MARAKWET WEST DISTRICT

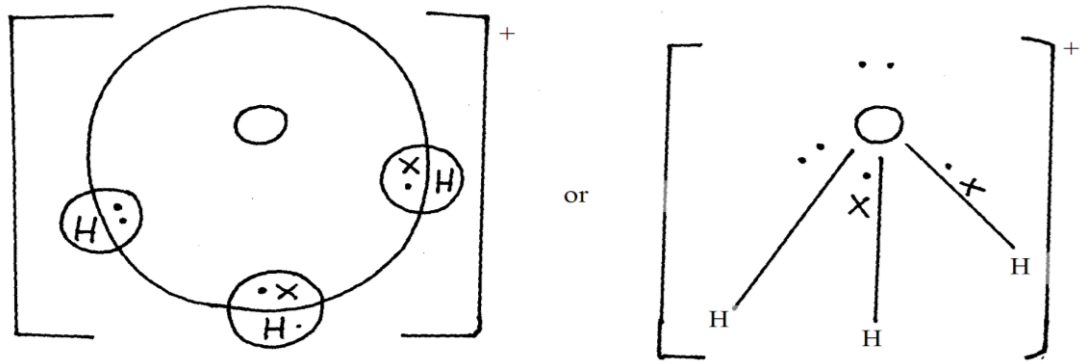
233/1
CHEMISTRY
PAPER 1
JULY/AUGUST 2015
TIME: 2 HOURS

MARKING SCHEME

1. Non- luminous flame produces a lot of heat while luminous flame produces less heat.
   Non- luminous flame produces less soot while luminous flame produces which is dirty.

2. a) (i) Downward delivery/ upward displacement of air.
   (ii) Upward delivery/ downward displacement of air.
   b) X
3. - Magnesium is higher than carbon in the reactivity series therefore displaces carbon from carbon (IV) oxide leaving oxygen which supports combustion.
   - Zinc is lower than carbon in the reactivity series and therefore cannot displace carbon from CO_2.
4. a) - A covalent bond is a bond where both elements contribute or donate electrons to be shared.
   - A co- ordinate bond is a bond where one element donates electrons that are shared.

   b)



5. a) Sodium peroxide.
   b) $2Na_2O_{2(s)} + 2H_2O_{(l)} \rightarrow 4NaOH_{(aq)} + O_{2(g)}$

6. Let the mass number of other isotope be x.

$$\frac{(60.4 \times 69) + (39.6 \times x)}{100} = 69.792$$

$$\frac{4167.6 + 39.6x}{100} = 69.792$$

$$4167.6 + 39.6x = 6979.2$$

$$39.6x = 6979.2 - 4167.6$$

$$39.6x = 2811.6$$

$$x = \frac{2811.6}{39.6} = 71$$

$$x = 71$$

7. a) Solubility is the maximum amount of solute in grams that can dissolve in 100g of water at

a stated temperature.

b) Total mass of saturated solution at a solubility of 15.65 g per 100 g H_2O = 115.65 g
therefore 115.65 g = 15.65 g

45 g = ?

$$\frac{45}{115.65}\times 15.65$$

$$= 6.089\,g$$

8. The water in the beaker changes to purple solution due to diffusion of potassium manganate (VII) in water.

9. a) Calcium hydroxide
b) Chloride gas
c) $2Ca(OH)_{2\,(aq)}+2Cl_{2\,(g)}\rightarrow CaCl_{2\,(aq)}+CaOCl_{2\,(aq)}+H_2O_{(l)}$

10. moles of oxygen gas produced.

$$=\frac{0.83}{32}$$

$$= 0.0259375$$

Mole ratio of $O_2 : NaNO_3 = 1:2$

Therefore moles of $NaNO_3$ converted

= 0.0259375 x 2
= 0.051875
Mass of $NaNO_3$ = 0.051875 X 85
= 4.409375 g

$$\% = \frac{4.409375}{8.53}\times 100$$

= 51.69%

11. (i) A reaction in which both forward and backward reaction take place at the same time.
(ii) Pale yellow colour intensifier// dark brown colour disappears.

12. a) Mass in a volume of $1000cm^3$

$$= 1000\times 1.8$$

$$= 1800g$$

Molarity (moles in $1000cm^3$)

$$=\frac{1800}{98}$$

$$= 18.367M$$

b) $M_aV_a = M_bV_b$

$$18.367Va = 0.2\times 500$$

$$Va = \frac{0.2\times 500}{18.367}$$

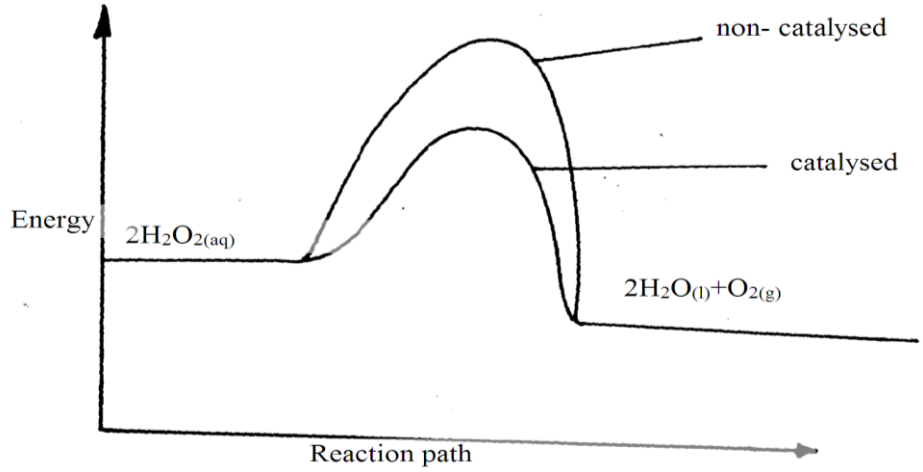
$$Va = 5.44cm^3$$

13. (i) Reducing property
(ii) $3CuO_{(s)}+2NH_{3(g)}\rightarrow 3Cu_{(s)}+3H_2O_{(l)}+N_{2\,(g)}$

(iii) - Manufacture of ammonia
- As a refrigerant (any 1 correct = 1mk)

14. - React excess lead (II) carbonate with nitric (V) acid.
- Filter
- To the filtrate add dilute hydrochloric acid.
- Then filter off lead (II) chloride acid.

15.



16. a) EDC
b) After removal of the first electron the remaining electrons are held more strongly by protons that remain the same attracting a reduced number of electrons.

17. a) Charles law states that the volume of a given mass of gas is directly proportional its absolute temperature, its pressure being kept constant.

b) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ 273+25 = 298 K

$\frac{100 \times 250}{298} = \frac{80 \times 400}{T_2}$

$T_2 = \frac{9{,}536{,}000}{25{,}000}$

$= 381.44K$

$= 108.44^0 C$

18. a) B - Does not form scum with hardwater.

19. a) A - Superheated water at 170^0c
B - Molten sulphur

b) - Superheated water at 170^0C under the pressure of 10 atmospheres and not. compressed air at 15 atmospheres are led into the sulphur bed through concentric pipes A and C respectively
- These combination melts the sulphur into a froth which is pumped to the surface through concentric pipe B.

20. a) 2, 3- dimethylbutane
b) Edthylpropanoate
c) Propan - 1, 2 – diol

21. a) V_1 and V_3

b) Add petrol to the mixture for V_4 to dissolve filter off the insoluble V_2. Put the solution of V_4 in the sun for petrol to evaporate.

22. a) $\Delta H_1 = Lattice\ energy$

$\Delta H_2 = Hydration\ energy$

b) $\Delta H_1 + \Delta H_2 = \Delta H_3$

23. a) $Fe_2(SO_4)_3 = 2\times56 + 3\times32 + 3\times16\times4$

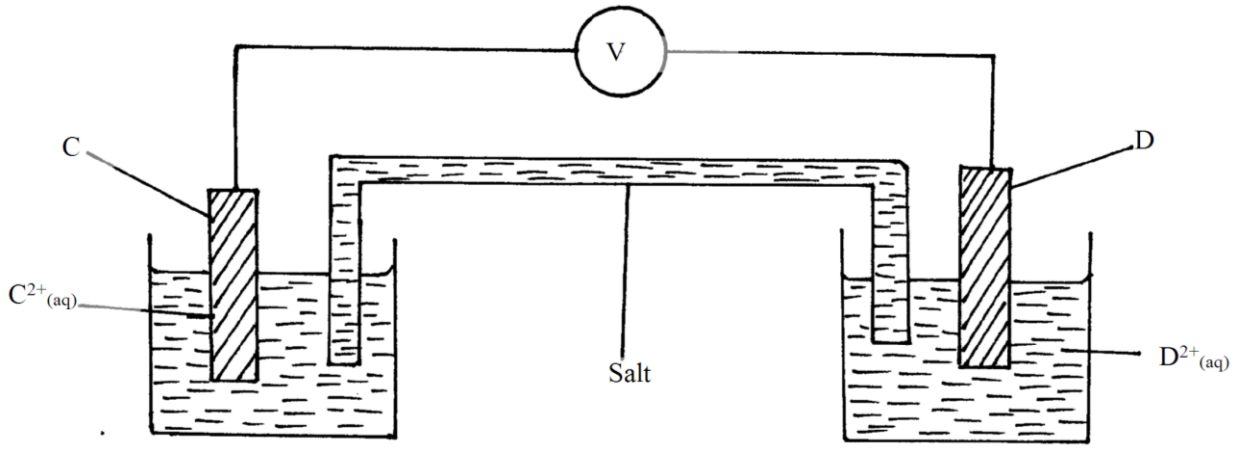
$= 112 + 96 + 192$

$= 400$

b) $KMnO_4 = 39 + 55 + 4\times6$

$= 158$

24. (i)



(ii) $C_{(s)}\left|C^{2+}_{(aq)}\right\|D^{2+}_{(aq)}\left|D_{(s)}\right.$

25. a) Element Y. This is because the nuclear attraction by 13 protons in Y is greater than the nuclear attraction by 12 protons in X hence smaller atomic radius in Y.

b) Element Y. Element Y with 13 protons creates a stronger metallic bond compared to X with 12 protons hence high melting point in element Y.

26. a) $4OH^-_{(aq)} \rightarrow O_{2(g)} + 2H_2O_{(l)} + 4e^-$

b) Mass = $\dfrac{108\times5.0\times3\times60\times60}{96500\times1}$

$= 60.435$ g

27. a) Zinc blende, calamine (any 1 pt= 1mk)

b) Froth flotation

c) $ZnCO_{3(s)} \rightarrow ZnO_{(s)} + CO_{2(g)}$

d) - Making dry cells
- Making alloys e. g. brass (any 1 pt = 1mk)

28. a) Half- life- is the period or time taken by a radioactive substance to decay to half its original value.

b) $100 \xrightarrow{t\frac{1}{2}} 50 \xrightarrow{t\frac{1}{2}} 25 \xrightarrow{t\frac{1}{2}} 12.5$

$$3t\frac{1}{2} = 7.5hrs$$

$$t\frac{1}{2} = ?$$

$$t\frac{1}{2} = \frac{7.5}{3}$$

$$= 2.5hrs$$

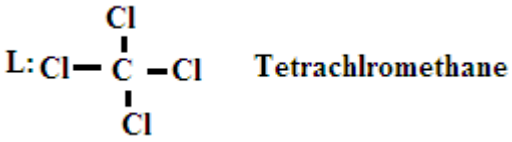
MARAKWET WEST DISTRICT

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST 2015
TIME: 2 HOURS

MARKING SCHEME

1. a) A 2 . 8. 2
   B 2. 8. 5
   b) (i) Y It is the only element whose boiling point is below 25^0C
   ½ ✓ electronic configuration is below 2.8.8 hence
   (ii) V It has full stable and would not react with oxygen.
   (ii) $W_2(SO_3)_3$
   (iii) Ionic bond// electrovalent bond; W is a metal x is a non- metal// W loses electrons to form W^{3+}. X gains electrons to form X^{2-} ions. The ions attract form W_2X_3 through ionic bond.
   (iv) Z it has the greatest metallic character since it is in group 1 and the valence electron is faster away from the nucleus hence easily released.
   (v) W has 3 delocalized electrons while V has only one. The higher the number of delocalized electrons, the stronger the metallic bond, hence amount of energy required to break the bond.

2. a) (i) 2- methylprop- 1-ene
   (ii) Propanoic acid
   b) Add Na_2CO_3/ carbonate to each substance.
   Bubbles// effervescence are seen in $C_2H_4O_2$ while no bubbles/ effervescences are seen in C_2H_6O.
   c) (i) 1 Reagent Q- sodium ethoxide.
   (ii) Substannce S- 2- bromoethanol
   (ii) $P: CH_3COOCH_2CH_3$
   (iii)



Tetrachlromethane

   (iv) Step II
   Type of reaction – oxidation
   Reagent- conc- H_2SO_4
   (v) 28 n = 56000

$$N = \frac{56000}{28} = 2000$$

3. a) (i) Gas T- sulphur (IV) oxide
   (ii) Iron (II) oxide// FeO
   (ii) $2CuFeS_{2(s)} + 4O_{2(g)} \rightarrow Cu_2S_{(s)} + 2FeO_{(s)} + 3SO_{2(g)}$
   (II) $FeO_{(s)} + SiO_2 \rightarrow FeSiO_{3(s)}$
   (iii) SO_2 forms acid rain// corrosion of buildings and damages to vegetation.
   - Bad health effect from SO_4 THAT IS POISONOUS.

- Leads to soil erosion due to extraction of ores the ground.

b) (i) Impure copper
(ii) Blue colour of $CUSO_4$ remains.
- Anode dissolves as cathode increases in size.
- Copper ions discharged at cathode are replaced at anode.

$Cu_{(s)} \rightarrow Cu^{2+}{}_{(aq)} + Ze^-$

$Cu^{2+(aq)} + 2e^- \rightarrow Cu_{(s)}$

(iii) $Cu^{2+}{}_{(aq)} + 2e^- \rightarrow Cu_{(S)}$

- Leads to soil erosion due to extraction of ores from the ground.✓

b) i) Impure copper
ii) blue colour of $CUSO_4$ remains
- Anode dissolves as cathode increases in size.

2 F is required to deposit 1 mole of Cu, 63.5g (2 x 96500)C

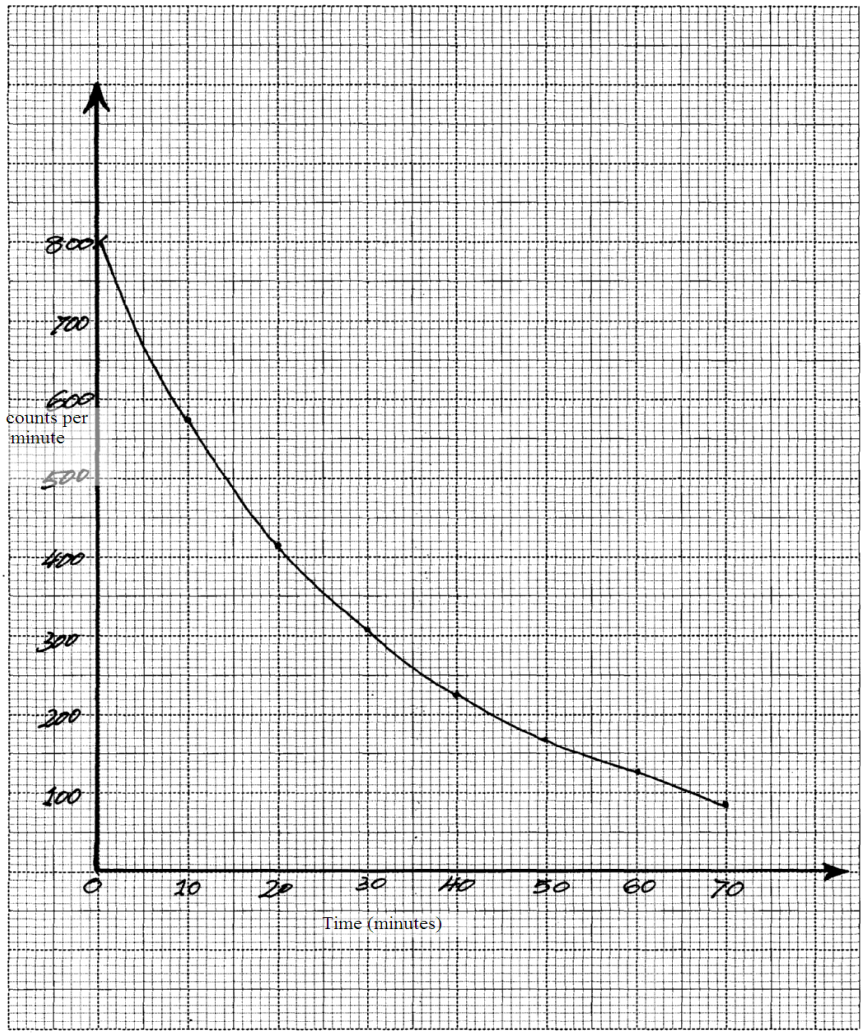
5000g required - $\frac{5000 \text{ x2 x } 96500}{63.5}$

Q = it $\frac{5000x2x96500}{63.5}$ = Ix4x60x60

$\frac{5000 \text{ x } 2 \text{ x } 96500}{63.5 \text{ x4x60x60}}$ = 1055.3368 A

iv) Hydrogen is discharged in preference to Magnesium because Magnesium is above hydrogen in the electrochemical serie's while Copper is lower than hydrogen hence it is discharged.

4. a) (i) ${}^{31}_{15}P + {}^{2}_{1}H \rightarrow {}^{32}_{15}P + {}^{1}_{1}H$



Labelling – ½ mk
Scale – ½ mk
Plotting – 1mk
Curve – 1mk

(ii) ${}^{10}_{5}B + {}^{4}_{2}He \rightarrow {}^{13}_{7}N + {}^{1}_{0}n$

b) i) - Particles/ alpha particle
- Particle/ Beta particle

ii) ${}^{232}_{90}Th \rightarrow {}^{224}_{88}Ra + 2{}^{4}_{2}He + 2{}^{0}_{-1}e$

c)

Chemical reaction	Nuclear reaction
-No change in mass in overall reaction -Its rate depends on pressure, temperature etc (external factors -Involves valency electrons -No new element is formed -Involves a little amount of energy	-Mass changes in overall reaction -Rate of nuclear reaction is independent of external factors. -Involves nucleus (protons + neutrons) -New element is formed -New element is formed -Involves great amount of energy (any 2 @2mks)

d i) check the graph (3mks)

ii) I 22 minutes (from graph)

II) No of half lifes = $\frac{110}{22} = 5$

$$64g \xrightarrow{t\frac{1}{2}} 16g \xrightarrow{t\frac{1}{2}} 8g \xrightarrow{t\frac{1}{2}} 4g \xrightarrow{t\frac{1}{2}} 2g$$

e) - Treatment of cancer (Radiotherapy)
- Sterilisation of surgical apparatus
- Treatment and detection of goiter
- Regulating heart pacemakers
- Detection of blood circulation disorders
- Measurement of uptake of Iodine- 131 in Kidneys (Any 1 /lmk)

5. a) To remove Oxygen which would react with the element to form an oxide

b) To absorb excess chlorine

- To absorb moisture from the atmosphere

c) Sodium chloride has a high melting point or boiling point.
The Bunsen burner flame temperature is not able to vaporize it

d) Soda lime (mixture of Sodium hydroxide and Calcium hydroxide

e) $2Al_{(s)} + 3Cl_{(g)} \rightarrow 2AlC1_3$

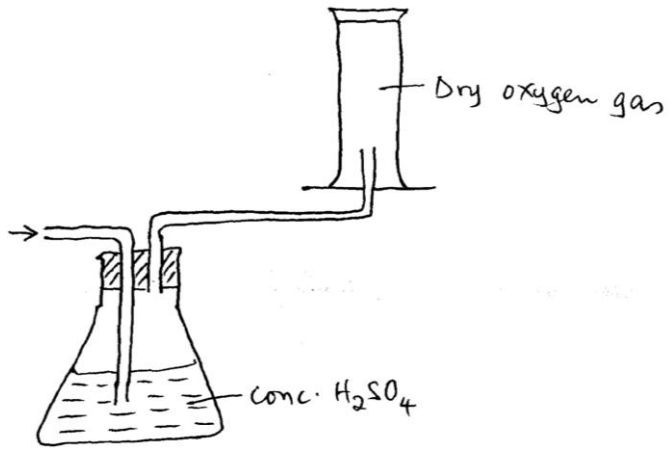
f) Liquid bbecause room temperature is between its melting point and boiling point.
//its melting point is less than room temperature while boiling point is greater than room temperature

g) $2P + 3cl_2(g) \rightarrow 2\ Pcl_{3(l)}$
No of moles of Cl_2 $\frac{240}{24000} = 0.01$
No of moles of Pc13 = $\frac{0.01 \times 2}{3}$
= 0.006667
Mass of $Pc1_3$ 0.006667 x 137.5
= 0.9167125 g

6. a)

	Name of process
i)	Efflorescence
ii)	Hygroscopy
iii)	deliquescence

b)



- Identification of a dring agent i.e conc H_2S0_4 or arthydrous $CalCl_2$) in a wash/u-tube

- Method of collection —upward delivery
- workability

ii) Sodium Peroxide/Na_2O_2

iii) $Na_20_{2(s)}\ 2H_20_{(l)} \rightarrow 2NaOH_{(aq)} + O_{2(g)}$

c) i) $4P_{(s)} + 5\ O2_{(g)} \rightarrow 2P_2O_{5(s)}$

ii) Phosphorus being a non-metal reacts with Oxygen to form an acidic oxide. The acidic oxide dissolves in water to form a strong acid.

d) - A firm oxide layer of Al_2O_3 is formed on the surface of the metal. The oxide protects the metal from further attack.

7. a) - It is the simplest formula of a compound which expresses its composition by mass.

Element	Cu	S	O	H_2O
Composition by mass	25.4	12.8	25.8	36
R.A.M	63.5	32	16	18
Moles	25.4/ 63.5 = 0.4	12.8/ 32 = 0.4	25.8/16=1.6	36/ 18=2
Ratio	1	4	4	5

E.F is $CuSO_4.5H_2O$

b) ii) No of moles of hydrated salt = $\frac{9.98}{249.5} = 0.04$

$0.04 moles \rightarrow 200 cm^3$

$? \rightarrow 1000 cm^3$

$= 1000/200 \times 0.04 = 0.2M$

c) Solid Sulphur is made up of 8 rings it melts into a liquid of 8 rings. On further heating, they open to form long chains of sulphur atoms which then entangle making it viscous. (3mks)

d) $\Delta H\ reaction = (H-H+Cl-Cl)-(2\times H-Cl)$

$= (435+243)-(2\times 432)$

$= -184 KJ/mol$

e) enthalpy of atomization of $Na_{(s)}$

MARAKWET WEST DISTRICT

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST 2015
TIME: 2 HOURS

MARKING SCHEME

1. b) Table 1

Complete table
3 titrations done – ½
2 titrations done – ½
Incomplete/ with 1 titration done – 0

penalties
- wrong arithmetic
- Inverted table
- Burette readings beyond 50 cm^3
- Unreadistic title values. Penalize ½ mark to max ½ mark.

Decimal point
Tied to 1st and 2nd rows only.
Accept 1 or 2 d.p used consistently.

Accuracy.
Compare candidates value with school value.
± 0.1 (1mk)
± 0.2 (½ mk)
Average
Values averaged must be consistent within ± 0.2 of each other.

Final Answer.
Compare candidates value with school value.
If within ± 0.1 award (1mk)
± 0.2 award (½ mk)

b) 1000 $cm^3 \rightarrow 0.1 moles$
answer in a above $\rightarrow$?

$$\frac{answser(a) \times 0.1}{1000}$$

c) $H_2SO_{4(aq)} + 2NaHCO_{3(s)} \rightarrow Na_2SO_4 + CO_2 + H_2O$
mole ratio
1 : 2
Answer in (b) x 2
= mples of $NaHCO_3$

d) $25cm^3 \rightarrow answser\,in(c)above$

$250cm^3 \rightarrow ?$

$$\frac{250cm^3 \times answer\,in(a)above}{25}$$

e) Dilution 10 times

$250cm^3 \rightarrow answser\,in(d)above$

$$100cm^3 \times 10 \rightarrow \frac{1000 \times answer\,in(d)above}{250}$$

f) $NaHCO_3 = 23+1+12+(16\times 3)$

$= 84$

1 mole = 84 g

Answer in (e) = ?

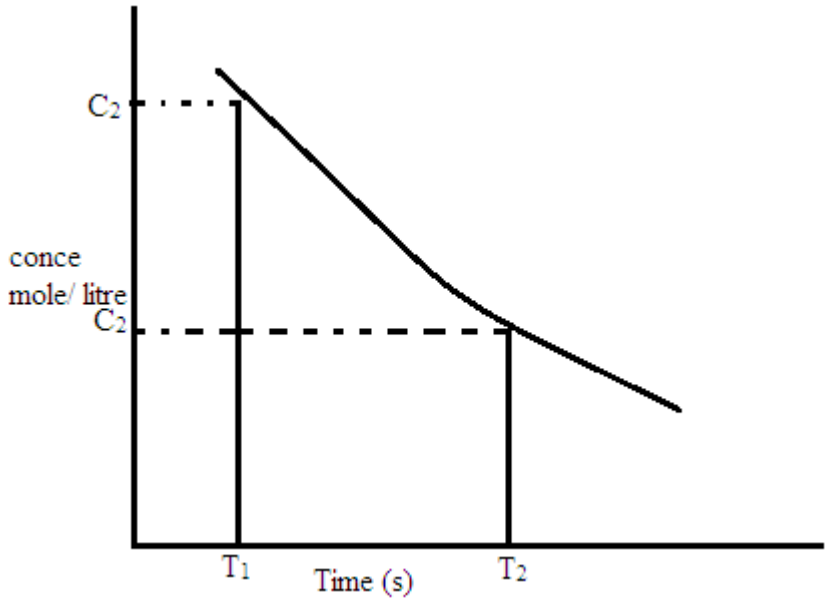
$= g/100gH_2O + stated\,temp.$

2.

Experiment	I	II	III	IV	V	VI
Volume of acid + water						
Concentration of acid in moles/ little	2	1.72	1.42	1.01	0.89	0.57
Time (sec)						

(6mks)
(1 mark each)

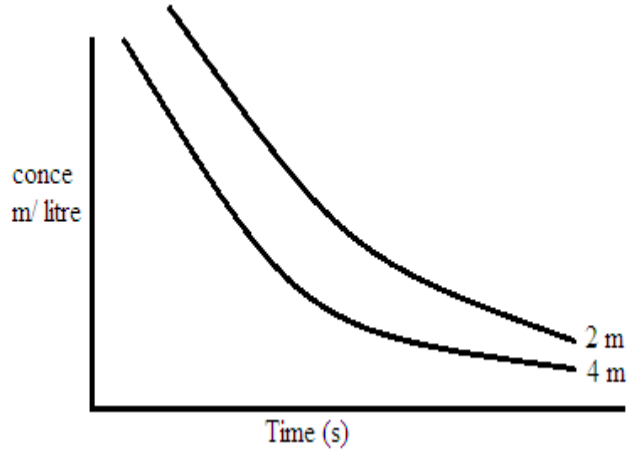
a) (i)



P – 1
S – 1
C – 1
L – 1

(ii) As concentration decreases time increases.

b) Rate = $\frac{DifferenceinconcentrationEin}{Differfence\,inTime} = \frac{C_2 - C_1}{T_2 - T_1}$



Plotting – 1
Scale – 1
Curve – 1
Labelling of axes – 1

3

a) Solid Q dissolves to form a colourless solution	- Soluble salt
b) No white pp formed	- Absence of $Pb^{2+}, Zn^{2+}, Al^{3+}$
c) White ppt formed	- SO_4^{2-}, Cl^- or CO_3^{2-}
d) White ppt that dissolves on addition of HCl acid.	- SO_4^{2-} *absent* SO_3^{2-} *present*
e) The purple solution turns colourless.	- SO_3^{2-} *present*
f) The orange solution turns green.	SO_3^{2-} *present*