liquid displaced by the fully submerged block

(2 mks)

(iv) Hence determine the tension, T in the string (1 mk)

(c) A certain solid of volume 50 cm^3 displaces 10 cm^3 of kerosene (density 800 kgm^3) when floating. Determine the density of the solid. (4 mks)

18. (a) State the pressure law for an ideal gas (1 mk)

(b) An air bubble is released at the bottom of a tall jar containing a liquid. The height of the liquid column is 80 cm. The volume of the bubble increases from 0.5 cm^3 at the bottom of the liquid to 1. 15 cm^3 at the top. Figure 11 shows the variations of pressure, P, on the bubble with the reciprocal of volume 1/v, as it rises in the liquid.

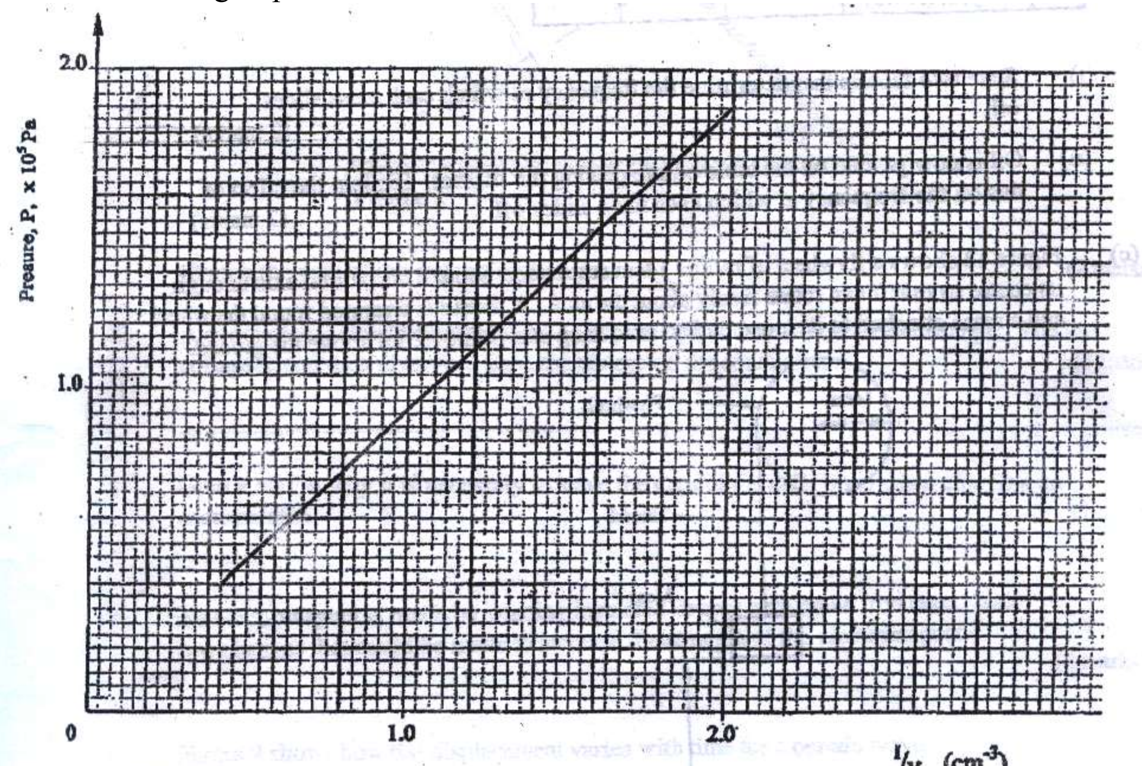


Figure 11

(i) State the reason why the volume increases as the bubble rises in the liquid Column (1 mk)

(ii) From the graph, determine the pressure on the bubble:

(I) At the bottom of the liquid column; (2 mks)

(II) At the top of the liquid column (1 mk)

(iii) Hence determine the density of the liquid in kgm^{-3} (3 mks)

(iv) What is the value of the atmospheric pressure of the surrounding? (1 mk)

(c) A rubber tube is inflated to pressure of 2.7 x 10^5 Pa and volume 3800 cm^3 at a temperature of 25^{0}C. It is then taken to another place where the temperature is 15^{0}C and the pressure 2.5 x 10^5 Pa. Determine the new volume. (4 mks)

19. (a) Define angular velocity (1 mk)

(b) Three masses are placed on a rotating table at distances 6 cm, 9 cm and 12 cm respectively from the centre of rotation. When the frequency of rotation is varied, it is noted that each mass slides off at a different frequency of rotation of the table. Table 1 shows the frequency at which each mass slides off.

Table 1

Radius r (cm)	12	9	6
Sliding off Frequency, f, (rev/s)	0.68	0.78	1.0

(i) State two factors that determine the frequency at which each mass slides off (2 mks)

(ii) Oil is now poured on the table before placing the masses. Explain the effect of this on the frequency at which each mass slides off. (2 mks)

(c) Figure 12 shows a flywheel of radius 14 cm suspended about a horizontal axis through its centre so that it can rotate freely about the axis. A thread is wrapped round the wheel and a mass attached to its loose end so as to hang at a point 1.2c above the ground.

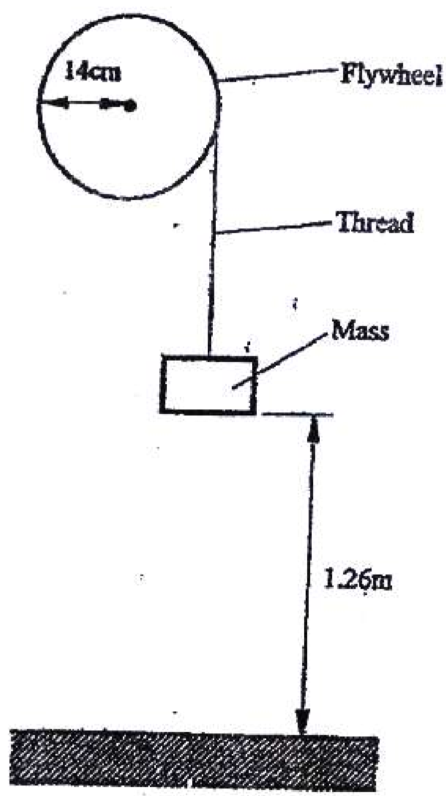


Figure 12

When the mass is released, it accelerates at 0.28 ms^{-2}. Determine the angular velocity of the wheel just before the mass strikes the ground.

(4 mks)

PHYSICS PAPER 2 YEAR 2009

SECTION A (25 MARKS)

Answer all the questions in this section in the spaces provided

1. State the number of images formed when an object is between two plane mirror placed in parallel

(1 mk)

2. Figure 1 shows a ray of light incident on a mirror at an angle of 45^0. Another mirror is placed at an angle of 45^0 to the first one as shown

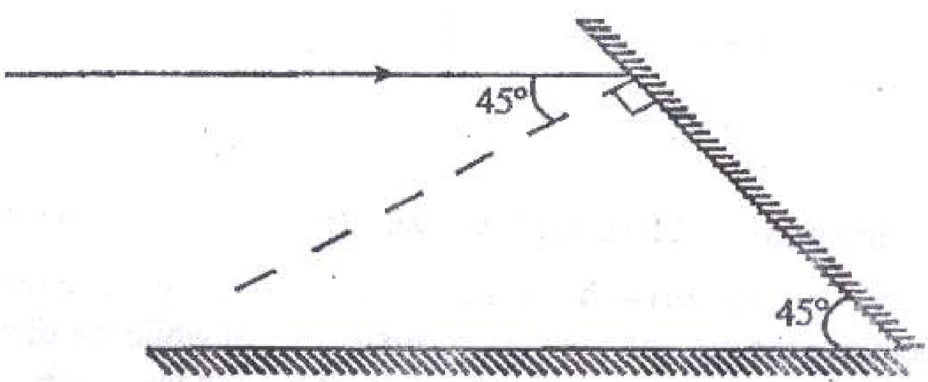


Figure 1

Sketch the path of the ray until it emerges (2 mks)

3. A conductor is slowly bought near the cap of a positively charged electroscope. The leaf first collapses and then diverges. State the charge on the conductor.

(1 mk)

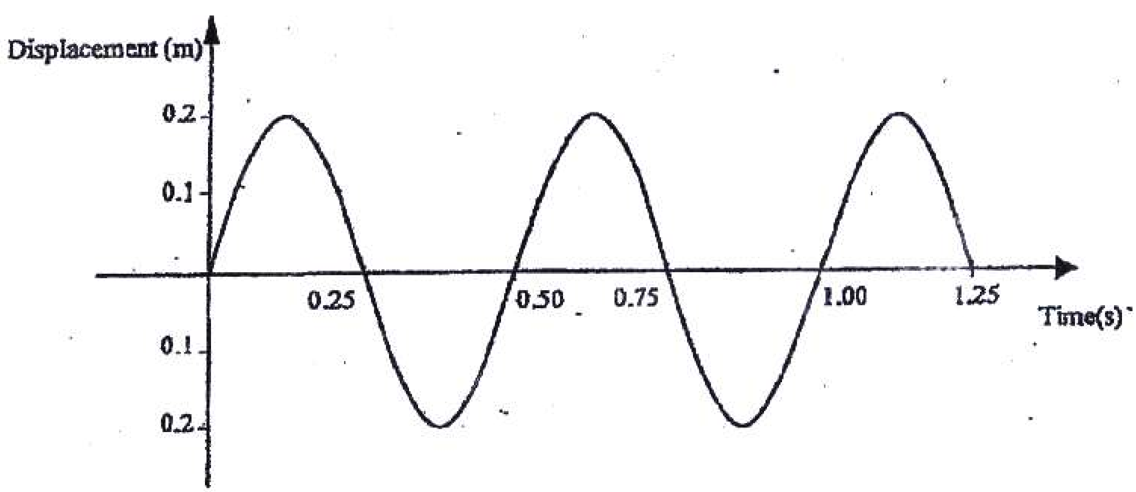
4. Give a reason why it is necessary to leave the caps of the cells open charging an accumulator.

(1 mk)

5. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet.

(2 mks)

6. Figure 2 shows how the displacement varies with time for a certain wave



Determine the frequency of the wave (3 mks)

7. Determine the speed of light in water given that the speed of light in air is 3.0×10^8 ms^{-1} and the refractive index of water is 1.33 (3 mks)

8. Figure 3 shows part of an electrical circuit. The current through the 18Ω resistor is observed to be 2A.

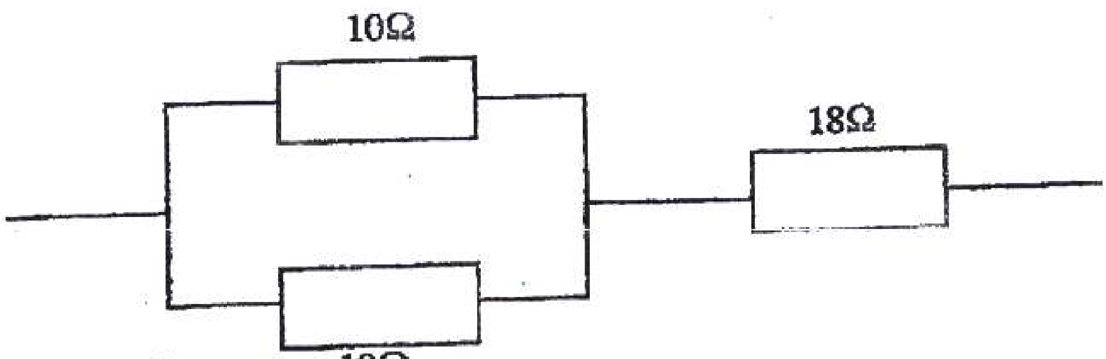
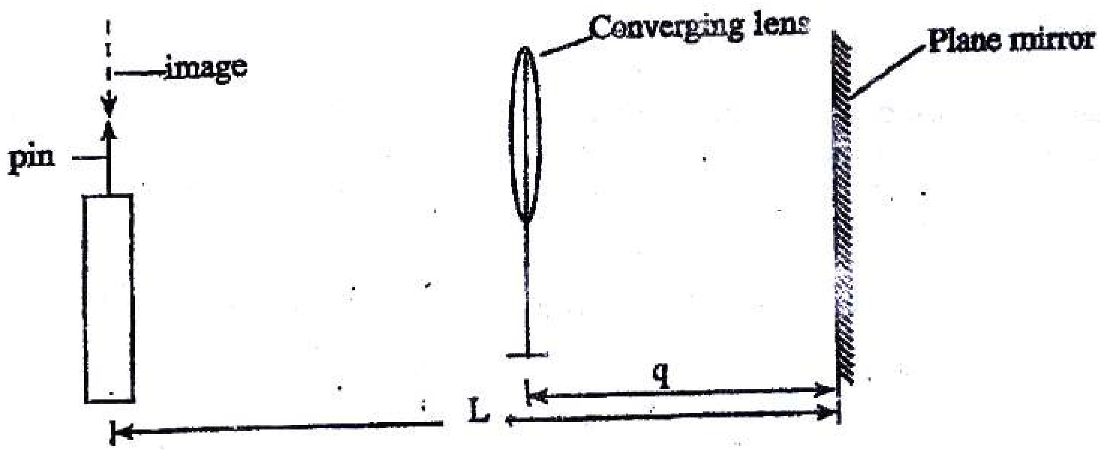


Figure 3

State the value of the current through each of the 10 Ω resistors (1 mk)

9. In an experiment, a pin a converging lens and a plane mirror are arranged as shown in figure 4. The distance between the pin and the plane mirror is L cm while the distance between the lens and the plane mirror is q cm. The position of the pin is adjusted until its tip coincides with its real image.



State the focal length of the lens (1 mk)

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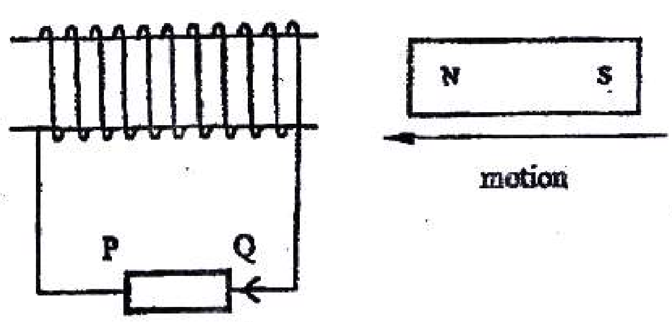


10. Figure 5 shows a magnet being moved towards a stationary solenoid. It is observed that

a current flows through the circuit in a direction Q to P.

Explain:

(i) How the current is produced (2 mks)

(ii) Why the current flows from Q to P (1 mk)

11. In an X- ray tube it is observed that the intensity of X- rays increases when potential differences across the filament is increased. Explain this observation

(3 mks)

12. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5s. He then moves 17 metres further away from the cliff and blows the whistle again. He now hears the echo after 0.6s. Determine the speed of the sound.

13. Figure 6 (a) and figure 6 (b) show a p-n junction to a battery. It is observed that the current in figure 6 (a) is greater than the current in figure 6 (b)

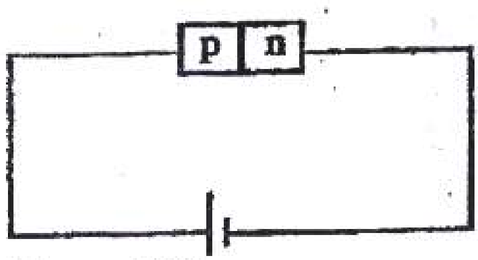


Figure 6(a)

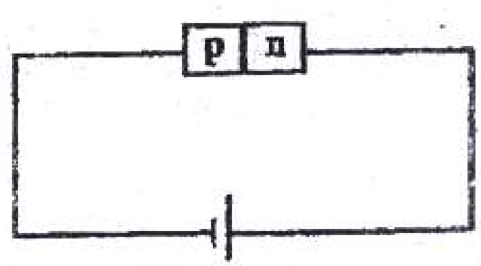


Figure 6(b)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided

14. (a) Figure 7 shows a pair of parallel plates of a capacitor connected to a Battery the upper plates is displaced slightly to the left.

Figure 7

State with reason the effect of this movement of the capacitance (2 mks)

(b) Figure 8 shows an electrical circuit with three capacitors A, B and C of capacitance 4.0 µF, 5.0 µF and 3.0 µF respectively connected to a 12V battery

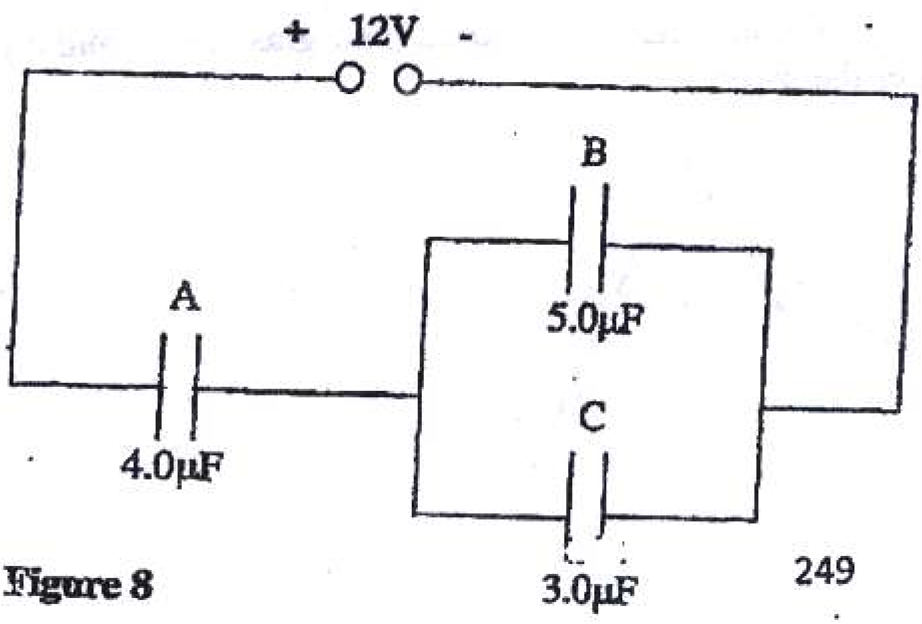


Figure 8

Determine:

(i) The combined capacitance of the three capacitors (3 mks)

(ii) The charge of the capacitor A (2 mks)

(iii) The potential difference across the capacitors B (2 mks)

15. Figure 9 shows the graph of the relationship between current I and potential difference V for two trungsten filament lamps X and Y. The normal working voltages for the lamp X and lamp Y are 2.5V and 3.0V respectively.

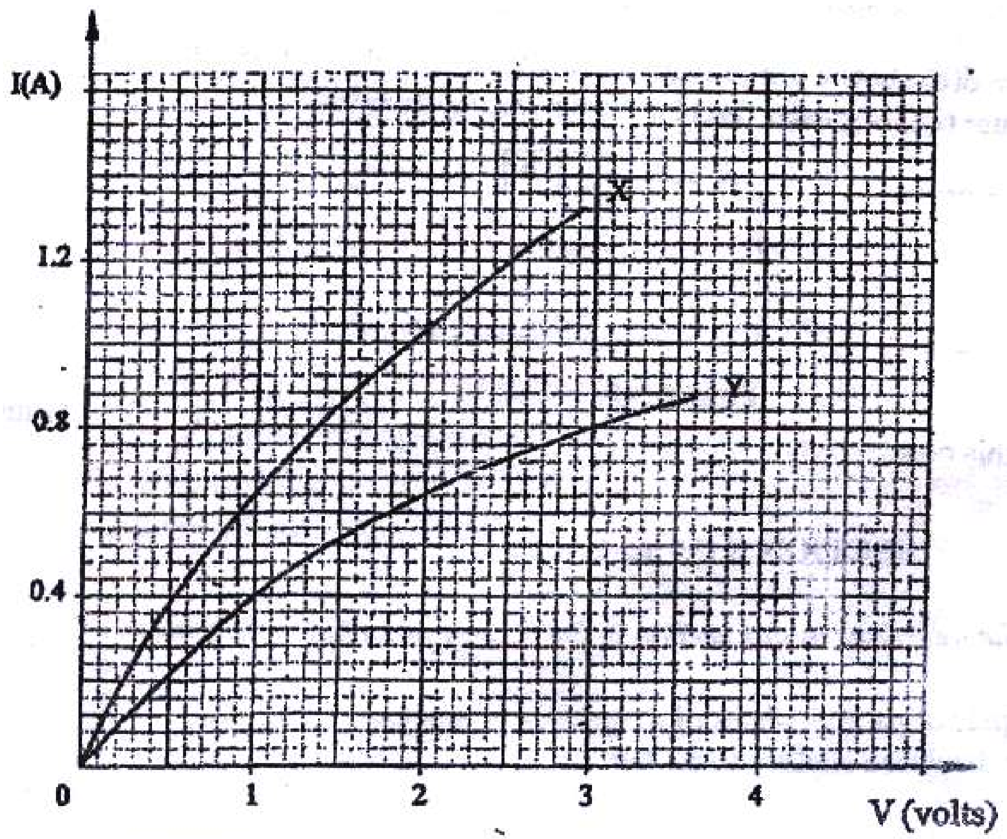


Figure 9

(2 mks)

(b) Determine the resistance of lamp X at the normal working voltage

(3 mks)

(c) The lamps are now connected in a series circuit in which a current of 0.4 A flows. Find the potential differences across lamp Y (1 mk)

(d) Determine the power at which lamp Y operates under normal working voltage

(2 mks)

16. (a) Figure 10 shows a ray of light incident on a triangular glass prism and white screen S placed after the prism

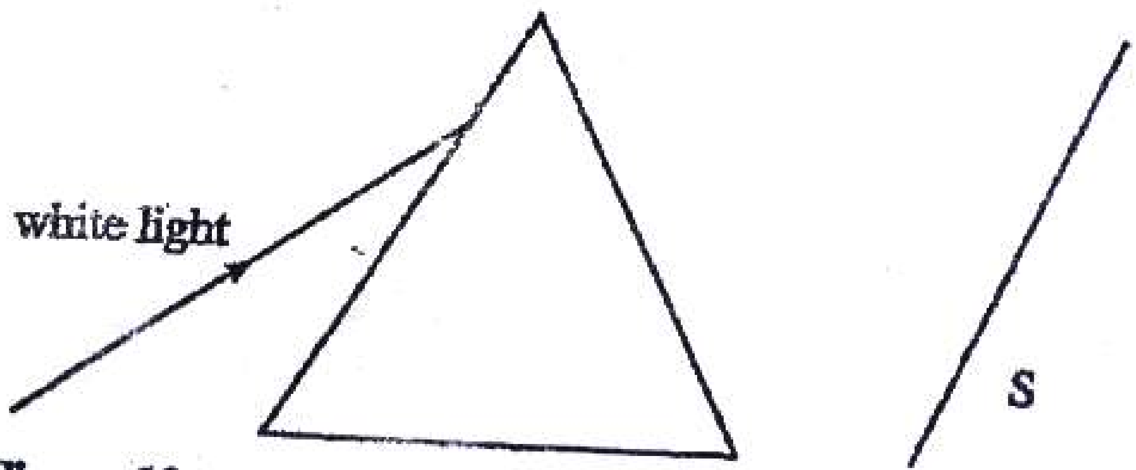


Figure 10

(i) Complete the path of the ray through the prism to show how a spectrum is formed on the screen (3 mks)

(ii) A thermometer with a blackened bulb is placed at various parts of the spectrum. State with reason the region where the thermometer indicates the highest reading (2 mks)

(b) A pin is placed at the bottom of a beaker of depth 11.5 cm. The beaker is then filled with kerosene. By using another on the side of the beaker and observing from the top, the distance of the image of the pin in the beaker is found to be 3.5 cm from the bottom. Determine the refractive index of kerosene. (4 mks)

17. (a) Figure 11 shows the path of radiation from a radioactive source. The field is perpendicular to the paper and directed out of the paper.

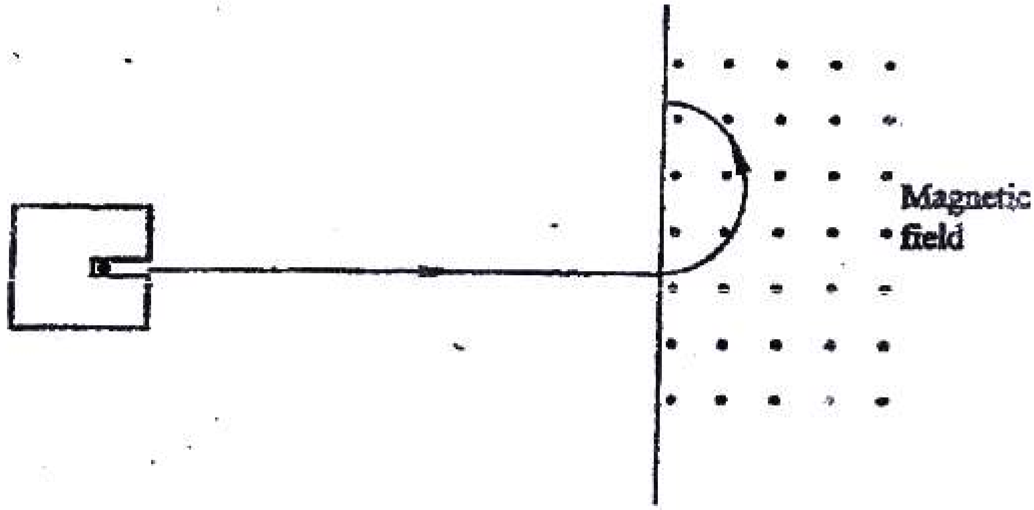


Figure 11

Identify the radiation (1 mk)

………………………………………………………………………………

(b) Radiation from a radioactive source enters a G.M tube

(i) State the effect of the radiation on the gas inside the tube (1 mk)

(ii) Explain hoe the large discharge current is created (2 mk)

(c) The following is a nuclear equation for a fission process resulting from the reaction of a neutron with a Uranium nucleus

$${}^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{141}_{56}A + {}^{y}_{x}Q + 3\,{}^{1}_{0}n$$

(i) Determine the values of x and y (2 mks)

(ii) State the source of the energy released (1 mk)

(iii) Explain how this reaction is made continuous in a nuclear reactor (2 mks)

18. (a) It is observed that when ultra- violet radiation is directed onto a clean zinc plate connected to the cap of a negatively charged leaf electroscope, the leaf falls

(i) Explain this observation (2 mks)

(ii) State why this observation does not occur if the electroscope is positively Charged (1 mk)

(iii) Explain why the leaf of the electroscope does not fall when infra- red radiation is directed onto the zinc plate (1 mk)

(b) State the effect on the electrons emitted by the photoelectric effect when:

(i) The intensity of incident radiation is increased (1 mk)

(ii) The frequency of the incident radiation is increased (1 mk)

(c) The maximum wavelength required to cause photoelectric emission on a metal surfaces is 8.0×10^{-7}m. The metal surface is irradiated with light of frequency 8.5×10^{14} Hz.

Determine:

(i) The threshold frequency (2 mks)

(ii) The work function of the metal in electron volts (3 mks)

(iii) The maximum kinetic energy of the electrons (2 mks)

Take: leV= 1.6×10^{-19}J.

Speed of light = 3.0×10^{8} ms^{-1}

Plank's constant, h = 6.63×10^{-34} Js

19. Figure 12 shows a set up for observing interference of waves from two sources S_1 and S_2. The points C and D represent positions of the constructive and destructive interference respectively as observed on the screen

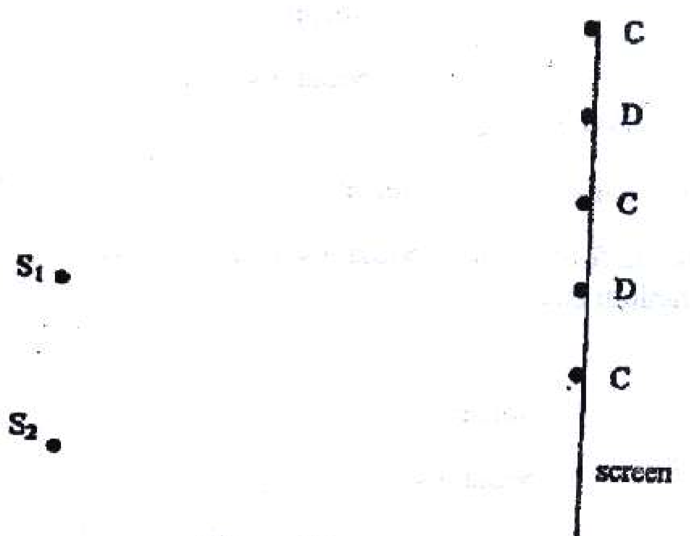


Figure 12

(a) If the observation was made in a ripple tank, describe:

(i) How the constructive and destructive interferences are identified (1 mk)

(b) Explain how the constructive interference C and the destructive interference D patterns are produced. (2 mks)

……………………………………………………………………………………

…………………………………………………………………………………….

Draw:

(i) The line joining all points where waves from S_1 and S_2 have traveled equal distance. Label it A (1 mk)

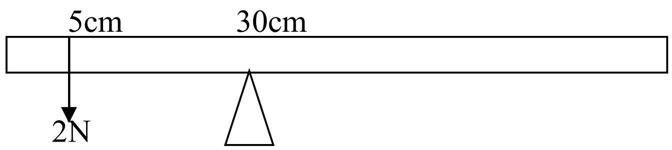
(ii) The line joining all points where waves from S_2 have traveled one wavelength further than the waves from S_1. Label it B. (1 mk)

K.C.S.E YEAR 2010 PAPER 1

1. Figure 1 shows a vernier caliper being used to measure the internakl diameter of a tube.

2. A stop watch started 0.50s after the started the start button was pressed. The time recorded using the stopwacth for a ball bearing failing through a liquid was 2.53s. Determine the time of fail.
3. Some water in a tin can was boiled for some time. The tin can then sealed and cooled. After some time it collapsed. Explained this observation.
4. A paper windmill in a horizontal axis was placed above a candle as shown in figure 2.

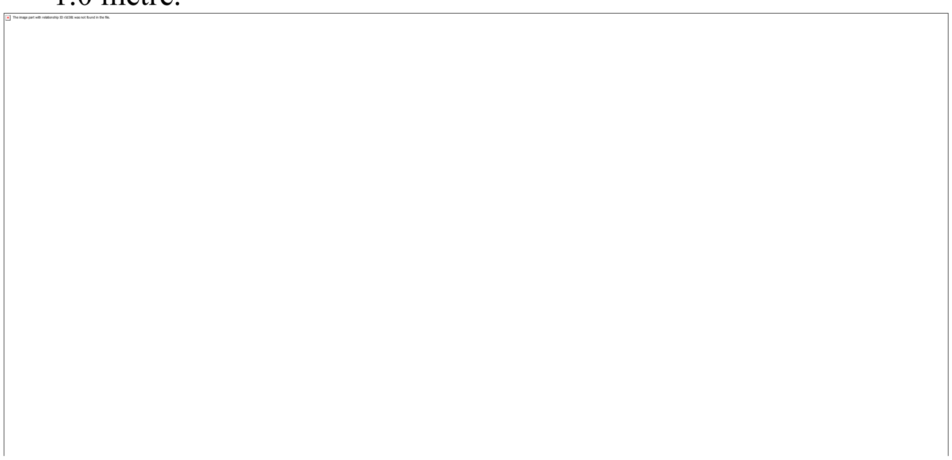
   When the candle was lit the paper windmill begun to rotate. Explain this observation.
5. When a liquid is heated in a glass flask, its level at first fails, mthen rises. Explain this observation.
6. **Figure 3** shows a uniform metre rule pivoted at 30cm mark. It is balanced by weight of 2N suspeded at the 5cm mark.



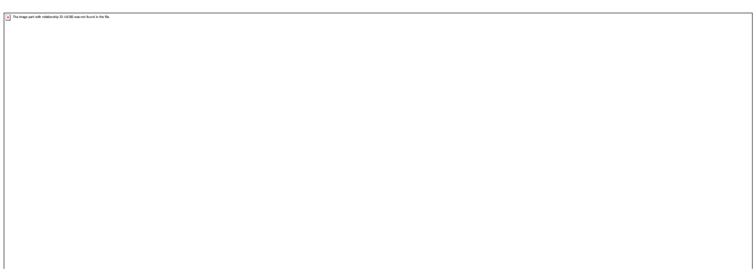
   Determine the weight of the metre rule.
7. **Figure 4** shows a horizontal tube with rwo vertical tubes x and y. water flows through the horizontal tube from right to left. The water level in tube x is higher than water in tube y.

Explain this observation.

8. A cart of mass 30kg is pushed along a horizontal path by a horizontal force of 8N and moves with a constant velocity. The force is then increased to 14N. determine:
   i. The resistance to the motion of the cart.
   ii. The ecceleration of the cart.
9. When a drop of oleic acid of known volume is dropped on the surface of water in a large trough, it spreads out to form a large circular patch. State one assumption made when the size of the molecule of oleic acid is estimated by determining the area of the pacth.
10. The weight of a solid in air is 5.0N. when it is fully immersed in a liquid of density 800kgm^{-3} its weight is 4.04N. determine:
    a. The upthrust in the liquid
    b. The volume of the solid.
11. When a bicycle pump was sealed at the nozzle and the handle slowly pushed towards the nozzle, the pressure of the air inside increased.
    Explain this observation. (1 mk)
12. Figure 5 shows a mass of 200g connected by a string through a hollow tube to a mass of 0.5kg. Teh 0.5kg mass is kept stationary in the air by whirling the 200g mass round in a horizontal circle of radius 1.0 metre.



    Determine the angular velocity of the 200g mass. (3 marks)
13. State the SI unit of a spring constant (NB in words) (1 mk)
14. Figure 6 shows an athlete lifting weights while standing with the feet apart.



    Explain why standing with the feet apart improves an athlete's stability. (1 mk)

SECTION B(Marks)

Answer all the questions in their section in the spaces provided

15. a) A cyclist initially at rest moved down a hill without pedalling. He applied brakes and eventually stopped. State the energy changes as the cyclist moved down the hill. (1 mk)

b) Figure 7 shows a mass of 30kg being pulled from point P to point Q with a force of 200N parallel to an inclined place. Teh distance between P and Q is 22.5m. In being moved from P to Q the mass is raised through a vertical height of 7.5m.

i) Determine the work done:

I by the force (2mks)

II on the mass (2 mks)

ii) Determine the efficiency of the inclined plane. (2 mks)

c) Suggest one method of improving the efficiency of an inclined plane. (1 mk)

16. In an experiment to determine the density of sand using a density bottle, the following measurements were recorded:

Mass of empty density bottle - 43.2g
Mass of density bottle full of water = 66.4g
Mass of density bottle with some sand = 67.5g
Filled up with water = 82.3g

Use the above data to determine the:

a) Mass of the water that completely filled the bottle: (2 mks)
b) Volume of water that completely filled the bottle: (1 mk)
c) Volume of the density bottle: (1 mk)
d) Mass of sand
e) Mass of water that filled the space above the sand. (1mk)
f) Volume of teh sand:
g) Density of the sand (2 mks)

17. a) Explain why it is advisable to use the pressure cooker for cooking at high attitudes(2 mks)

b) Water of mass 3.0kg initially at 20^0C is heated in an electric kettle rated 3.0KW. The water is heated until it boils at 100^0C. (Take specific heat capacity of water $4200jkg^1K^{-1}$. Heat capacity of the kettle = 450JK-1, Specific latent heat of vaporization of water = 2.3mjkg-1)

Determine

i) The heat absorbed by the water. (1 mk)
ii) Heat absorbed by the electric kettle (2 mks)
iiii) The time taken for teh water to boil (2 mks)
iv) How much longer it will take to oil away all the water. (2 mks)

18. Figure 8 shows a stone of mass 4.0kg immersed in water and suspended from a spring balanced with a string. The beaker was placed on a compression balance whose reading was 85N. The density of the stone was 3000kg-3 while the density of the liquid was $800kg^{-3}$.

Determine the:

a) Volume of the liquid displaced. (2 mks)

b) Upthrust on the tone (4 mks)

c) Reading of the spring balance: (2 mks)

d) Reading of the compression balance when the stone was removed from the water. (2mks)

19. a) Figure 9 shows a velocity-time graph for the motion of a certain body.

Describe the motion of the body in the region.

i) **OA** (1 mk)

i) **AB** (1 mk)

iii) **BC** (1 mk)

b) A car moving initially at $10ms^{-1}$ decelerates at $2.5ms^{-2}$

i) Determine

I its velocity after 1.5s:

II the distance travelled in 1.5s (2 mks)

III the time taken for the car to stop (2 mks)

ii) Sketch the velocity-time graph for the motion of the car up to the time the car stopped. (1 mk)

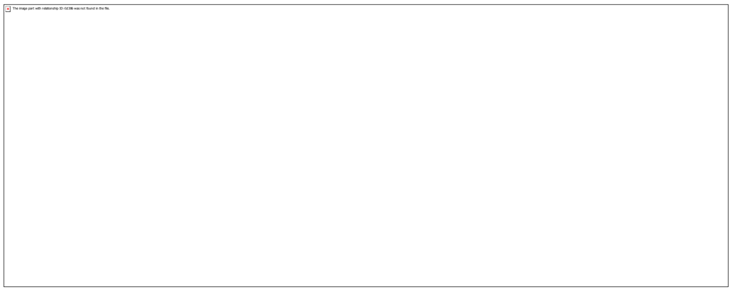
iii) From the graph, determine the distance the car travelled before stopping. (2 mks)

K.C.S.E YEAR 2010 PAPER 2

SECTION A (25 marks)

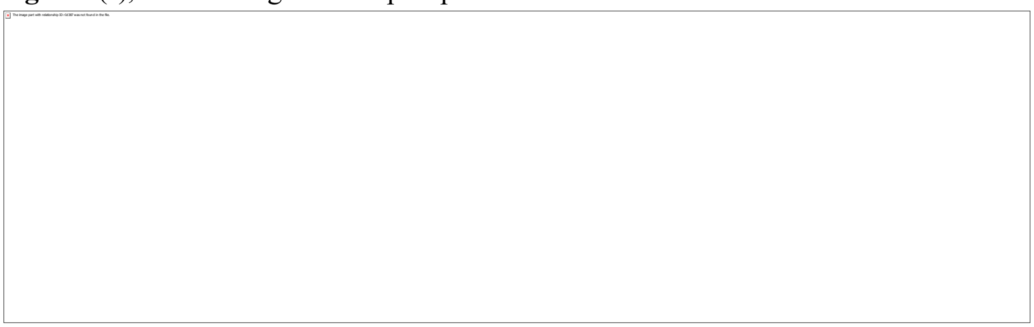
*Answer **ALL** the questions in this section in the spaces provided.*

1. Figure 1, shows a ray of light incident on a plane mirror at O. The mirror is then rotated anticlockwise about O from position M to position M_2 through an angle of 10°. The final reflected rayisOC.



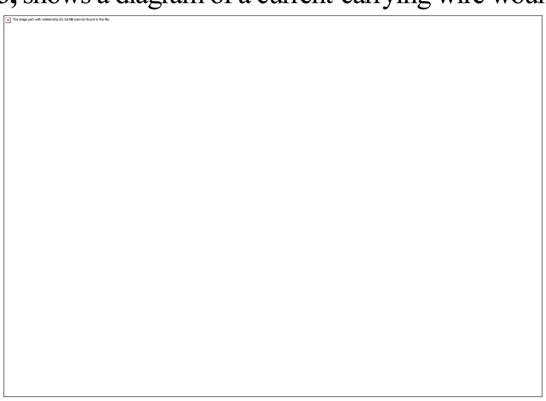
Determine the angle of deviation BOC.

2. **Figure** 2(a), shows a magnetic compass placed under a horizontal wire XY



A large current is passed from X to Y. Draw the final position of the magnetic compass needle in figure

3. **Figure 3,** shows a diagram of a current-carrying wire wound on a U-shaped soft iron



Draw the magnetic field pattern around P and Q.

4. A positively charged sphere is suspended by an insulating thread. A negatively charged conductor is suspended near it. The conductor is first attracted, after touching the sphere it is repelled. Explain this observation.

5. **Figure 4,** shows a bright electric lamp placed behind a screen which has a hole covered with a wire gauze. A concave mirror of focal length 25cm is placed in front of the screen. The position of the mirror is adjusted until a sharp image of the gauze is formed on the screen.

Determine the distance between the mirror and the screen.

6 Explain why electric power is transmitted over long distances at high voltages.

7. **Figure** 5, shows how the displacement of a point varies with time as a wave passes it.

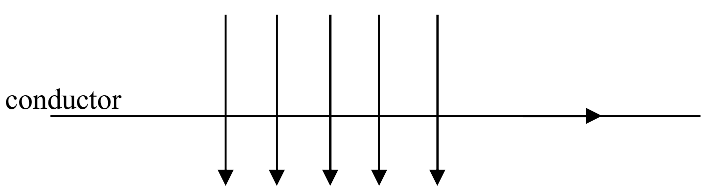
On the same diagram, draw a wave which passes the point with half the amplitude and twice the frequency of the one shown.

8. A water wave of wavelength 18 mm is incident on a boundary of shallow water at right angles. If the wavelength in the shallow end is 14.4 mm, determine the refractive index of water for a wave moving from the deep to the shallow end.

9. The initial mass of a radioactive substance is 20g. The substance has a half-life of 5 years. Determine the mass remaining after 20 years.

10. A current I flowing through a wire of resistance R was increased seven times. Determine the factor by which the rate of heat production was increased.

11 Figure 6, shows a horizontal conductor in a magnetic field parallel to the plane of the paper.

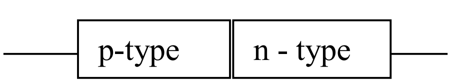


State the direction in which the wire may be moved so that the induced current is in the direction shown by the arrow.

12. An x-ray tube produces soft x-rays. State the adjustment that may be made so that the tube produces hard x-rays.

13. The wavelength of a radio wave is 1km. Determine its frequency. (Take the speed of light as 3.0×10^8 ms^{-1})

14. Figure 7, shows a block diagram of a p-n junction diode.

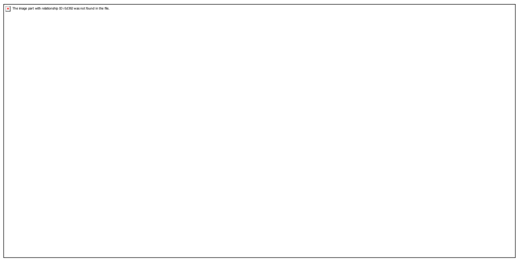


On the same diagram, show how a battery may be connected so that the diode is reverse biased.

SECTION B (55 marks)

Answer ALL the questions in this section in the spaces provided. **15**

15. (a) **Figure 8,** shows a ckcuit that may be used to charge a capacitor.



(i) state the observation on the milliameter when the circuit is switched on:

(ii) explain the observation in (i) above.

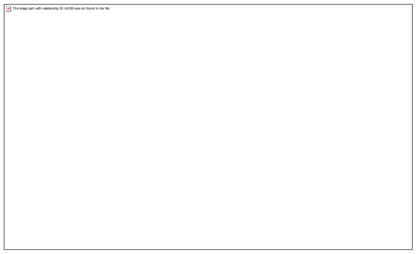
(b) The circuit in **figure** 8 is left on for some time. State the value of p.d. across:

(i) the resistor R;

(ii) the capacitor C;

(c) sketch the graph of potential difference (V) across R against time.

(d) **Figure 9** shows three capacitors connected to a 10V battery.

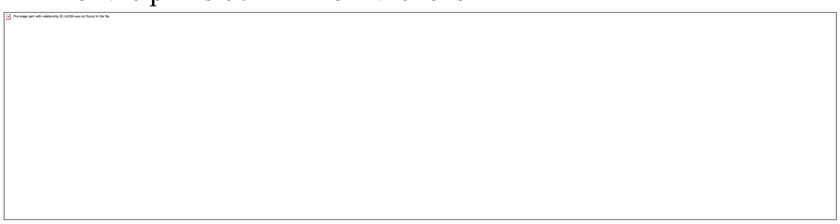


Calculate:

(i) the combined capacitance of the three capacitors;

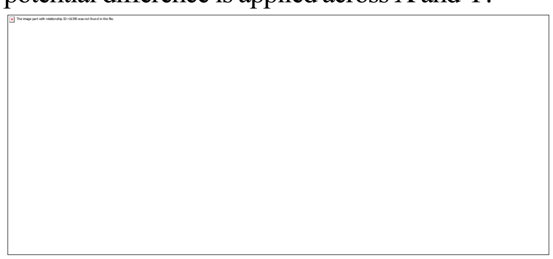
(ii) the charge on the 5.0 juF capacitor.

(b) Figure 11, shows a pin 60 mm long placed along the principal axis of the lens used in part (a). The near end of the pin is 80 mm from the lens



Determine the length of the image.

17 (a) **Figure 12,** shows an electrical circuit including three switches, Sj, S_2, S_3, and three identical lamps L,, L_2, L_3. A constant potential difference is applied across X and Y.



(i) Other than Lj, state the lamp that will light when $S_:$ and S_2 are closed.

(ii) How does the brightness of L_l in (i) above compare with its brightness when all the switches are closed?

(iii) Explain the observation in part (ii) above.

(b) **Figure 13,** shows a cell in series with a *3Q* resistor and a switch. A hig resistance voltmeter is connected across the cell.

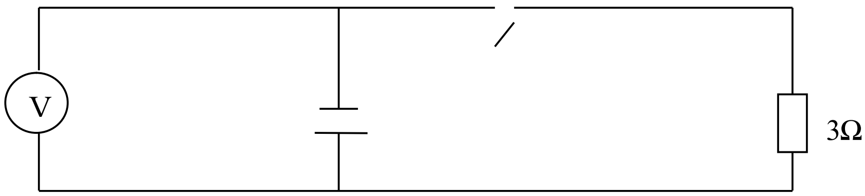


Figure 13

The voltmeter reads 1.5V with the switch open and 1.2V with the switch closed.

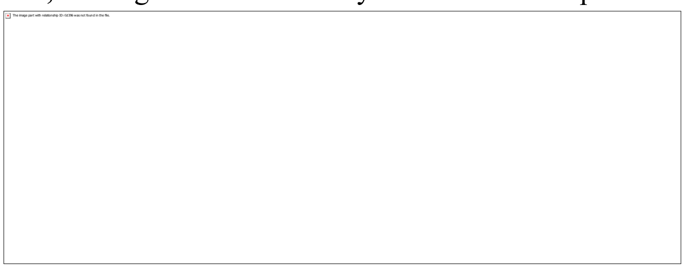
(i) State the electromotive force of the cell.

(ii) Determine the current through the 3Q resistor when the switch is closed.

(iii) Determine the internal resistance of the cell.

(c)(i) Another resistor R is connected in series with the 3Q resistor so that a current of 0.15A flows when the switch is closed. Determine the resistance of R.

18. **Figure 14a,** is a diagram of a cathode ray tube. M and N are parallel vertical plates.



(a) When switch S is open, a spot is seen at the centre of the screen as shown in **figure 14(b).**

(i) State what happens to the spot when S is closed.

(ii) State what would happen to the spot if the potential difference across MN is increased.

(iii) State what would be seen on the screen if the battery is replaced with an alternating emf of:

(I) a low frequency of about 1 Hz;

(II) a high frequency of about 50Hz.

(b) Explain the process by which electrons are produced at F.

(c) State with a reason how the brightness of the spot can be increased.

(d) The accelerating voltage of the tube is 1000V and the electron current in the beam is 1.5mA. Determine the energy conveyed to the screen per second.)

19. (a) State the property of radiation that determines the number of electrons emitted when a radiation falls on a metal surface.

(b) **Figure 15** is a graph of the stopping potential V_s against frequency in an experiment on photoelectric effect.

The image part with relationship ID rId397 was not found in the file.

(i) What is meant **by** stopping potential?

(ii) Given that the stopping potential V_s is related to the frequency by the equation.

$V_s = \frac{h}{e} f - \frac{w_0}{e}$ Where *e* is the charge of an electron, *(e* = 1 .6 x 10^{-19}C)

Determine from the graph:

(I) plank's constant, h;

(II) the work function co$_0$ for the metal in electron volts (eV).

PHYSICS PRACTICALS 2011

PAPER 3

Question 1

Part A

You are provided with the following: .

- a voltmeter
- a resistance wire labelled P mounted on a metre rule.
- a resistance wire labella Q mounted on a piece of carton.
- 2 dry cells at dea cell holder
- 6 connecting wires each with a crocodile clip at one end.

Proceed as follows:

(a) Place the dry cells in series in the cell holder. Measure and. record the total emf E of the cell.
$E_0 = 3.0 +- 0.2$ V (1 mark)
2.8 to 3.2V

(b) Connect the circuit as show in figure 1

O is a point on P at the 50cm mark of the metre rule. A and B are points on P such

(c) Adjust the positions of the crocodile clips A and B on. P such that.
AO = OB = X - 2.5cm; Close the switch. Read and record the potential difference (V) across AO in table 1

(d) Repeat. part (c) for other values of X shown in table 1 and complete the table.

(e) On the grid provided, plot a graph of — (y - axis) against
(5 marks)

(f) ***Determine the slope S of the graph. (3 marks)***

(g) ***Use the slope to determine the constant h, given that h = <u>8</u>***
(9 marks)

E_0S

Part B

You are provided with the following:

- a soft drawing board.
- a semicircular glass block.
-three drawing pins;
- a white paper:
- a liquid labelled L
-adropper.

Proceed as follows;

(h) Place the white paper on the drawing board. Place the semicircular glass block on the paper and trace its outline using a pencil. ; .

(i) At the centre of the straight edge of the outline mark a point 0. Also mark a point X approximately at the centre of the curved edge of the outline as shown in the figure 2.

(j) Place the semicircular glass block on the outline. Push a drawing pin vertically through 0 into the drawing board. Ensure the pin is in .contact with the glass block. Using a dropper, place two or three drops of liquid L on the pin, so that the liquid flows down the pin forming a thin film between the pin and the vertical face" of the glass block.

(k) View the image of the pin from point X through the glass block and move the eye round the curved surface to the right side of X until the image of the pin just disappears from view, **(see figure 3)**

Using a second pin locate and mark a point N on the curved outline at the point where the image just disappears.

(l) Repeat part (k) with the eye moving to the left side of X. Locate and mark the point M on the curved outline where the image just disappears from view.

(m) Draw the lines OM and ON on the outline.

(i) Measure and record angle MON

(ii) If MON = 2A, determine q given that Sine A = $\frac{2}{3}$ q

Question 2

Part A

You are provided with the following:

- a 100ml glass beaker.
- a weighing balance (to be shared).
- a liquid labelled L.
- a measuring cylinder.

Proceed as follows:

(a) Measure and record the mass M: of the empty beaker.
M_1

(b) Measure and pour 2ml of liquid L into the beaker. Measure and record the mass of the beaker + liquid L.

(c) Determine the density d: of the liquid L (2 marks)
d =

Part B

You are provided with the following:

- a retort stand, boss and clamp.
- 2 boiling tubes
- a thermometer.
- some distilled water in a beaker labelled W.
- some liquid in a beaker,labelled L
- a large beaker containing some water.
- a measuring cylinder
- a stopwatch
- a tripod stand and wire gauze.

- a cardboard with a hole in the middle.
- a burner.

Proceed as follows:

(d) Clamp one boiling tube on the retort stand. Measure and pour 45ml of the distilled water (W) into the boiling tube. Setup the apparatus as shown in figure 4.

(e) Heat-the water in the large beaker until/the' temperature- of the distilled water reaches 85°C. Remove the boiling tube from the 'hot water by lifting up the retort stand and placing it a way from the burner.

(f) Stir the water in the boiling tube using the thermometer. Record in the table 2 the temperature of the distilled water at intervals of 30 seconds starting at 80°C until it drops to60°C. *(Stir the distilled water before taking any reading).*

(g) Using the second boiling tube; repeat the procedure in (d), (e) and (f) using 45ml of liquid L instead of distilled water. Record; your results in the same table.

(h) Using the same axes on the grid provided, plot a graph of temperature (y - axis) against time f or :

(i) distilled water W

(ii) liquid L.

(Lable the graphs of Land W).

(i) From the graphs determine (1 mark)

(i) the time *t* taken for the distilled water to cool from 75°C to 65°G.

t_W = minutes

(ii) The time *t* taken for liquid L to cool from 75^0 to 65^0C

t_L = minutes

both time to come from candidate work / graph within

(j) Determine the constant r given that $r = \frac{4.2\ t_L}{dt_w}$ where d is the density of the liquid L in part (A). (2marks)

- Correct substitution in right = 1mk
- Correct evaluation to 1 d.p