BIOLOGY PAPER 231/1 K.C.S.E. 1995
MARKING SCHEME

1. They produce, they grow
   Respond to stimuli/ irritability

2. Protein synthesis – Ribosomes
   Transport of cell secretions – Endoplasmic reticulum

3. Food Spoilage
   Poisoning / cause disease

4. Water in RBC moves out by osmosis and the RBC shrinks
5. Provide energy required for splitting water molecules/ photosynthesis.
6. A - Scrus – acc. Sori
   B- Rhizome
7. Nitrogen
   Making cell walls
   Magnesium / mg
8. Evidence does not support Larmacks theory
   Acquired characteristics are not inherited characteristics are found in reproductive cells only
9. Sickle cell anaemia (Rej. Bleeders disease)

SECTION B

10. (a) K-Enzymes/ Sucrose/ Invertase/ Saccharise
    L- Inhibitor Acceptance any example e.g. any acid

    (b) – Addition of sucrose/ substrate
    - Optimum/ suitable/ correct / right pH
    - Removal of products

    (c) - Competed with substance: for active site (of K)
    - Acc. L made the medium acidic; unsuitable for K
    - L occupies active sites

11. (a) A – Epidermis
    B – Pith

    (b) C – Transport manufactured food / translation; Rej. Digested food
    D – Produces new cells/ divides to give new cells. Accept secondary Thickening/ growth/ produces phloem & xylem.
    E- transport minerals salts/ minerals/ salts alone

    (c) - Xylem in central/ Star shaped
    - Phloem in arms of xylem
    - Root hairs present in root / has pilferous layer

- No pith in root

12. (a) To absorb CO; reacts with CO_2
    (b) To provide moisture to generating seeds. Accept water for moisture
    (c) (i)
    (ii Oxygen in the tube is taken up for germination CO absorbed by higher pressure outside tube

13. (a) - Green plants – Grasshoppers – Lizards – snakes
    - Green plants – Grasshoppers – Lizards – Cats
    - Green plants – Mice – Snakes – Hawkers
    - Green plants – Mice – Snakes – cats

    (b) – Mice
    (c) Lizards eat Hawk snakes, Rej. If any primary, tertiary consumer is given
    (d) (i) Most plants will die / dry
    (ii) (same) organisms may starve to death
    (iii) (same) organisms may migrate

14. (a) (i) P – will tend/ grow towards light
    Q – will remain straight/ little/ no growth
    R – will remain/ grow straight / Acc. Grow upwards
    (ii) P – Growth substances or hormones/ auxins/IAA are produced by the stem tip. They move downwards and get disturbed to the side away from the side of light. Where they cause more rapid growth/ cell division/ elongation (that results in bonding)
    The source of auxin has been removed and the auxins are not affected by light because the era has been covered.
    (b) Tip will bend towards the light
    (c) All the seedlings will grow upwards.

SECTION C

15. (a) - Sigmoid of the curve shown
    (b) - 92 acc. 93
    (c) $\frac{110 - 78}{4} = 8.0$ (cells/ min)

    (d) 31.5 (mins)
    (e) (i) A to B Lag phase / slow growth phase
    (ii) B to C Exponential /log/rapid growth phase
    (f) Slow/ reduced growth due to limiting environmental factors (Accept any example) rate of multiplication is almost the same as the death rate, Acc: few cells are still diving Rej. Growth for multiplication but acc. Reproduction.
    (g) – Low death rate/ low mortality;
    - Rej. Decrease in death rate/ reduced death rate
    - High birth rate/ high fertility acc. Increased birth rate
    - Improved medical services: Acc. Increased medical facilities
    - Enough food/ availability of food

- Absence of war/ political stability/ peace
- Improved standard of living

(h) Measure the total area of the habitat, throw or mark out the quardrat in the area for the study; at random. Identify label the various species of the plants in the quardrat; count plants of each species; record the numbers, repeat the process (owtte) work out the average per quardrat for each species in the area/ calculate the population for the total area in Nairobi.

16. (a) (i) Large; brightly coloured corolla/ inflorescence/ florets/ bracts to attract Insect
(ii) Scented to attract insects
(iii) Have nectary guides/ nectarines/ that directs insects/ secret nectar to attract insects.
(iv) Pollen grains rough/ spikey/ sticky/ surface; to stick on insects body
(v) Special shaped corolla tube; to enable insects to land
(vi) Anthers are situated inside the flowers to ensure that they are in contact with the insect
(vii) Sticky stigma; for pollen to stick or to adhere

(b) (i) Oestrogen
Repair/ heal endometrium/ wall of uterus; which is destroyed in menstruation
(ii) Progesterone
Stimulates the thickening of the uterus; increases the blood supply to the endometrium. Inhibits the production of follicle stimulating Hormone.
(iii) Luteinising hormone
Responsible for maturation of the graafian follicles/ causes ovulation/ stimulates corpus luteum; to secrete progesterone.

17. (i) Mammalian Kidney
Blood reaches the kidney from the renal/ renal artery enters the kidney; then branches into capillaries/ glomeruli/ in the Bowmna's capsule, blood vessels leaving the capsule/ efferent are those entering it/ afferent causing high pressure to develop in the glomeruli. This forces the plasma/ causes ultra filtration into the capsule. The filtrate contains waste products (acc. One example) The filtrate moves into the proximal/ first convolulated tubule; where selective reabsorption of glucose amino acids, some water and vitamins take through the loop of henle; excretory products/ urea, excess water and salts acc, one example) pass into the distal tubule, where the remaining useful substance (acc. One example e.g salts and water) are reabsorbed; The filtrate passes into the collecting tubule; where more reabsorption of water takes place: Excess water, urea and salts (all three must appear)/Urine are removed through the ureter.

(ii) Green plants
CO_2 / O_2 /H_2O diffuse through the stomata lentils/ hydrathods some toxic wastes are converted into non – toxic substances; these are deposited in certain tissues of the plant/ stored in ageing structures. Resins/ tannins – are exuded though the bark of the stem; or lost during leaf fall.

BIOLOGY PAPER 231/1 K.C.S.E 1996
MARKING SCHEME

1. - Controls/regulates/ enzymes/ synthesis is the material for inheritance
2. - Sexual transmitted
   - Blood transfusion
   - Sharing needle/syringes/ razors
3. After vigorous activity when blood fall below normal
4. scurvy
5. Arthropoda
6. Capable of interbreeding; to produce viable offsprings
7. (a) To split water/ Photosynthesis/hydrous
   (b) Glucose/carbohydrate/ starch/ sugar.
8. Store chemical salts/sugar/blood/; maintain shape of cell. Osmotic gradient the bring about movement of water.
9. Presence of special structure that attract agent of pollination protandry; protogency; monoecism; self – sterility.
10. (a) O_2 is necessary for germination
    (b) Germination in B; no fermentation
11. Gametes form new offspring
12. To increase the chances of fertilization and survival of species

SECTION B

13. (a) Drive out oxygen / air
    (b)Avoid killing yeast cells/ denaturing enzymes in yeast
    (c) To prevent air from getting into the glucose and yeast Suspension
    (d) Limewater turns milky
    (e) Used boiled yeast on glucose

14. CO_2 diffuses into tracheoles follows the trachea; not through spiracles
    Stomata pores / stomata; cuticle
    Acc. Lenticels.

15. (a) $\frac{374 \times 400}{80}$
    (b) - There was even distribution of crabs
    - No movement in and out of regions; no migration
    - There was random distribution of errors after the first capture.
    (c) – Capture/ recapture; capture release recapture.

16. (a) – Phototropism
    (b) Auxins / hormones; move diffuse to the demised/ away from the light side; causing elongation/ growth on the dark sides hence bending
17. (a) Anaemia/ low blood volume/ loss of iron/ low red blood cells/ low haemoglobin; leading to low oxygen; loss of nutrients and dehydrations.

(b) Blood clotting
(c) Transfusion; taking fluids) eating iron rich food stuff/ taking iron tablets.

18. Parents Bb x Bb

Gametes B b B b

F_1 generation BB Bb Bb bb

(b) 3 black 1 brown

19. (a) K- Root hair
L- Xylem vessel

(b) Water moves from the soil into the root hair by osmosis; because concentration of cell sap is higher than water in the soil; the cell sap in the root hair is diluted, thus making it less concentrated than neighboring cell; therefore water moves into the neighboring cell; it is actively secreted into structure L.
(c) Active transport/ diffusion

SECTION C

20. (a) 10 HRC and 31 HRC
(b) (i) A and B
The number of bacteria dividing are few: bacteria are adjusting conditions: few are dying therefore high increase in population
(ii) B and C
More cells are dividing due to suitable environment/ favorable conditions; few are dying; therefore high increase in population
(iii) C and D
No population change; number produced is equal to number dying.
(c) Accumulation of toxic wastes; that kills bacteria; depletion of nutrients leading to competition of space.
(d) (i) The population will remain the same
(ii) Temperature not conclusive for division

(g) – Food to be sufficient for population
- Social amenities/ education; health services

21. The cornified layer is made up of dead cells, that prevent entry of bacteria and prevent physical damage; melanin protects the body against U-V variation; sebaceous glands produce a chemical/ ring substance which is of blood vessel; which when the body temperature is high dilate and heat is lost or when body temp is low blood vessels constrict. And heat is retained. Hair when it is called, stands and traps air between themselves; to retain heat/ stop heat loss or when it is hot hair lies flat close on the skin; so does not trap air, and therefore heat is retained and sweat is lost; the skin has sweat glands which produces sweat; sweat evaporates thus cooling the body.

22. Lower plants/example Bryophyta/pterophyta; produces spores which develops to new plants; budding an overgrowth arises from plant drop off; and develops into a new plant; common in lower plants yeast.

- Fragmentation – e.g Spirogyra; breaks off and grows into a new plant
- Vegetative propagation: common in higher plants involves growth of new plants from buds/bubils
- Root stem/ tubers/ leaves: possesses buds; which develops to new plants
- Corns; have terminal buds that grows vertically and produce a new plant
- Runners; have lateral buds that produce new plants

BIOLOGY PAPER 231/1 K.C.S.E 1997
MARKING SCHEME

1. (a) Golgi apparatus
   Packaging of synthesized materials; Accept correctly named materials e.g glycoproteins
   (b) Ribosomes
   Transport of the packed materials, secretion of packed materials;
   Manufacture synthesis of proteins.
2. The animal belongs to the class – Arachnida;
3. Alcohol, carbon dioxide and energy;
   - accept Ethanol, C_2H_5OH/CH_3H_2OH.
4. – Lignified thickened to prevent collapsing (Acc. Strengthened add strength)
   - Narrow to facilitate capillary:
5. Cerebrum cerebral hemisphere/ cerebral cortex;
6. (a) Mosquito larvae/ Pupae are killed; Accept suffocation/ Breaking life cycle of Mosquitoes
   (b) Pollution of environment/ oil expensive, other aquatic are killed; accept Contamination.
7.

Biceps	Gut Muscles
Striated	Unstriated
Multinucleated	Uninucleated
Long Fibres	Short fibres
Cylindrical	Spindle Shaped

8 (a) Disease the person was suffering from
   Diabetes inspidus ref. Diuresis/ water diabetes
   (b) Hormone that was deficient
   Antidiuretic hormone/ ADH/Vasopressin

9. Fossil (records) paleontology; geographical distribution
   Comparative anatomy/taxonomy; cell biology
   Comparative serology; comparative embryology
   Comparative immunology
10. Vitamin D- Rickets/Osteoporosis
    Iodine- Goitre

SECTION B (40 MARKS)

11. (a) Grass → Grasshoppers → Guinea fowls
    Grass → Termites → Guinea fowls
    (b) Lions would compete with leopards
    Gazelle numbers would reduce
    Grass would increase
    (c) Grass; rej. Plants
12. (a) Long sighted ness/ hypermetropia

(b) Eye ball too short/ eye lens are unable to focus because they are flat/weak, unable to focus the image on the retina; eyes are unable to accommodate/ change their focal length

(c) By wearing convex / biconvex lenses; accept converging lenses

13. (a) strong air/ winds
High temperature
Low humidity; accept dry conditions/ sunlight

(b) Absence of leaves/ stomata absent
Transpiration; / little transpiration

(c) Arid/dry/ desert/ accept semi- desert
Reason
Low rate of water loss; accept more/ a lot of water loss
Wet/Moist/aquatic
Reason
High rate of water/ high rate of transpiration /acc. A lot of water loss

14. (a) E- Denitrifying bacteria; e.g pseudomonas denitrifications
J- Nitrifying bacteria; Nitrobacteria reject nitrosamines

(b) H- Death decay/ decomposition; excretion/ Aminonification putrefaction egestion.
F- Nitrogen fixation

(c) Plants

15. (a) Deamination

(b) Removal of excess amino acids availing energy in the body formation glycogen/ fat for storage.

(c) Proteins

(d) Essentials amino acids are acquired from food
Non- essential are synthesized in the body

16. (a) White
Give a reason – Fewer numbers/ lower ratio; lower in numbers/ absence of white in parents & absence in offspring.

(b) Heterozygous Rr. Accept appropriate letters
Rejects R.w appropriate/ letters (o-dominance)

(c) Double recessive /rr/ homozygous (recessive)

17. (a) Figure 1 R:
Figure 2 T: Accept growth

(b) Development of the foetous/zygote/fertilized/ova/egg/embryo

(c) Style

(d) R;P;

(e) X

SECTION C: (40 MARKS)

18. (a) (i) Bamboo plants
4 and 6
(ii) Maize plants
12 and 14

(b) (i) Bamboo
(ii) It had accumulated more weight and therefore greater dry weight

(c) Maize plants have reached maturity/maximum height food being manufactured (in green parts); is utilized for growth storage primary in the cob.

(d) Increase in weight – bamboo reject both increase/ decrease accept bamboo and maize increase/ decrease.

(e) (i) Dry weight instead of fresh weight
Fresh weight is dependant on the amount of water present in the plants and this fluctuates depending on environmental factors.

(ii) Weight and height
Both given a better measure of growth

(f) Average height
At every 2 weeks measure the height of samples of plants in each plot:
Divide the total height by the number of plants in each of plot.

Average dry weight
Harvest the sample measure of the plants in each plot; dry to constant weight:
And divide by the number of plants

(g) Being monocots/ lack (Inter) fascicular cambium:

19 (a) An association between two organism; where one benefits; and the other is adversely affected. Or an association where an organism lives in or on another living or organism: obtaining from it and causing harm without necessary killing it.

(b) Has hooks/suckers: for attachment to wall of intestines: long; to increase surface area for absorption of food: award increase in S.A for absorption once. Secretes enzymes/to neutralize digestive enzymes; (mucus inhibitor substance/anti enzymes)
Hermaphroditic: to ensure reproductive/ self fertilization.
Production of many eggs: to ensure survival
Segment for egg dispersal:
More than one host; for transmission: e.g T solium – pig (Intermediate host) T. Saginata.
Long to fit in the intestine/ increase surface area for (flatten) Absorption of food;
Anaerobic survive in the gut with low O_2.

20. (a) Breakdown of (complex) food substances by enzymes; to simpler compounds (which can be absorbed)

(b) Small intestines are long/coiled: to offer large surface area for digestion and absorption:
The walls are muscular: for peristalsis/ inner walls posses mucus glands/ accept goblet cells that secrets mucus; for lubrication; and protection of wall from digestive enzymes:
The inner walls have digestive glands: that secret (digestive) enzyme:
The inner walls have villi: to increase surface area,
absorption/ diffusion; accept 'epithelium is one cell thick'

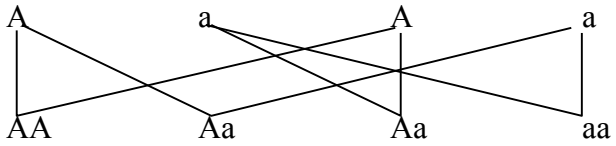
The Villi have numerous blood vessels: for transport of the end products of digestion; accept at least two correctly named examples/ end products of glucose amino acids/ mineral salts vitamins.

The villi also have vessels for transport of fats/lipids
Accept illustrations of cell are thick epithelium

BIOLOGY PAPER 231/1 K.C.S.E 1998
MARKING SCHEME

1. Blood has no antigens and does not cause agglutination (with other types)
2. Yellowing of leaves/stunted/ growth/chlorosis/ lack chlorophyll
3. Skeletal muscle cell
   Mitochondria
   Palisade cell
   Chloroplasts
4. To facilitate transportation of gases/ Exchange of gases; if gases are mentioned (both must be O_2 and CO_2
5. Symbiotic/ both benefit/ mutual benefit; correct description of mutual benefit
6. (a) Phototais
   (b) To avoid desiccation/ drying/ dehydration
   Escape from predators;
7. (a) Femur
   (b) Ball and socket
8. (a) wind
   (b) To enable it trap pollen grains in the air; reject catch/ attach for trap
9. Turgidity
   Presence of collenchymas (in the cortex)
10. –Light intensity decreases with depth light limiting
    - Temperature decreases with depth
11. – Use of unsterilized instrument;
    - Temperature decreases depth
    - blood transfusion
    - Mother to the foetus/ mother to baby infant/ breast milk/ sharing of instruments e.g needles syringes, razor blade e.t.c
    - Mixing of infected blood through cuts

12. (a) Aa, Aa, Acc, both are Aa
    (b) Normal children AA, Aa,
    Genotype of the albino child
    Albino child aa,



    (c) 25% ¼

13. (a)

Meosis	Mitosis
(i) Reduction/ having chromosomes/ haploid no. of chromosomes cells.	Maintenance of chromosomes number/ diploid no. of chromosomes/ cells
(ii) Takes place in reproductive cells/ glands gamete formation	In somatic cells/ body cells/ for growth
(iii) Crossing over takes place/ variation	No crossing over no variation

(iv) 4 daughter cells 2 division processes	2 daughter cells 1 division processes

(b) X or / x and Y; Rej XY, X alone, XX
Ova?
X/XX

14. (a) Light; Rej: light intensity
(b) Test for starch
(c) (i) The covered part of the leaf remain brown/yellow/ retain color
Of iodine, and the uncovered parts turned blue/ black; rej blue alone black alone.
(ii) Starch was formed in the covered part of the leaf (because of the presence); while starch was not formed in the covered part of the leaf (because of lack light)
(d) To destarch the leaf; OWETT

15. (a) (i) Species A;
(ii) The rate of multiplication/ growth in A is faster than of species B
(b) (i) One year and three years
1-3 years shortage of resources more suitable environmental
Conditions/ such as food space e.t.c resource were not limiting hence the population increased exponentially rapidly; acc correctly named resource e.g food space.
(iii) Three years and seven years
3-7 years shortage of resources/ limiting/ birth rate equals death rate; hence the population had become stagnant/ constant; acc;
Environmental resistance has set in rej. Incorrect resources e.g PT and T.
(c) Species A would decrease (because of there is less competition with species A/ More resources available.

16. (a) (i) Protozoa
(ii) Unicellular/ single celled
(b) N- Contractile vacuole
P – Cilia, Acc cilium
Q – Gullet/cytopharynx
(c) Cilia
Streamlined body.

17. (a) (i) Sensory neurone/sensory nerve cell; reject sensory nerve
(ii) Cell body on a branch/ at the side of axon/off the axon/cell body unipolar both axon and dendron are long.
(b) T- myelin sheath; Acc Neurilema
(c) Direction of impulse from receptor towards cell body.

18. (a) If axes reversed allow marks for identification of curves only max 2
Correct scales
Correctly leveled axes
Curves reject broken lines for curves

(b) 0-1 hour.

i) Acc constant/low/below normal levels in blood; No/little digested foods/glucose from the intestines/gut/alimentary canal/absorption.

ii) 1-2 hours
Sharp increase in concentration of glucose in blood; (more) absorption of glucose; after digestion of the meal.

iii) 2-4 hours.
Glucose concentration declining/decreasing; less glucose being absorbed; (more) glucose being converted to glycogen in the liver/tissue/used for (tissue) respiration.

iv) 5-7 hours.
Concentration of glucose stabilizes/constant/ this is the normal glucose level concentration in the blood.

(c) The concentration of glucose in the iliac vein is lower than in the hepatic portal vein because it hasn't been stored in the liver to be used respiration. Portal vein because most of it was stored/used up by the liver/other tissues/respiration.

(d) Proteins take longer to digest.

19. Comparative anatomy/taxonomy.
Members of a phylum group show similarities; organisms have similar structures/similar organs performing similar functions e.g. digestive system/urinary system, nervous system. Any correct example i.e. vertebrate heart.

The pentaductyle limbs/ any correct example; these are homologous organs/structures. Homologous – same origin structure different functions. Analogous structures – different structures performing the same function e.g. wings of insects, bats and birds. Analogous different origin structure, same function convergent.

Fossil records/palaeotology
These are remains of organisms preserved in naturally occurring materials for many years show morphological changes of organisms over a long period of time.

Comparative embryology.
Acc. Any 2 names embryos> vertebrate embryos the morphologically similar; suggesting the organisms have a common origin/ancestry.

Geographical distribution.
Present conditions are thought to have been a large land mass joined together, as a result of continental drift; isolation occurred bringing about different patterns of evolution i.e. The Ilamas in the Amazon resemble the Camel. Any other example e.g. Kangaroos in Australia, Jaguar in South America, Camel in Africa.

Comparative serology/physiology.
Antigen/antibody reactions/Rh factor/blood group/haemoglobin structure; reveal some phytogenetic structure. Relationship among organism/common ancestry.

20. The mammalian intestines are relatively long/coiled/folded. This allows food enough (enough) lime/increases surface area for digestion and absorption of products of digestion. The intestinal surface area for absorption. The glands have enzymes which secrete enzymes for digesting e.g. of correct enzyme, maltase, sucrase, lactase, enterokinase and peptidases. Some glands/goblets cells also produce mucus which protects the intestinal wall from being digested, reduce friction. Intestines have opening of ducts which allows bile/pancreatic juice into the lumen. The intestines have circular and longitudinal muscles whose contraction/relaxation/peristalis leads to the mixing of food with acc. At least enzymes/juices facilitating rapid digestion and helps pus food along the gut. Intestines are well supplied with blood vessels to supply oxygen/remove digested food. Presence of lacteal vessels for transport of fats/lipids.
Have thin epithelia to facilitate fast/rapid absorption/diffusion. Allow increase in surface area for absorption only.
Cell biology/cytology. Occurrence of cell e.g. mitochondria, ribosome's, nucleas, cytochromes organelle point to a common ancestry.

BIOLOGY PAPER 231/1 K.C.S.E 1999
MARKING SCHEME
SECTION A

1. Active transport
   Diffusion
   Mass flow
   Cytoplasmic streaming Any two

2. Lactic acid is poisonous to tissue and must be removed.
   To increase supply of oxygen to tissues.

3. Brings about change of genetic materials; which leads to variations; that enable organisms to exploit new environments/resistance to disease/high yields in plants

4. Assists to eliminate disadvantages characteristics.

5. Shelter Food, Oxygen Removal of CO_2 breeding sites.

6. Ability to pollinate
   Response to (tactic, nastic, tropics) Stimuli
   Ability to exploit localized nutrients/ability to photosynthesize
   Ability to disperse seeds/fruits-propagation

7. a) Co dominance
      Acc; partial/incomplete/equal
   b) 1 red flower
      2 pink flowers
      1 white flower Acc 1:2:1

8. Lack of variation;
   Acc. No Hybrid Vigour
   Disadvantages traits/are retained within the species

SECTION B (40 MARKS)

9. a) B- Cerebellum
      C- Medulla Oblongata ; Acc Oblongata alone . Rej. Medulla alone

   b) Control locomotion
      motor area/sends impulse to affectors/controls
      Voluntary
      Vision/hearing/smell/taste.
      Personality speech;
      Mediates cranial (any three)

   c) Loss of muscle co-ordination/balance

10.

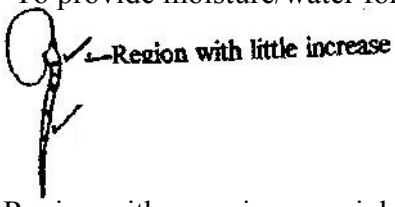
Classes	Organisms	Reasons
Insecta	Praying Mantis Tsetse fly	3 body parts 3 pairs of legs
Myriapoda	Centipede Millipede	Many segments Many legs
Arachnida	Tick Spider,	2 body parts 4 parts.

Rej; if mixed Acc; it its one and correct.

11. a) Most enzymes in the body function within a narrow range of temperature;
High temperature denature enzymes
Low temperature inactive /inhabit enzymes

b) Sugar in a raw material for respiration, hence less energy, available to body/low/rate of metabolism.

12.a) i) -Region of elongation (rapid) growth in a root.
-Region with more increase ink mark
-To provide moisture/water for growth (germination)

ii) 

Region with more increase ink (mark)

iii) To provide moisture/water for growth (germination)

b) i) Oxygen
Oxidation of stored food; to provide energy (for germination)

ii) Cotyledons
Store food necessary for germination; protecting the plumule.

13 a) A community consists of all plants and animals (organisms of different species in a habitant interacting with each other.

b) Use the capture and recapture methods; Catch the grasshoppers count and mark using permanent ink; record and release; and allow time 1 to 2 hours; recapture and count the marked and the unmarked; total population is equal to the number of marked and unmarked grasshoppers in the second sample multiplied by number marked grasshoppers in the first sample; divided by the number of grasshoppers marked in the second sample that were recaptured.

14. a) Trypanosome

b) i) Locomotion

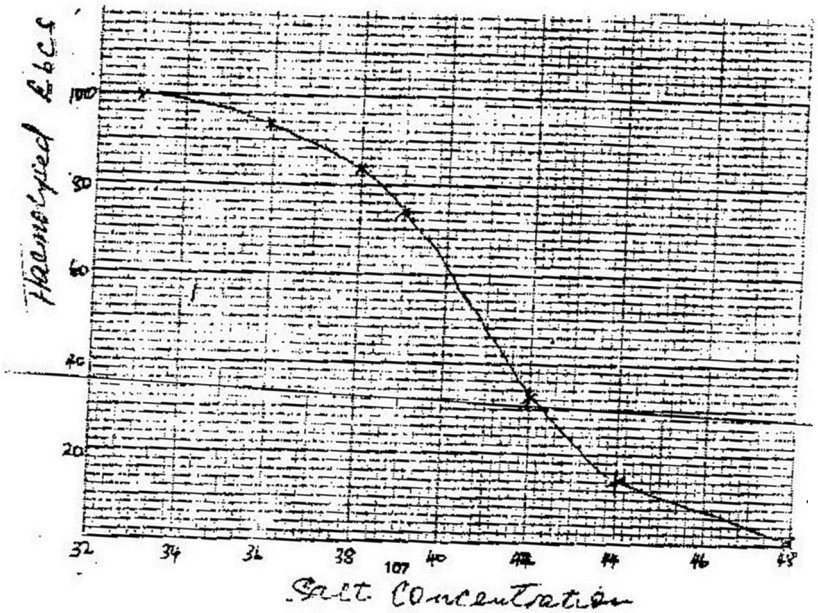
ii)

c) Sleeping sickness/trypanosomiasis

d) -Orally ingested including boring through bites
-Sexually; cuts and wounds (contaminated) needles syringes/surgical instruments; contaminated blood transfusion.

SECTION C 40 MARKS)

15. a) (i)



ii) 0.402; 0.403; 0.404; $\pm$ 0.002
iii) 9-10-11%

b) Account for the results obtained at:
(i) 0.33 percent salt contration.
Less concentration // hypotonic // dilute than blood cells cytoplasm/ red blood cells; water is drawn in by osmosis the cells swells and eventually burst.

(ii) 0.48
(ii) 0.48 percent salt concentration.
Concentration of cytoplasm same as concentration of salt solution/isotonic; therefore no net movement of water; hence no heomolysis.

c) Percentage of cells haemolysed would still be zero? Becomes turgid;
but does not burst; due to the cell wall.

d. The cells would absorb water due to osmosis, swell and become turgid.
The cell sap move conc. than surrounding water gate into the cell by osmosis; the cell swells/becomes turgid; but does not burst due to the cell wall

16. Muscles of diaphragm contract; causing the diaphragm to flatten (from dome position. The external intercostals muscles contract internal intercostals muscles relax pulling the ribcage upward/forward and outward in man.

These movements increases the volume of the thoracic cavity; reducing the pressure; of the thoracic cavity; compared to atmospheric pressure; this causes the atmospheric air to rush into the lungs. (Through the nostrils, trachea bronchioles and alveoli).

b) Theory- photosynthesis
Guard cells have chloroplasts; in the presence of light; photosynthesis occurs in guard cells, producing sugar in guard cells; osmotic pressure increases/osmotic potential lowers; water from neighboring /adjacent cells enter into guard cells; causing turgidity of guard cells; causing turgidity of guard cells.

Theory 1.
Guard cells have chloplasts; in the presence of light photosynthesis occur in the guard cells of stomata; producing in the guard cells; osmotic pressure increases/lowers osmotic potential water from the neighboring /adjacent cells, enter into guard cells; causing turgidity of guard cells .
The inner walls of the guard cells are thicker than outer walls; so during turgidity the inner walls stretch more; causing the guard cells to bulge outward; stomata opens.

Theory 2.
Guard cells have chloroplasts (Day) in light; photosynthesis occurs in the leaf/guard cells lowering the CO_2 concentrations; this increases PH/alkalinity which triggers of enzymatic conversion of starch to sugar (glucose); leading to low osmotic potential/ increased osmotic pressure in guard cells; guard cells absorb water from epidermal cells; thus becoming turgid; the inner walls are thicker than the outer walls; outer walls stench more than inner walls; causing guard cells to bulge outwards, stomata opens;

In the absence of light (night); no photosynthesis; CO_2 concentration increases due to respiration; PH lowered/ acidity increases; sugar converted to starch; osmotic pressure lowered/ osmotic potential increases; guard cells lose water to adjacent epidermal cell becoming flaccid; stomata close.
Day low H+ high PH opens stomata.
Starch glucose.

Theory 3
Guard cells have chloroplasts; in light AT produced; the energy drives K+ irons from adjacent epidermal cells into guard cells; accumulation of K+ raises osmotic pressure (lower osmotic potential) of guard cells; guard cells absorbs water from adjacent epidermal cells; becoming turgid; the inner walls are thicker than the outer walls so outer walls stretch more than inner walls causing guard cells to bulge outward. Stomata opens.

In the absence of light (night) ATP rapidly decreases; no energy of potassium +ions pump ion; migrate by diffusion from guard cells to adjacent epidermal cells; become flaccid; the thinner outer walls of guard cells shrink (OWWTE; thicker inner walls reduces their curvature/OWTTE; thus closing the stomata.

17. Sulphur based chemicals e.g. sulphure dioxide gas H_2S Cl_2 HCl_2 produced by (food preventing) industries /sewages matter, Affect gaseous exchange/makes acid rain /damages plants leaves.

Acc. Pesticides, Herbicides, Insecticides, Acaricides, paint sprays,
Aerosols
CFCs sprayed to control (plant) disease and pests, also affect respiratory organs of animals; the chemicals are residuals and persistent (not easily) broken down deplete.

Ozone layers; smoke/fumes produced in areas with (heavy) industries and (high density of motor vehicles / fire which burn fuel/oils wood coal; These visibility; fumes also settle on leaves and stop photosynthesis (excessive) production of carbon dioxide causes the green house effect/Temp. inversion as a result of heating in lower layers of atmosphere; sound /noise produced incessantly b machines/ heavy vehicles/aircraft; affects hearing in animals; Dust, industrial production of (cement) generates dust; which finally settles on plants leaves limiting photosynthesis; removal of vegetation/cutting of trees; interferes with.

The carbon cycle; radioactive emissions; from nuclear reactors/mines/ x-rays machines bombs cause mutation/cancer/death.

BIOLOGY PAPER 231/1 K.C.S.E 2000
MARKING SCHEME

1. *(a) Cones*
   Discrimination of colours/ details/ accurate/ vision colour perception/ sensitivity to high intensity/ bright
   (b) Rods
   Dim light vision/ low light intensity

2. *Due to stiff competition of resources leading to elimination/ exclusion of one species; acc. Currently named example food*
3. *Presence of Rhizoids*
   -Lack of vascular tissue/ absence of both xylem and phloem
   -Body parts not differentiated/ not organized into roots, stem and leaves.
4. *– Brewing industries; baking*
   - Manufacture of medicine/ antibiotics
   - Food e.g. mushrooms yeast also provides vitamin B, and B2
5. *– Maintenance of constant levels of water/ salt/ ions/ osmotic pressure/ for optimum conditions of metabolism/ cellular functions*
6. *– Attachment of powerful back muscles that maintain posture flex the vertical column/ support viscera/ abdominal organs*
7. *(a) Fossils records*
   Gives evidence of types of plants/ animals/ organism that exist at a certain geological age. Long ago
   Gives evidence of morphological/ anatomical. Structure/ changes that have occurred over a long period of time.
   (b) Comparative anatomy.
   Gives evidence of relationship among organisms
   Gives evidence of common ancestry of a group of organisms; e.g. structural/ functional relationship among organization
8. *Oxygen is required for respiration that produces energy necessary for active transport e.g. oxidation of food for respiration*
9. *The adult and larvae exploit different food/ don't compete for food/ pupa can survive adverse conditions/ pupa being a non- feeding state enables organisms to go through adverse conditions*
10. *– Curved/ sharp/ hooked strong beaks fro killing / tearing/ ripping off flesh from bones*
    - *Curved/ strong/ sharp claws for grabbing/ holding prey*

SECTION B

11. *(a) X– Spongy mesopyll (cell) layer*
    (b) Y – Cuticle
    (c) Broad/ flat leaf (lamina) to provide large surface area or absorption of gases
    Thickness: allow gases to pass though fast
    Presence of stomata for efficient diffusion of gases
    Presence of air spaces for easy defuses

12. (a) RR and rr
    (b) (i) red
    (ii) complete dominant; i.e Rd dominant/ white recessive
    (c) Ratio of filial generation: 3: 1
    (I.e. in every 4 flowers 3 are red 1 is white
    Therefore 480 red flowers means ¾ of the total number
    Total number of flowers $\frac{480 \times 4}{3} = 640$
    So ¼ of 640 flowers are white in F_2 plants
    ¼ x 640 = 160 flowers

13. (a) Heat loss by conduction/ convection from the blood vessels
    The body skin to the cold water, the cooler blood leaving skin enters general circulation cooling the whole body.

    (b) Vasoconstriction; thus less blood flowing to the skin reducing heat loss.
    Sweating eases heat produced through metabolism
    Accept shivering producing heat

14. (a) Crop
    Potatoes / tomato
    Disease
    Tomato/potato bright/ Acc. Tomato rot

    (b) Use of fungicides
    Eradication of infected crop/ uprooting/ burning of infected plants
    Use biological control
    Use of disease resistant varieties
    Crop rotating

15. (a) (i) 78/78 mg/ $100cm^3$
    (ii) 8.5^{th} and 29.5^{th} / 8min 30 sec and 29 min 30 sec
    (iii) 47 mg/100cc; Acc. 47

    (b) - The demand for oxygen is more than the supply
    - leading to anaerobic respiration. Acc. Lactic acid converted to glucose/Glycogen
    (c) Lactic acid is oxidized (to form CO_2 and H_2O)
    Acc. Lactic acid is converted to glucose/ glycogen

16. (a) Genetic variation/ hybrid/ crossbreed
    (b) favorable characteristics of parent remained
    Exploit parents favorable conditions
    Acc. New plants adapts parental favorable conditions
    Short life cycle/ early maturity/ faster reproduction
    Large store of food supply
    Independent of two parental/ organisms reproduces without another fertilization/ pollination

17. (a) (i) Goat
(ii) It is a grazer and a browser
(b) Insufficient grass in bush/ aren't adapted to eating twigs/ not browsers/ are grazers
(c) (i) Domestic animals - total counts
Wild animals – total counts; aerial counts/ quadrat/ Belt transect/ capture/ recapture
(ii) Analyzing gut counts, studying dentition/ breaks/ claws/ parts

(d) Observation
Examine droppings
Dissecting a sample of animals/ study structure/ nature of digestive
System/ size of caecum/ length of intestine/ chamber
(e) Irrigation
Competition; diseases
Predation; human activity/ man accept any correct
Parasitism
(f) Poaching, cropping/ culling/ licensed spot hunting
(g) Pollution; translocation
Burning trees, charcoal- deforestation

18. Inferior lobe of pituitary gland secretes F.S.H which causes grafian follicle develops in the ovary. It also stimulates ovary tissue/ ovary/ follicle walls secret estrogen which repairs, heals uterine wall, oestrogen stimulates inferior lobe of pituitary gland produce L.H. for ovulation. It also causes grafian follicle change into corpus interim L.H stimulates corpus luteum secret progesterone which causes proliferation of the uterine walls; in preparation of implantation; oestrogen/ progesterone inhibits the production of F.S.H (by anterior lobe of pituitary) thus no more follicle develop; and oestrogen production reduces; 14 days later progesterone level rises inhibits production of L.H from anterior lobe of pituitary gland produce L.H for ovulation. It also causes grafian follicle change into corpus interim L.M stimulates corpus luteum secret progesterone which causes proliferation of the uterine walls in preparation of implantation; oestrogen/ progesterone inhibits the production of F.S.H (by anterior lobe of pituitary) thus no more follicle develop; and oestrogen production reduces; 14 days later progesterone level rises inhibits production of L.H from anterior lobe of pituitary gland/ The corpus luteum stops secreting progesterone, and menstruation occur when the level of progesterone drops; (anterior lobe of pituitary starts secreting F.S.H again.

19. Broad/ wide/ flat lamina provides large surface area for absorption of (O) and sunlight, thin to ensure short distance of CO_2 reach photosynthesis/ palisade cells; presence of stomata guard cells for efficient diffusion of O_2 gaseous exchange / H_2O vapour transpiration/ CO_2 into the leaf transparent cuticle epidermal cells; for light penetration into palisade cell which contains chloroplast next to upper epidermis; these receives maximum light for photosynthesis. Chloroplasts have chlorophyll, which traps light energy.
Leaves have vein, xylem and phloem to transport products of photosynthesis to other part of the plant.
Air spaces on spongy mesopyll, easily circulates gases/ CO_2 diffuse into palisade cells.
Mosaic arrangements of leaves; enable leaves to trap sunlight.

BIOLOGY PAPER 231/ 1 K.C.S.E 2001
MARKING SCHEME

1. *Interbreed to produce fertile/ viable offspring*
2. *Utilize energy from the sun to manufacture food/ photosynthesis; for subsequent tropic level/ consumers/ other organisms*
3. *A, B, AB, O*
4. *– ovary/ accept ovules*
5. *Act as valves for regulations of food movement/ to close or open various parts of the canal.*
   - Churning (acc. mixing food with enzymes) pushing food along peristals
6. *The surface area to volume ratio is higher in calves than in adults; hence adults retain more heat than the young.*
   - The surface area to volume ratio is lower in adults than in calves; hence calves loose more heat than adults.

7. *– Ribosomes*
8. *(a) Open/ lacuna*
   (b) (i) Hepatic portal vein
   (ii) Pulmonary vein
9. *– Inversion duplication, deletion, translocation, non- disjunction*
10. *– Mesophyll cells/ spongy mesophyll/ palisade mesophyll/ stomata/ substomatal chambers; lenticels; cuticles.*

SECTION B

11. *(a) (i) Efferent arteriole/ vessels*
    (ii) Loop of henle
    (b) Ultra – filtration (acc. Pressure filtration) rej. Filtration
    (c) Glucose (acc. Blood sugar)
    (d) (i) Disease – diabetes mellitus (acc. Sugar diabetes)
    (ii) Hormone – insulin
    (e) – Small Bowman's Capsule/ Groleruli`; Rej few Bowman's capsule
    - Loop of Henle

12. *(a) (i) More active sites of enzymes available, for a large number of molecules of substrate; hence increase in the rate of reaction (rapid of fast increase in the rate of reaction)*
    (ii) B and C
    Enzymes/ substrate are in equilibrium / All active sites are occupied; hence rate of reaction is constant.
    (b) Raising concentration of enzymes
    (c) P^H, temperature, inhibitors/ cofactors
13. *(a) A – Nitrogen fixation*
    D – absorption
    (b) Nitrate/ nitrates/ NO_2
    (c) Denitrifying bacteria/ Denitrifiers
    (d) (i) Leguminous plants, (acc. Legume/ acc examples e.g beans peas)
    (ii) Roots nodules; rej root or nodules alone; acc; root

(e) – Killing / reducing of composers
- Killing/reduction of nitrogen fixing bacteria/ nitrogen fixing microorganisms
- Destruction of leguminous plants

14. (a) (i) Tt, Tt
(ii) Tt and Tt
(iii) 1TT; 2Tt; 1tt/ 1 tall homozygous; 2 tall heterozygous
1 short homozygous 1:2:1
(b) Crossing a homozygous recessive organism with an organism which shows dominant characteristics.
15. (a) water, temperature moisture (Acc. Warmth)
(b) Mobilize/ hydrolyze stored food/ active enzymes/ breaking
Of dormancy softening the testa / seed coat (acc. As a solvent/ transport media.)
(c) Setup A – those in set up A will germinate
Setup B- those in set up B will not germinate
Setup C- those in set C will not germinate

SECTION C

16. (a) (i) The more the feed the more the feacal output
The less the feed the less the faecal output
(ii) The first four months

$$\frac{2.1 + 2.0 + 1.8 + 1.7}{4} \quad \Big| \quad \frac{28.0 - 20.4}{4} \quad \Big| \quad \frac{7.6;\ 1.9\ (kg)}{4}$$

The last two months

$$\frac{14 + 0.1}{2} \quad \Big| \quad \frac{29.5 - 28.0}{2} \quad \Big| \quad \frac{1.5}{2} = 0.75kg$$

iii) Fast/ rapid/Active growth hence increase in weight
The last tow months
Slow growth, reached maturity
iv) Feed X
Give reason for your answer
Group A gained (more) weight, on less food while group B lost weight on more food.
b) growth, repair, protection, energy production
c) a solvent, transport medium.. Hydrolyses of food, maintenance of temperature.

17 a) i) Tympanic membrane.
Receives sound waves (from the air); and vibrates / transforms sound wave into vibrations to transmit them to the ear osssicles / malleus; acc. Hammer for malleus.
ii) Eustachain tube.
Equalizes the air pressure in the middle ear to that in the outer ear.
iii) Ear ossicles
Amplify / transmits vibrations from the tymphanic membrane in the inner ear / venestra ovalis / oval window.

b) *There are three semi – circular canals; arranged in planes at right angle to each other; at the end of each canal is swelling called ampulla's which contains receptors.*
The movement of the cause movement of the fluid in at least one canal, the fluid movement deflects / displaces the coperta and thus stimulating the receptors / sensory hairs, the impulse / nerve sensory impulse is transmitted / conducted to the brain; by auditory nerve, about the movement of the body / head.

18. a) *pollen grains stick in the stigma surfaces; that surface of stigma producers a chemical substance; which stimulates the pollen grain to produce a pollen tube / germinate. The pollen tube/ germinate. The pollen tube grows down (into the tissues of style) from where it derives nutrients; the generative nucleaus divides to give rise to two male nuclei and the antipodal cells; when pollen tubes disintegrates and make nucleus fuses with the egg cell and forms the zygote. The other male nucleus fuss with the two polar nuclei to form a triploid nucleus. The process involves double fertilization.*

b) *Integument change into seed coat / testa; Zygote into embryo;*
Ovary wall into fruit; Ovule into seed; triploid nucleus into endosperm
Style dried up / fall off leaving a scar / corolla dries up (falls off) stamens dry 'up. Ref; Degeneration disintegrates.

BIOLOGY PAPER 231/ 1 K.C.S.E 2002
MARKING SCHEME

1. Cephalothorax; prosona
2. a) Rhizobium Nitrogen fixing bacteria
   b) Symbiosis / mutualism
3. a) Substances that activate enzymes
   b) Metallic ions e.g. iron / mg / Zn / Cu /(accept correct iron forms)Fe 2+, Mg2+, Ca2+, Mn2+, Co2+ , Kl, mo2+, (Reject wrong charges).
4. Endosperm material was being oxidized / hydrolyzed / converted into new cytoplasm new material for growth / food used for growth.
5. High yielding / hybrid vigor / heterosis; resistance to decrease early maturity.
   Resistance to drought / salinity.
6. Oxyhaemoglobin acc. HbO2 / HbO
7. Cattle are mainly grazers while others are browser.
8. a) Ball and socket
   b) Hinge
9. Stomata, lenticels: (reject cuticle)
10. Converted into fatty acids and stored beneath skin (adipose tissue)
11. Y CHROMOSOME
    Tuft and hair sprouting from pinna / baldness; hairy pinna;

    X CHROMOSOME
    Colour blindness / haemophilia.
12. a) A A photosynthesis
       B Decomposition / decay
       C Respiration
    b) X Bacterial
       Y Fungi
    c) Regulate the CO2 in the atmosphere.
13. a) Meiosis
    b) Ovary
    c) parent must be the 2n top; any ‘n’ is a gamete
    d) Non – dysfunctions
    e) increased yields / highbred Vigor, Resistance decreases
       Resistance to drought.

14. (a) Emergence of present fauna and flora/ new life
    Term/ species/ organisms from pre-existing forms gradually over a long period of time.

    (b) Standing upright/ erect posture. Higher intellectual capacity/ higher brain/bigger capacity; communication through language speech.

    (c) Divergent basic structural form is modified to serve different functions; e.g. vertebrate forelimbs, break structure in birds/ feet in birds’ convergent different structures are modified to pass or similar functions e.g. wings and birds and insects/ eye of human and octopus, vertebrates for humans e.g. squeal, legs of vertebrae and insects .

15. (a) Genus
(b) Ileum/ colon/ duodenum/ intestines/ of humans or intestines of pig
(c) Lack of elaborate elementary canal (simple guts) can tolerate raw corn
Thick cuticle pellicle, reject the outer covering lays many eggs
Mouthparts for sucking partly digested food

16. (a) R. Sieve pore
S- cytoplasmic strand, cytoplasmic filaments rej. Proto plasmic strand)
Cell labeled T
(b) Translocation (L is tied with structures)
(c) Thickened and lignified.

17. (a) Bulbils/ suckers, Aerial tubers
(b) Plant with desired qualities is able to grow on an established root system which lack desired qualities
(c) Early maturity/ short life span
Good qualities of parents are retained
Independent of fertilization/ pollinated dispersal
Large areas covered in a short time have large store of food

18. (a) – For exchanged axis award maximum 3 marks for points x identity
The scale must however be correct. For graphs on separate axis mark both and award the highest mark.

(a) Axis = 2
(b) Scale = 1
(c) (plotting) = 1
(d) curves) = 1

(b) X = 120 + -3)
Y = 140 + -3

(c) Person X is capable of regulating glucose while person y is likely to be diabetic.
X – Insulin

(d) X insulin released, excess glucose is converted into glycogen (in liver) must be mentioned if insulin is not mentioned
Y Insulin not released, thus the decline is due to glucose being released in urine.

(e) A.T.P / Adenosine triphosphate

(f) Deaminated; resulting in formation of ammonia
Ammonia combines with CO_2 to form urea (and H_20); Urea is passed out in Urine
carbohydrate group is oxidized/ stored as glycogen

19. - Indole acetic acid/IAA/ Auxins

- Promote cell division tropic responses, (accept cell division in cambium)
- Promote formation of absecission layers/ bring abrupt leaf – fall
- Promote fruit formation (parthenocarpy)
- Promotes cell differentiation (of vascular tissue)
- Causes apical dominance/ inhabit growth and development of lateral buds
- Promote growth of adventitious roots (on stems)
- IAA + cytokine induce formation of callus tissue (during healing of wounds)
  N.B if this point for cytokines it should be marked

GIBBECETINS (accept GA3)

- Promotes cell division / cell elongation in dwarf varieties
- Parthenocapy/ initiating formation of IAA/ setting of fruits after fertilization
- Formation of side branches (of stems) and dormancy (in buds); inhibit growth of adventitious roots.
- Activates (hydrolytic) enzymes during germination/ promotes germination of seeds/ breaks seed dormancy.
- Affects leaf expansion and shapes / retard leaf absecission

CYTOKININS' Accept any correct example kinetin 8 zeatin

- Breaks dormancy (in some species); promotes flowering in some species
- Promotes cell division (in presence of IAA)
- Stabilizes proteins and chlorophyll
- Promotes root formation
- Low concentration encourages leaf senescence/ high concentration protein increased cell enlargement
- Promotes flowering (in some species)

Ethylene / Ethene / C2114 (reject ethane)

- Stimulate lateral bud development
- Ripening of bananas/ fruits
- Induces thickening of stem/ inhabits stem elongation
- Promotes germination of certain seeds/ acc promotes flowering in pineapples
- Causes abscission pf leaves/ fruits/ leaf fall abscisic acid / ABA
- High concentration of ABA stomata closure (by interfering with uptake of potassium ions
- Inhibits germination/ growth of embryo/ cause seed dormancy
- Causes abscission of leaves/ fruits / leaf fall
- Inhibit elongation growth, inhibit sprouting of bud/ induces dormancy in buds (accept Dormin causes/ dormancy in buds/ seeds

Traumatin

- Heal wounds by callus tissue formation

Florigens

- Promote flowering

20. (a) **Hydrostatic**
    - Exoskeleton
    - Endoskeleton

(b) Cervical vertabrae

Vertebraterial canals for passage of (vertebral) artery; atlas has (broad) surfaces for articulation with condylyses of skulls to permit nodding

- Axis has adenoid process/ protein Centrum to permit rotary/ turning act as a pivot for atlas/ skull/ movement of atlas/ Branched / forked/ short/ broad transverse processes, for attachment of (neck) muscles; ace zygopophysis, for articulation between vertebrae (acc. Vertebraterical canals and zygopophogen if shown on a diagram of the vertebrae
- Has a short reduce neural spine, for attachment of (neck) muscles, has wide / larger neural canal; for passage of spinal cord/ alternatively has wide neural for protection of spinal cord.

Lumbar

- Broad/ long/ neural spine for attachment of (powerful back) muscles long/ large/ well development/ transport processes for attachment of muscles (that maintain posture and flex the muscles)
- Has metamorphosis and hypothesis for muscle attachment large/ thick centrums for support
- Prezygapophysis/ post/ zygapophysis for articulation between vertebrae (acc. Anapophysis for hypopyses)

<u>Sacral Vertebrae</u>

- Anterior vertebrae has a well developed transverse process, which are fused to the pelvis girdle/ articulate with pelvic girdle
- Vertebrae fused, for strength transmit weight of the stationary animal to the rest of the body.
- Sacrum has a broad base/ short neural spine; for attachment of (back)

BIOLOGY PAPER 231/1 K.C.S.E 2003
MARKING SCHEME
SECTION A (20 MARKS)

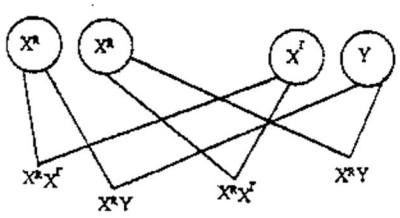
Answer all the questions in this section in the spaces provided.

1. a) Anaerobic respiration / fermentation; Acc. Alcohol production / drawing dough.
   b) Brewing/ Banking.
2. Chordata
3. By pollen tube that grows through style
4. a) Rhizobium
   b) Convert nitrogen into nitrates / convert nitrogen into proteins / convert N2 into nitrogenous Compounds / foxed N2 into nitrates.
5. a) Ulna
   b) radius;
      Humerus;
6. Analogous structures – structures which (appear similar and) perform similar functions but have different origins.
   Homologous structures – structures which have a common origin but (have evolved to) perform different functions.
7. a) Zone of cell division Acc cell multiplication
      Zone of cell elongation / enlargement; Acc expansion for elongation
   b) To protect root tip
8. Absorption of water; accept absorption of salts / calcium / iron; secretion of mucus
9. a) lignin
   b) Phoem
10. Numerous chloroplasts to absorb light / epidermis have chloroplasts to absorb light.
    - Deeply divided / truncated leaves / branched leaves to increase surface area.
    - Large air spaces for storage of air / buoyancy; acc parenchyma tissue for storage of air
    - Have no cuticle to facilitate exchange of gases
11. Salmonella typhi; Acc.Bacteria / salmonella alone

SECTION B (40 MARKS)

12. a) Genes are located on the sex chromosomes; they are transmitted along with those determining sex.
    b)- Colour blindness
    - Hair ears / pinna
    - Haemophila
    - Baldness

    c) X^RX^R X X^rY;



Accept Punnett Square

X^RX^R	X	X^rY
♀ ; ♂	X^r	Y
X^R	X^RX^r ;	X^RY
X^R	X^RX^r	X^RY

13. a) i) Oxygen
ii) Carbon dioxide
b) Oxyhaemoglobin
c) i) The blood plasma except blood cells and proteins; that has filtered out of the capillaries.
ii) It is a medium of exchange of substances/ materials between capillaries and body cells; supply nutrients to cells / supply oxygen to cells / remove waste products from cells.
d) i) Hepatic portal vein
ii) Pulmonary artery

14. a) Swallow plenty of sea water to increase amount of water in the body
- Have chloride secretory cells in the gills to remove excess salts
- Eliminate nitrogenous wastes in form of trimthylamine exide which requires little water for elimination.
- Few / small glomeruli; thus slow filtration rate in the kidneys.

b) Less ADH secreted (by pituitary gland); causing less reabsorption of water in the kidney tubules; thus resulting in dilute urine.

15. a) i) Thigmotropism / haptotropism
ii) Contact with support; causes migration of auxine to enter the side; causing faster growth on the side away from centre of surface (causing tendrils curl around support.)
b) Escape injurious stimuli / seek favorable habitats; move towards light / stimuli.
c) Induce foot growth in stem cutting
- Selective weed killers
- Encourage apical dominance
- Encourage sprouting of side brances
- Breaking seeds dormancy
- Induce pathencarpy
- Promotes flowering
- Induce fruit fall
- Accelerates ripening of fruits.

16. a) i) study of a single species within a community / ecosystem / habitat / environment.
ii) Synecology?
Study of natural communities within an ecosystem

b)

Leaf	**Habitat**
A	aquatic / fresh water
B	Forest; Terrestrial
C	Arid / semi arid; desert.

c) Sunken
Hairy
Reserved rhythm
Small stomatal pore

SECTION C (40 MARKS)

17a)

b) $\frac{80 - 18}{2.5} = \frac{62;}{25}$ 2.48C /Min

c) **Control**

d) Rate was faster in tube A; because the film of methylated sprit evaporated; removing heat from the tube;

e) Convection ; radiation

f) Lower rate of heat loss;

g) i) birds
Feather
ii) Mammals?
Fur

h) i) external temperature changes
Temperature
ii) Internal temperature changes
Hypothalamus

Q 18. Sclerotic layer – (made up of collagen fibres thus) protects the eye
maintains shape of eyeball.

Cornea - Allows light to enter the eye
- Refracts light towards retina

Conjunctive - Protects cornea

Eyelids - Protects cornea from mechanical & chemical damage / protects eye form entry of foreign particles.
- protects retina from bright light (by reflex action)

Choroids –(Contains black pigment which)prevents reflection of light within the eye / absorbed light.
-Nourishes the eye / retina / supply oxygen / remove CO2

Ciliary muscles – Alter shape of lens during accommodation
- Ciliary body produces aqueous humour.

Suspensory ligaments – adjusts shape of lens during accommodation

Lens – Refracts light rays / focuses light on retina

Vitrerous aqueous humour once.

Aqueous Humour – Nourishes cornea / lens
Refracts light
Irus – (pigmented thus) – gives the eye its colour / absorbs light controls amount of light entering the eye / adjusts size of pupil impulses.

Pupil – light enters the eyes through pupil.

Retina – has photoreceptor cells / rods / cones / image formation ;l generates impulses.

Fever / yellow spot – visual acuity / most sensitive part of retina with only cones.

Blind spot – point where nerve fibre emerges from the optic nerve / where the optic nerve leaves the eye / point where blood vessels & nerve fibres enter the eye.

Optic nerve – transmit impulses to brain.

Q19. Water dispersed fruit / seeds

- Mesocarp / seed has air spaces thus light / buoyant to float.
  Therefore carried away by water.
- The fruit / seeds are protected from soaking by water proud pericarp.
-

Animal dispersed fruits / seeds

Presence of hooks for attachment to animals; thus carried to other placed
Fruits are brightly coloured; succulent; aromatic attract animals, which feed on them.
The seed coats are registrant to digestive enzymes; thus carried to other places on them.
The seeds are dropped always from parent plant in faeces/ droppings.

Self dispersed fruits / seeds / explosive mechanisms

The dry pods / fruit split (along lines of weakness / satures)
Scattering seeds away from parent plant

Wind dispersed fruits / seeds

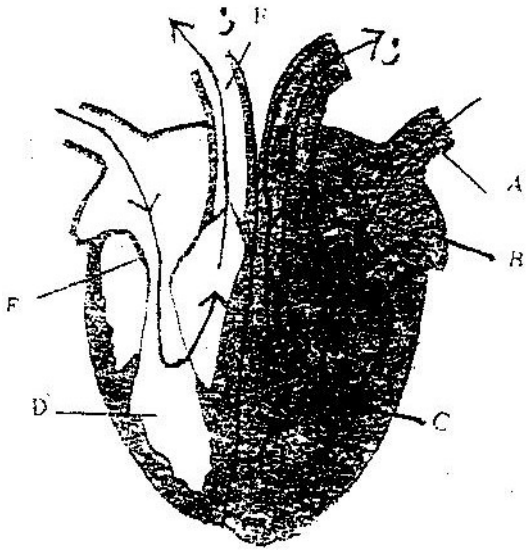
Censer mechanism
Perforated capsule is usually loosely attached to stalk / the long stalk is swayed by wind scattering seeds.
Presence of hairs / wing – like structure, floss / extensions which increase surface area / for buoyancy making is easy for fruits / seeds to be blown away
Fruits / seeds are light due to small size; therefore easily carried a ways by wind.

K.C.S.E 2004 MARKING SCHEME
BIOLOGY PAPER 231 /1

1. a) Intervertebral disc.
   b) -Act as a cushion / absorbs shock;
   - Reduce frictions; flexibility of the vertebral column. Rej. prevent avoid.
2. - Natural immunity is inherited / transmitted from parent to offspring;
   - Acquired immunity is developed after suffering from a disease / thought vaccination.
   * Accept innate / inborn for natural Rej. Born with it.
3. Has air spaces; which store gases for gaseous exchange buoyancy;
   Acc. Floating.
4. -Ethanol / Alcohol
   -Energy / ATP/ 210kj / heat;
   Rej. atp, formula of alcohol.
5. Prophase 1;
6. a) Myopia/ shortsightedness / short sight
   b) Concave lens / divergent lends; to diverge the rays so that the image is focused on the retina
   Acc. Concave.
7. a) Stores hydrolytic enzymes for destruction of worn out organelles / cells / tissues / digestion of bacteria. / pathogens;
   Acc. Digestion of food / accept autolysis.
   b) processing / packaging synthesized and transporting of packaged cell materials;.
   Production of lysosomes/ secretions of packaged material;
8. Insecta; Rej insects/ exopoda
9. Nitrogen;
   Magnesium;
   Iron, acc. Magnesium ion/ iron rej symbols of elements
10. Thickened walls/ lignified accept lignin
11. Parthenocarpy
12. (a) RR WW
    (b) Parental genotypes RW X WW
    Gametes R W R W
    Fertilization
    Offsprings RR RW RW WW
    (c) (i) Phenotypic ration Red Pink White
    1 2 1
    (ii) 1RR : 2RW; 1WW
    (a) (ABO) blood grouping; blood groups; reject Rh factor

13. (a) A Pulmonary vein
    B Left atrium I auricle
    E Tricuspid valve
    F Pulmonary artery

(b)



(b) The left ventricle 'C' pumps blood a longer distance to all parts of the body; while the right ventricle 'D' pumps blood to a shorter distance/ to the lungs; therefore the left ventricle has thicker walls to generate exert more pressure.

14. (a) Lamarckian
Inheritance of acquired characteristics/ Environment induces production of inheritable character which is then inherited.

Darwinian
Inheritance of genetically acquired characteristics/ character happens to appear spontaneously which then gives advantage to organisms therefore better- adaptable characters are then inherited by natural selection.

(b) (i) Have a common (embryonic) origin modified to perform different functions; vertebrae for limb/ pentadactyl limb
Example
Vertebrate fore limb/ pretadactyl limb; acc beaks of birds (fee of birds/ mouthparts in insects.

(ii) Have different (embryonic) origins (but have evolved) to perform similar functions.

(iii) Are greatly reduced in size and therefore caused to function
Acc. Third digit of wing of bird
- Halteres in flies
- Presence of hind limb (buds) in python
- Human ear muscles

Example
Human appendix / kiwi (flightless bird) with reduced wings/ vestigial wings in flies human hair/ presence of hind limbs in python; reduced pelvic girdle of whale.

15. (i)

anther	Insect	Wind
Small short anther firmly Attached to elements		Large/ long anthers/ loosely attached to filaments

(ii) Large heavy/ spiky small/ light/ smooth
(iii) Small/ sticky Long feathery
Reject short stigma/ negative comparisons

(b) Source of variation/ hybrid acc. Production of hybrid
Rej heterosis/ vigour

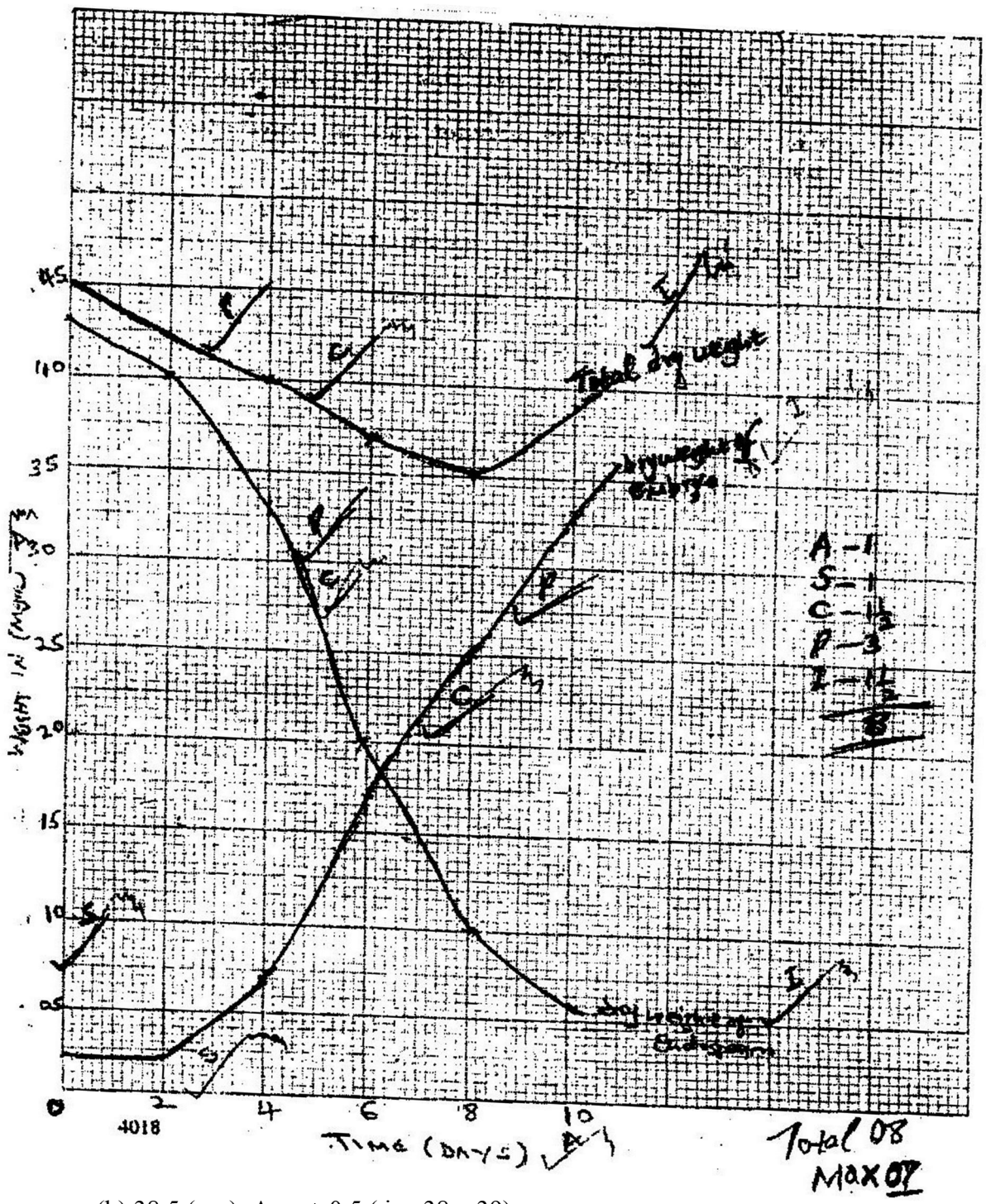
16. (a) The movement of molecules; from a region of high concentration to a region of low concentration; until the molecules are uniformly distributed in the medium)
Acc. Particles for molecules;
Rej substance for molecules

(b) (i) The higher diffusion gradient between (two points) the rate of diffusion; acc converse.

(ii) The higher the surface area:: Volume ratio, the faster is the rate of diffusion ; acc converse

(iii) Increasing temperature increases the rate of diffusion; acc converse.

(c) Reabsorption of glucose/ some salts in the kidney/ by kidney tubules;
- Absorption of digested food/ from the alimentary canal
- Reabsorption of useful material in the blood stream
- Accept sodium pump mechanism in the nervous system, the nerve cell
Rej. Sodium pump mechanism alone.



(b) 38.5 (mg); Acc. + 0.5 (i.e. 38 – 39)

(c) (i) Hydrolysis of starch into simple sugars; which are translocated to the embryo;
Respiration/ to give energy/ heat/ gases
Acc. Simple sugar oxidized
Rej. Oxidation of starch/ endosperm.

(ii) New materials are synthesized from protein); bringing about growth of embryo; acc new cells/ protoplasm synthesized

(iii) The rate of respiration is faster than that of synthesis of materials for growth

(iv) First leaf (carried out photosynthesis) leading to growth

(d) (i) Presence of absiscic acid/ germination inhibitors;
Embryo not fully developed
Absence of hormones/ enzymes that stimulate germination
Impermeable seed coat; rej hard seed coat
Acc. Inactive enzymes/ hormones/ absence of gibberellins/ cytokinins.

(ii) – Unsuitable / unfavourable temperature
- absence of light
- lack of water
- lack of oxygen
- rej. Premature for immature

(c) Dense cytoplasm
- Thin cell wall
- Absence of vacuoles (cell sap)

18. The skin is made of epidermis and dermis. The epidermis is made up of three layers. The outermost layer is known as cornified layer; made up of dead cells that protect against mechanical damage/ desiccation/ microbes; the granular layer; is made up of living cells that give rise to the cornified layer, the malpighian layer; contain actively dividing cells that rise to new epidermal cells, that contain melanin that protects the skin against ultra violet rays.

- The dermis has several components has sweat glands' sudondic glands that produce sweat; sweat evaporates carrying it with latent of vaporization) thus reducing the body temperature; under cold conditions little/ no.
- Sweat is produced thus heat is conserved; the sweat contains water/ sodium chloride/ uric acid/ urea; the skin is excretory organ.
- Has hair, the hair stands erect to trap air when temperature is low to reduce heat loss/ lies flat to allow heat loss when the temperature is high.
- Has nerve endings, which are sensitive to stimuli/ such as heat/ cold/ pain/ pressure/ touch
- Has subcutaneous fats/ adipose tissue, that insulate the body against heat loss.
- Has arteriole; that vasodilate when temperature are high to lose heat by radiation/ convection (see converse)
- Has sebaceous gland; which secrete sebum, an antiseptic/ water repellant/ that prevent drying/ cracking of skin/ skin supple
  Acc blood vessels/ capillaries for arterioles to supply food/ nutrients/ oxygen/ remove excretory products.

19. **Wind.**
In windy conditions the rate of transpiration increases; wind disperses fruits/ seeds; is an agent of pollination; acc. Spores for seed.

Temperature
Changes in temperatures affects the rate of photosynthesis and other biochemical reactions/ metabolic reactions/ enzymatic reactions/ enzymatic reactions, temperature increases rate of transpiration;

Lights
Plants need light for photosynthesis, some plants need light for flowering/ photoperiodism/ seeds like lettuce require light for germination.

Humidity
When humidity is low, the rate of transpiration increases;

PH
Each plant requires a specific pH to grow well/ acidic/ alkalinity/ neutral;

Salinity
Plants with salt tolerant tissues grow in saline area, plants in estuaries adjust to salt fluctuations;
Topography
North facing slopes in temperature lands have more plants than south facing slope
Plants on windward side have stunted/ distorted growth;
Acc. Comparisons of mountains and valleys
Acc. Description of other areas with other topographies e.g. River valley rainfall/ water

- Fewer plants in areas/ semi arid and
- Water is needed for germination/ is a raw material for photosynthesis/ dissolves/ minerals salts/ provides turgidity for support/ fruits/ seeds

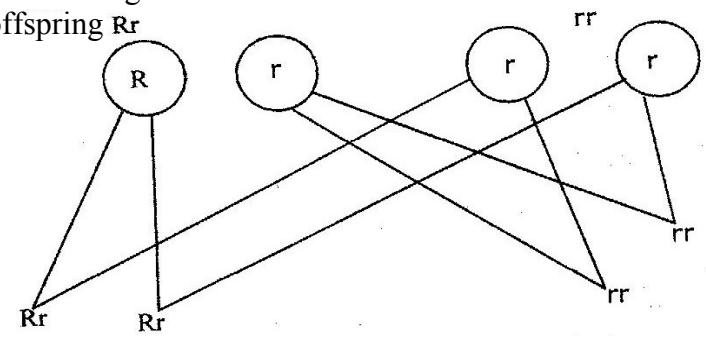
Pressure;
Variation in atmospheric pressure affect availability of CO+2+ which affects photosynthesis and low pressure increase rate of transpiration; and affect amount of oxygen; for respiration

Mineral salts/ trace elements
- Affects distribution of plants in the soils
- Plants thrive well where there are mineral salts in the soil

Plants living in the soil deficient in particular mineral element have special methods obtaining it; for example legumes obtaining from nitrogen by fixation or carnivorous.

K.C.S.E 2005 BIOLOGY PAPER 1(THEORY)
MARKING SCHEME

1. Maintain balance and posture of the body
2. a) X – Chloroplast
   Y – Cell vacuole / sap vacuoles
   b) To receive maximum amount of light.
3. Xylem vessels transport water and mineral salts from the roots to the leaves. Phloem tissues transport manufactured food/soluble Organic products of photosynthesis within the plant.
4. a)It is the process through which ancient simpler forms of life under went gradual series of small changes for many million years, to give rise to the modern species of life // accepts as a theory formed one large single land mass, which later broke up into parts which drifted from one another forming the present day continents.
5. Arachnida
6. Lactic acid
7. -Absorption of water to the soil
   - Support in seedlings, leaves and herbaceous plants.
   -Opening and closing of Stomata
   -Distribution of water from cell to cell
8. -Embryo may not yet be fully developed
   -Presence of chemical inhibitors e.g. abscisic acid, inhabit germination.
   -Low hormone and enzyme concentrations e.g. gibberellins
   -Hard and impermeable seed coats, preventing air and water entry.
   -Low temperatures which inactivate the enzymes.
9. It does not easily dissociate and therefore reduces the capacity of hemoglobin to transport oxygen to the tissues.
10. Entamoeba hystolystica
11. a) W – Spinal column / reutebral column
    Y – Sternum
    Z – Intercostal muscles.
    b) The external intercostals muscles contract while the internal intercostals. Muscles relax. This movement pulls the ribs upwards and outwards. The diaghragm muscles contracts (flattens).The thoracic volume increase while the pressure reduces, leading to atmospheric air rushing into the lungs through the nose and trachea hence inflating the lungs.
12. a)3:1
    b) (i) Parent gametes
    f_2 generation offspring Rr
    (ii)1:1



c) Apart of Genes with contrasting characteristics

13. a) E – Malpighian layer
F – Nerve cell
G – Erector pili muscle

b)i) H – Excretion of waste products of metabolism from the body e.g. excess.
-Water, mineral salts traces of urea, lactic acid etc.
-Temperature regulation in the body brings a cooling effect through
- Loss of excess heat by evaporation of water.
-Keeps the hair and epidermis flexible and water proof
-Contains antiseptic substances for protection against bacteria.

14. a)Transpiration

b)i)The leafy shoot should be from herbaceous plant
- Cut off the last few centimeters of the stalk under water
-All the air in the capillary tubule should be expelled
-Jelly should be applied around the stem around the rubber bung.
-The end of the capillary fusing should rest in beaker of water.

ii) Avoid air bubbles.
-For continuity of the flow of water
-Jelly should not touch the xylem vessels because it might block they xylem.
-To avoid introduction of air bubbles in the xylem.
-For continuity of water uptake.

c) –Temperature
-Humidity
-Wind
-Atmospheric pressure
-Light intensity
-Availability of water

15. a)i)A flower whose ovary is situated below the other floral parts.
ii) A flower with only the male reproductive parts parts (male flower)

b) Larger anthers.
-Anther loosely attached
- Flexible filament
-Small, smooth and light pollen grains

16. a) - Fungus
-Bacteria

b) Refrigeration
-It inactivates disease causing organisms/micro-organisms.
Irridation –The radiation kills/destroys the micro-organism.
Pasteurization (for milk only)
Canning-Kills the micro – organisms.

17. a)Photosynthesis

b)Heterotrophic – holozoic

c) Small fish pond / dam, rain forests.

d) Algae ⟶ Zoo plankton ⟶ small fish ⟶ bird ⟶ large bird.

e)-Snails would increase in number
-Bird M would increase in number.
-Green plants would decrease in number

f) The energy to be passed on from one trophic level to the next is contained in food materials. Most of the food taken in by consumers passed on from one trophic level to the next is consumers passes through the digestive track as undigested matter that is removed as faeces. The digested materials are absorbed in to the bloodstream and conveyed to various tissues of the body. Most of the absorbed food materials are used in respiration, to Produce is lost as heat during sweating, evaporation and transpiration in plants.

g)i) Scavengers e.g. vultures
Decomposers e.g. bacteria

ii) Scavengers feed on dead bodies of herbivores and carnivore // the consumers.
-Decomposers act upon the remains of the producers, consumers, &
Scavengers causing decay, to release inorganic materials, which are later re-used by producers to make new organic compounds.

h) i) -Deforestation
-Overgrazing
-Soil erosion
-Hunting, poaching
-Over fishing
-Poor waste disposal // Environmental pollution

ii) **Deforestation**
Lack of trees leads to reduced number producers in an ecosystem.

Overgrazing
Many animals eat away and trample the vegetation hence reducing / depleting the number of producers.
-Lead to gully erosion hence carrying away some of the underground and crawling animals (Consumers)

18. **Gaseous exchange in terrestrial plants.**
Gaseous exchange in plants involves two main respiratory gases: carbon IV oxide and oxygen.
During daytime green plants take in carbon IV oxide for photosynthesis and oxygen for respiration. During photosynthesis oxygen is given out as a by product and released to the atmosphere. In plants such as the flowering plants stomata in the leaves and lenticels in the woody stems and pneumatophores/breathing roots in aquatic woody plants provide the surface for gaseous exchange. Gaseous exchange taken place by diffusion across the respiratory surface.

Stomata
These are located mainly in the leaves and in younger parts of the stem. The opening and closing of stomata is controlled. Mainly by the intensity of light. They are normally open during the day and closed during the night. Several theories explaining the mechanism of stomata opening and closing have been put forward.

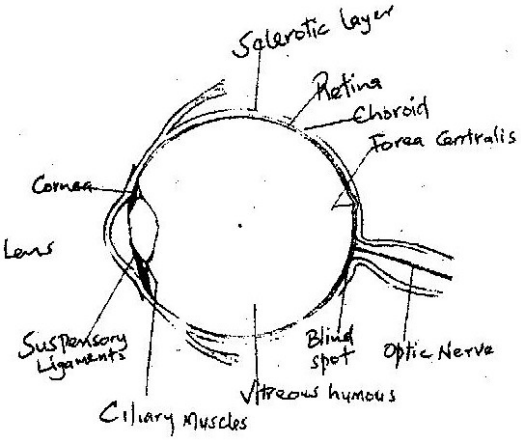
1. **Photosynthetic theory**

Guard cells have chloroplasts. During daylight, they carry out photosynthesis producing surges. The surges increase the osmotic pressure of the cell sap. This causes water to more into guard cells from the neighboring epidermal cells by osmosis.
The results is an expansion and increase in turgidity of the guard cells causing the stomata to open.
In darkness photosynthesis stops. The sugar in the guard cells is converted to starch. This lowers the osmotic pressure of guard cells causing the to lose water to neighboring cells by osmosis.
The guard cells become flaccid and the stomata close.
The guard cells become flaccid and the stomata close.

2. **Starch – sugar interconversion**:
The enzymatic conversion of starch to sugar proceeds more readily in an alkaline environment(high PH).The conversion of sugar to starch occurs more readily in an acidic environment (low Ph).During the night, when photosynthesis is not taking place, carbon dioxide accumulates in leaf cells it combines with water to form carbonic acid. This lower the PH in the guard cells leading to conversion of sugar to starch this decreases the osmotic pressure in the guard cells causing them to lose water to the neighboring epidermal cells. The guard cells become flaccid and the stomata close.
During daylight, when photosynthesis is taking places, the concentration of carbon dioxide in the leaf cells, raising their PH, and favouring the conversion of starch to sugar. This increases the osmotic pressure in the guard cells causing them to take in is an expansion and increase in turgidity of the guard cells causing the stomata to open.

3. Potassium Ion (K+) mechanism
When guard cells are exposed to light, their chloroplasts manufacture ATP. The ATP drives at K+ pump in the cell membrane of the guard cells. This causes an active uptake of K+ into the guard cells from surrounding epidermal cells.
Accumulation of K+ in guard cells increases the osmotic pressure of their cell sap. This causes water to move into the guard cells from neighbouring epidermal cells by osmosis. The result is an expansion and increase in turgidity of the guard cells causing the stomata to open.
-At the onset of darkness, chloroplast stop making ATP and its concentration in guard cells falls rapidly stopping K+ pump, K+ migrate from the guard cells
Causing them to lose water to the neighbouring cells by osmosis. The guard cells become flaccid and the stomata close.
-Water molecules are pumped into the guard cells from adjacent epidermis cells.
-A small extent of gaseous exchange takes place in the stem through structures called lenticels.
These are small gaps in the bark usually circular or oval & slightly raked on the bark surface.
The cells in these area are thin walled and loosely packed leaving air space which communicates with air spaces in the cortex. Hence 0_2 for respiration is taken up & $C0_2$ is given out.

19. **Adaptations of the eye.**



The presence of:-

-The **sclerotic** layer which contains tough connective tissue fibres which helps it to support and protect the other parts of the eye ball.

-The **choroids** which contain many blood capillaries which supply oxygen and nutrients of the retina and removes metabolic wastes from eye.

-Its highly pigmented, to prevent reflection of light within the posterior chamber of the eye ball.

-The **retina** which contains photoreceptor cells called cones and rods. It is said to be the light sensitive part of the eye. Cones are adapted for light and colour vision while rods are adapted for dim light vision.

-The **vitreous humour**-Which is under pressure. It helps to maintain the shape of the posterior chamber of the eye ball. It also plays an important part in the refraction of light rays enabling them to be focused on the retina.

-**The cornea**, transparent and curved which helps to play an important role in focusing of the image on the retina. It accounts for the largest refraction of light rays.

-**The aqueous humour** –Contains oxygen and nutrients, which nourish the cornea and the lens. It is under pressure thus helping to maintain the shape of the anterior chambers of the eye. It also plays a part in the refraction of light rays enabling them to be focused on the retina.

-**The Iris is heavily** is heavily pigment, to prevent entry of light into the eye except through its central aperture called the pupil. It contains circular and radial muscles which constrict or dilate the pupil depending on the intensity of light.

-**The Iens** is elastic, therefore allows changes in its shape depending on the tension exerted through the suspensory ligaments. This enables it to bring light rays causing from either near or far objects into sharp focus on the forea.

-The ciliary's body Contains the ciliary muscles whose contraction and relaxation alters the tension exerted on the suspensory ligaments.

This in turn alters the shape of the lens enabling it to focus for both near and distant objects.

-**The eyelids** which are movable and opaque structures can be closed through a reflex action to protect the eye from too much light or from foreign objects.

- **The eye muscles** help to move the eye ball within the orbit. The lateral rectus muscles move the eye up and down whole the oblique muscles the eyeball in its up and down movement.

-**The lachrymal gland** which continuously secretes a watery, saline and

antiseptic fluid called tears. The tears moisten the cornea and wash foreign particles out of the eye.

-**The eyelashes,** which are many hairs, protect the eye from the entry of small foreign particles.

-**The eyebrows** raised portion of the skin above the eye, thickly covered with hair, whose functions are to prevent sweat and dust from entering the eye.

MARKING SCHEME K.C.S.E 2006
BIOLOGY 231/1

1. (a) To increase surface area for attachment of respiratory enzymes/ site for A.T.P formation/ site for energy production / site for respiration
   (b) (i) Stroma
   (ii) Bearing photosynthesis pigments/ chlorophyll/ site for light dependent reaction/ site for photolysis
2. (a) Ovule
   (b) Ovary
3. (a) Scherenchyma; Xylem vessels/ xylem tracheids/ xylem tracheids rej. Sclereids
   (b) Cell take in water and became turgid; (OWTTE)

4. (a) Sebum
   (b) Kills micro organisms
   - Cools the body
   - Getting rid of waste/ excretion
   Accept named example. E.g urea, sodium chloride, excess water, uric acid, tactic acid.
5. - Stomata found on upper epidermis to allow efficient gaseous exchange
   - Presence of large air spaces/Aerenchyma tissues to enable it float/Bouyant/
   - Storage of air
   - absence of cuticle to enhance gaseous exchange.

6. (a) - The genetic/ nuclear material is not surrounded by membrane.
   - smaller in size/ smallest.
   - Lack most organelles/ few organelles/ lack nucleolus
   Mitochondria, Ribosome/chloroplast/ lysosomes
   Endoplasmic reticulum/ Golgi apparatus
   (b) Insecta
7. (a) Thrombosis/Varicose veins/Arterion sclerosis/ Antheroma
   Antherosclerosis
   Accept cerebral vascular thrombosis
   (b) - Regulation of the body temperature
   - Regulation of pH of fluids
   - Defense against disease – causing organism/ pathogens/ infection.
   - Prevent excessive bleeding by enhancing clotting/ prevent excessive loss of blood

8. Prevents scurvy/ prevent bleeding of gums/ prevent bleeding of gums/ Prevents poor healing of wounds/ prevent degeneration of muscle and cartilages/ prevent red spot on skin/ prevent anemia
   Excretion absorption of iron
   Enables absorption of iron
   Boost immunity
   Development of healthy gums
   Synthesis/ maintenance of collagen fibres/ connective
9. (a) - Sister chromatids separate
   - Sister chromatids move to opposite poles of spindle fibre

- Accept chromatids separate at the centromere to mean chromatids

(b) - Gamete formation; accept sex cells formation
- Source of variation; rej. Reproduction cells

10. Move towards favorable environment; accept converse

11. Stimulates conversion of excess glucose to glycogen for storage
Enhances break down of glucose; stimulates glucose converts to fats and stored.

12 (a) Visking tubing will become turgid; accept will increase in volume / bulges/ swells/ becomes bigger/ expands.

(b) Sucrose solution is hypertonic/ water is hypotonic; water moves from beaker into visking tube by osmosis though semi permeable visking tubing, making visking tubing turgid.
Or water moves from beaker into visking tubing by osmosis, through semi permeable visking tubing; with hypertonic solution.

13 (a) - A.T.P/ adenosine triphosphate rej A.T.P

(b) -Brewing of alcohol accept examples;
- Baking of bread.
- Biogas production
- Compost manure formation
- Silage formation
- Commercial production of citric acid
- Sewage treatment.

14 (a) Epigeal – cotyledon are brought above ground surface
Hypogeal- cotyledon remains below surface.

(b) Required in aerobic respiration/ oxidation; to release energy from food reserve for germination; rej. Oxidation for starch (i.e. starch can not be oxidized before hydrolyzed).

15. Current continents existed as one large land mass/ Pingea/ Laureshia Guondaland; the present continent drifted leading to isolation of organisms; organism in each continent evolved along different lines hence emergence of new species,

16 (a) Decomposer – recycling of nutrients

(b) Predation – regulation of numbers/ population

17 (a) Homodont – having same kind/ type/ similar teeth. Heterodont – having different type kind of teeth

(b) Cutting/ chopping/ Shearing/ Slicing/ crusting

(c) $C \frac{0}{1} PM \frac{3}{3} M \frac{3}{3}$
Either capitals or small letters accepted. Their must horizontal line separating upper jaw from lower jaw.

18. (a) emulsification of fats/ breaking into small droplets; Increase surface area for digestion; Neutralizes acidity of chime/ provides alkaline media for enzyme action.

(b) Increase in substrate concentration rise enzyme action up to a certain point and further rise of substrate will have no effect.

19 (a) (i) Protoandry – Male reproduction organ/ anthers androecia/ stamens mature earlier than female reproduction organ/ carpels/ stigma/ pistil/ gynoecium.

(ii) Self sterility- pollen grains are sterile to stigma of some plants/ flowers

(a) – Increases variety;
- Hybrid vigour/ heterosis
- Resistance of disease/ drought/ dry climate/ unfavorable environmental conditions/ Frost; E.g. resistance to virus, fungi, bacterial diseases of pest.

20.(a) Thigmotropism/ Haptotropism; rej. Haptotrophism/ thigmotrophism

(b) Exposes leaves/ shoots for maximum/ a lot of absorption for sunlight for photosynthesis;
- Enable roots of plants to seek/search water; rej mineral salts/ ions alone.
- Enables plants stems to obtain mechanical support especially those that lack woody stems
- Enables roots to grow deep in soil fro anchorage
- Enable pollen tube to grow towards embryo sac to facilitate fertilization

21.(a) X- motor neurone- accept of motor neurone rej. Axon alone
Y- Sense organ/ receptor

(b) Acetyl; chlorine/ noradrenaline (Nerepinephrine)

22. (a) They contract and relax, to alter the shape of lens.

(b) **Rodes**	**Cones**
Perceives light of low intensity	Perceives light of high intensity
Not Sensitive to colour	Sensitive to colour
Have low visual acuity	Have high visual acuity

23. (a) Ear Ossicle – transmits/ magnify/ amplify sound vibration.
Rej. Sound waves
(b) Cochlea – converts sound vibrations into nerve impulse
(c) Semicircular canals- for body posture/ balance
(d) Eustachian tube- balances pressure in middle ear to that of outside.

24. Thin walls/ thin epithelium for faster diffusion of gases/ to reduce distance for faster diffusion.
- Moist for dissolving gasses
- Large surface area for maximum diffusion/ gaseous exchange
- highly vascularized to facilitate diffusion/ to enhance gradient.

- Speed up diffusion

25 (a) A mouse has a larger surface area to volume ratio than a dog, hence losses more energy per unit body weight/ mouse losses heat faster than a dog.

(b) Lactic acid, accept energy/ ATP

26. X- Denitrifying bacteria/ denitrification
Y- Animals/ Herbivores; accept primary consumers
Z- Nitrogen fixing bacteria (in soil) accept Azotobacter.

27. Hydrogen; Oxygen

BIOLOGY PAPER 231/2 KC.S.E 2006
MARKING SCHEME

1. (a) X- Femur
Y- Tibia
Z- Fibula

(b) (i) Synovial fluid
(ii) Lubrication of the joint/ shock absorption
Distribution of pressure

(c) Ligament

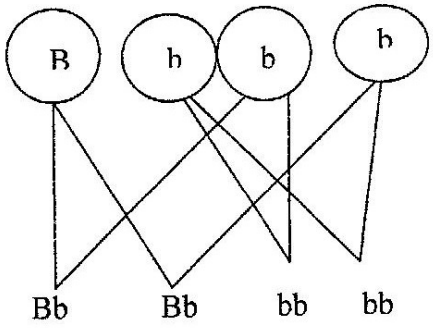
(b) Ball and socket joint allows movement in all planes while the illustrated allows movement in one plane only. Accept 360^0 for all planes 180^0 for one plane.

(c) Olecranon process.

2. (a) Albinism; sickle cell anemia; Haemophilia; colour blindness

(b) (i) Occurs when chromatids/ chromosomes break at 2 places and when rejoining the Middle piece rotates and joins in an inverted position.
(ii) Occurs when a section of chromatid break off and becomes attached to another chromatid of another chromosome.

Parental genotype gametes Bb x bb if other letters are used, penalize at parental genotype



	B	b
b	Bb	bb
b	Bb	bb

2 x 100 = 50%
4

3 (a) Pyramid of numbers is a diagrammatic representation of the number of organism, at each trophic level in a food chain; While biomass is a diagrammatic representation of dry weight organism at each trophic level in a food chain.

(b) Insufficient utilization of food resource/ wastage
Through respiration

Though excretion

(c) Run two ropes of parallel to each other a metre apart
Counts of shrubs are made between two ropes at marked points/ whole belt and recorded) repeat the process severally at least 3 times and obtain the average; calculate area of belt transect; calculate the population for whole area.

$$\frac{\text{Total area x count per belt}}{\text{Belt area}}$$

4 (a) Root

(b) Presence of root hairs
Presence of endodermis
Xylem star shaped at centre
Phloem at arms of the xylem

(c) J- Epidermis
K- Phloem
L – Xylem

(d) - Absorption of water
- Absorption of minerals salts

5. (a) Chorion

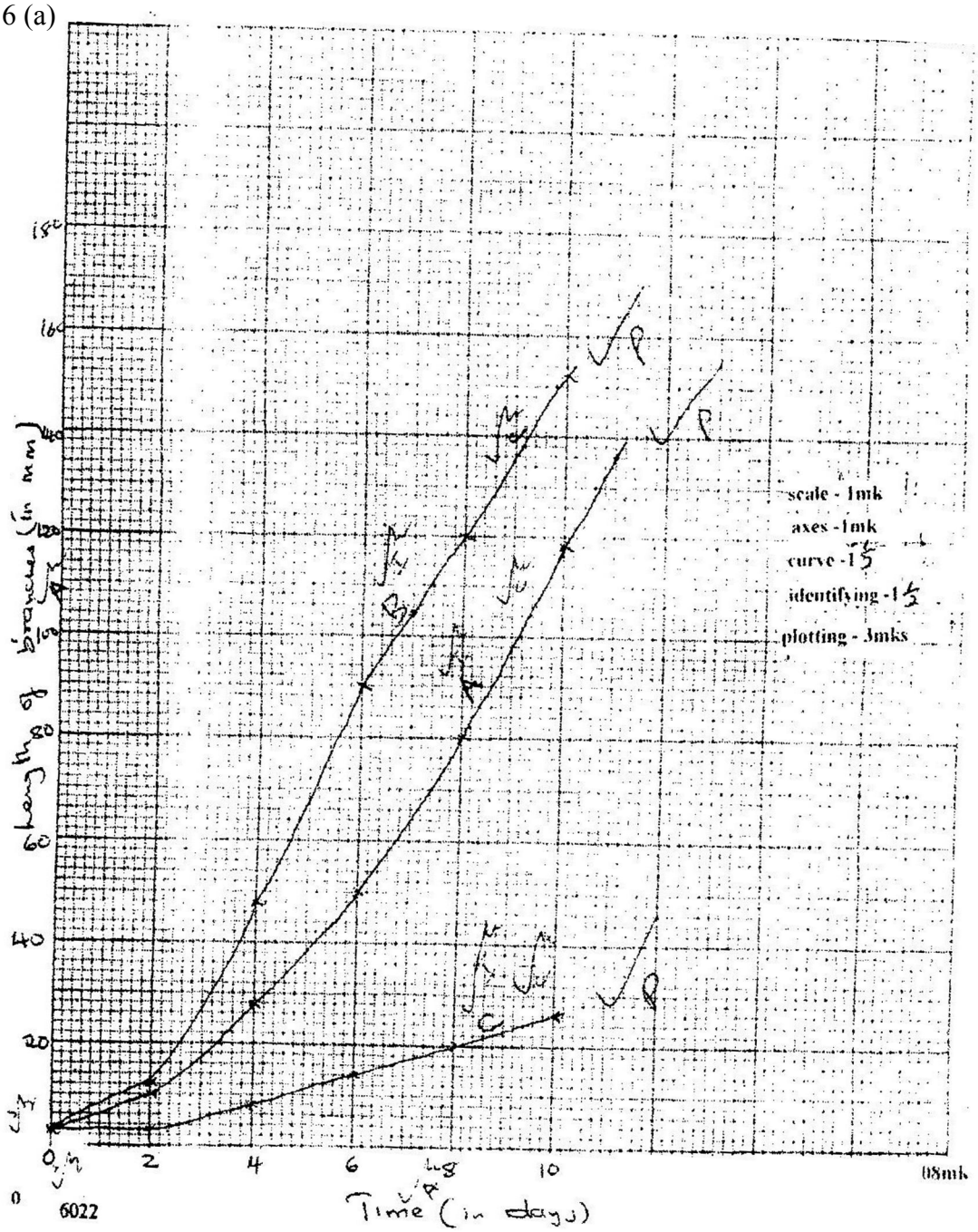
(b) (i) Arteries; veins

(ii) More food nutrients; more oxygen in veins less food nutrients more excretory products in arteries

(c) Highly vascular zed; large surface area
- Presence of secretory cells

(d) Cushion/ absorb shock

6 (a)



(b) (i) 105 + 1 (mm)
(ii) 134 – 140 (mm)

(c) **Graph A:** The tip of the shoot which was removed contained indole acetic acid (IAA); which causes apical dominance/ inhibits growth/ development of more lateral buds; hence lateral buds sprouted/grew.

Graph B; the gibberellic acid which was added on the cut. Promotes formation of lateral branches of stems, hence the fast growth of branches on shoot b.

Graph C; The shoot tip which remained intact contains IAA which inhibits growth/ development of lateral buds; hence little change of length of lateral branches.

(d) Control

(e) Increase productivity

(f) Promote cell division, and cell elongation

7. The afferent arteriole which is the branch of renal artery supplies blood to glomerulus; The afferent arteriole has a wider diameter than the afferent arteriole; this causes high pressure; leading to ultra filtration. The walls of the blood capillaries are one cell thick hence glucose, amino acids, (vitamins, hormones) salts, (creatinine) urea and water filter into Bowman's Capsule to form glomerular filtrate; White blood cells/ red blood cells and plasma proteins such as (Globulin, fibrinogen, platelets) are too large to pass through the capillaries: the filtrate flow into the proximal convoluted tubule; where amino acids (vitamin) and all glucose are selectively reabsorbs back into the blood stream. Many mitochondria provides energy for re- absorption of these substances against concentration gradient/ by active transport. The Glomerular filtrate flow into loop of henle. Water in descending loop moves by osmosis into the blood capillaries; sodium chloride is actively pumped from the ascending arm of loop henle into the blood capillaries. The glomerular filtrate flow into the distal convoluted tubule, water is absorbed from distal convoluted tubule into blood capillaries; the glomerular filtrate flows into collection tube/ duct from where more water is reabsorbed into the blood stream.

Antidiuretic hormone influences the amount of water reabsorbed (depending on osmotic pressure of blood); The glomerular filtrate from collecting duct now referred to as urine; is emptied into pelvis. The urine passes though pelvis and ureter into bladder out of the body through urethra.

8. Water exists as a thin film in the soil between soil particles. The concentration cell sap is greater than that of the surrounding solution in the soil; Thus drawing water molecules across the cell wall and membrane into the root hair cells; by osmosis; water drawn into the root hair cell dilutes the cell sap/ makes it less concentration than that in the adjacent cell into the cortex cells. (By osmosis); across the endosperm by active transport; into the xylem vessels (of the root); Then conduct the water up into the xylem (vessels) of the stem; into xylem of leaves. Water is pushed/ rises up the stem by root pressure (in the xylem vessels) water would rise by capillary; cohesion, and adhesive forces; water moves as a continuous an uninterrupted water column in the xylem (vessel) up the tree to the leaves. As water vaporizes from the spongy mesophyll cells; their cells sap becomes more concentrated than adjacent water flows into the cells from other surroundings cells; which in turn takes in water from xylem vessels within the leaf veins. This creates a pull / suction force/ transpiration pull that pulls a stream of water from xylem vessel in the stem and roots; the transpiration pull maintains continuous column of water from the roots into the leaves (transpiration stream).

BIOLOGY PAPER 3 (231/3) 2006
MARKING SCHEME

1 (a) Cervical region/ neck region (1 mark)

(b) K - Atlas
M - Axis
N - Cervical vertebra (3 marks)

(c) Wide neural canal
Absence of Centrum
Small neural spine (3 marks)

(d) spinal cord (3 marks)
Odontoid process

(e) S - Facets for articulation (2 marks)
T - For passage of blood vessels

(f) Occipital condyle (1 mark)

(g) U - Post zygapophysis
Y - Odontoid process
R - Centrum (3 marks)

2. (a) (i) The stem from L_1 is firm/ hard/stiff
The stem from L_2 is soft (2 marks)

(ii) Solution L_1 is hypotonic to the cell sap
Water moved into the stem cells by osmosis
Cells of the stem become turgid;
Solution L_2 is hypertonic
Water moves out of the cells by osmosis making the cells flaccid
(5 marks)

(b) (i) Material in L_1- The slit opens wider, and they bend backwards.
Material in L_2 The strips remain close together (3 marks)

(ii) In L_1 cells in the inner surface/ cut surface enlarged more because they took in more water; (by osmosis) than the outer cells which have cuticle.

3. (a) (i) Set A - Normal conditions/ in light
(ii) Set B - In the dark
(iii) Set C - Subjected to unilateral light (3 marks)

(b)

	SET A	SET B	
(i)	Green plants	Pale yellow plants	
(ii)	Large leaves	Small leaves	
(iii)	Short stems	Long stem	
(iv)	Thick stems	Thin stems	(4 marks)

(c) (i) Etiolation (1 mark)
(ii) To reach light (1 mark)

(d) Positive phototropism (1 mark)

(e) (i) Auxins migrate to the dark side
(ii) Causing faster growth of cells on the dark side
(iii) Resulting in the curvature of the shoot towards the source of light (3 marks)

K.C.S.E 2007 BIOLOGY PAPER 1
MARKING SCHEME

1. (a) Binomial nomenclature is a system of naming organisms by giving them two scientific name; the genetic and the specific names.

   (b) - It makes it easies to identify an organism
   - It is easier to describe an organism as it is based on characteristics of the organism
   - Large number of organisms is divided into smaller groups depending on characteristics
   - The whole world uses the same groupings, so that everyone understands each other.

2. (a) Drawing = $\frac{\text{length of the drawing}}{\text{Length of the object}}$

   (b) It is adding a dye to the specimen to make the feature clearer and distinguishable.

3. Plant cells have membrane and cell wall. When the cell is placed or immersed in distilled water, the water is absorbed by osmosis. As cell becomes turgid, the cell creates an inward force, wall pressure that prevents the cell from bursting.

4. From vesicles that transport materials to other parts of the cell e.g proteins.
   - Transportation secretions to the cell surface for secretion e.g. enzymes and mucus
   - They form lysosomes

5.

Diffusion	**Osmosis**
• Involves movement of particles of molecules of liquids or gas • It may be through a membrane or in air • Not affected by PH changes	• Involves movements of solvent molecules • It takes place though a semi permeable membrane • Rate affected by PH changes

6. Take place in the grana of the chloroplast. Light is absorbed and used to split water molecules into hydrogen ions and oxygen, photolysis. Energy is formed and is stored in form of ATP

7. (a) (i) – Pre- molar tooth
   (ii) – presence of two roots
   (iii)- Presence of cusps of the crown

   (b) Has nerve cells that increase sensitivity of the tooth to heat and pain
   - Has a blood vessel that provides nourishment to the tooth and remove waste products

8. (a) Vitamin D, Vitamin K.
(b)- Transmission of nerve impulses
- Ionic balance/ osmotic balance
- Contraction of muscles

9. Absence of cuticle to allow diffusion of water
- Thin walled to reduce distance of diffusion
- Elongated to increase surface area for absorption of water and mineral salts
- Presence of large vacuole to increase concentration gradient between cell sap and soil water

10 (a) Phloem tissues
(b) K- companion cell- L – sieve tube
(c) Supply nutrients and energy to the sieve tubes

11 (a) presence of valves
(b) Have biconcave shape to increase surface area for absorption of gases
- Thin capithelium to reduce distance of diffusion of gases
- Absence of nucleus and other organelles
- To increase packaging of hemoglobin
- Presence of red pigment hemoglobin that has high affinity for oxygen

12 (a) - Pneumatophores
- Aerenchyma tissues
- Cuticle

13 (a) (i) Ethanol and carbon (iv) oxide
(ii) Lactic acid
(b) It is the state when human body undergoes anaerobic respiration producing lactic acid. Oxygen has to be taken into the body to break the lactic acid

14 (a) (i) maintenance of a concentration of water and salts ion the body fluid.
(b) Insulin - Glucagon

15 (a) Population – It is all members of a given species in particular habitat at a particular time.
Community- all organisms belonging to different species interact in the same habitat.

(b)(i) Capture and recapture method
(ii) Line transect
- - Produce large number of eggs for increased survival
- Produce enzymes to digest human skin when penetrating
- Can withstand low oxygen concentration
- Have hooks – like structures to attach to the intestinal walls

17 (a) (i) Anaphase 1
(i) Homologous chromosomes separates at the equator

(ii) Chromosomes start migrating to opposite poles
(iii) Sister chromatids attached at the centromere
(b) Spindle fibres

18. Harmful characteristics from the parents may be passed on the offsprings
- Takes a longer time
- Few offsprings are produced at a time

19 (a) – absence of water (moisture)
- Unsuitable temperature
- Lack of oxygen
- Lack of light
(b) Hypocotyl

20 (a) It is an alternative form of a chromosome, similar in structure but may have different composition
(b)
(i) Occurs when some nucleotides of a part of a gene break off and disappear
(ii) Occurs when the nucleotides of a part of gene become inverted by taking a 180^0 turn.
(c) Testing the genotype of an individual by crossing with the recessive trait

21. (a) When organisms of the same origin become adapted (modified) in different ways in order to fit in the environment. The organisms are separated due to natural factors.

(b) When an organism is exposed to drug fro sometime it becomes modified (adapted) to living in presence of the drug. The offspring produced therefore survive in presence of the drug. Hence drug resistant.

22 (a) In the central nervous system (spinal cord)
(b) Motor neutron
(ii) P- Dendrites
Q- Axoplasm (Axon)
(d) Insulates the axon

23 (a) Auxin
(b) Growth response due to touch of a part e.g. tendrils

24 (a) Have short neural spines
(b) – Xylem tissues
- Collenchyma tissues
- Sclerenchyma tissues
- Parenchyma tissues

25 (a) In the stomach there is acid medium and ptyalin only acts at slightly alkaline medium
(b) High temperature above 40^0
(c) Villi- microvilli

26. During birth, breast feeding

K.C.S.E 2007 BIOLOGY PAPER 2 ANSWERS

1 (a) K- Pleural membranes L- Alveolus
M- Intercostal muscles

(b) Has c- shaped cartilage rings that support it preventing it from collapsing and allow free flow of air

- Inner lining has secreting cells that trap fine dust particles and micro- organisms
- Inner lining has hair like structures called cilia that enhance upward movement of the mucus to the larynx

(c) Diffusion

(d) Mycobacterium tuberculosis

2 (a) The amino acids are broken into amino group (NH_2) and carboxyl group (CoOH). The amino group combines with hydrogen forming highly toxic ammonia It immediately combines with carbon (iv) oxide forming urea that is less toxic.

- The carboxyl group converted to carbohydrates and then oxidized or converted into neutral fats and deposited on the parts of the human

(b) Bowman's capsule

- Proximal convulated tubule
- Distal convulated tubule

(c) (i) Less water reabsorbed the blood stream and dilute urine produced

(ii) Diabetes insipidus

3 (a) (i) Protandry – stamens mature and pollen grains are shed off before the stigma matures

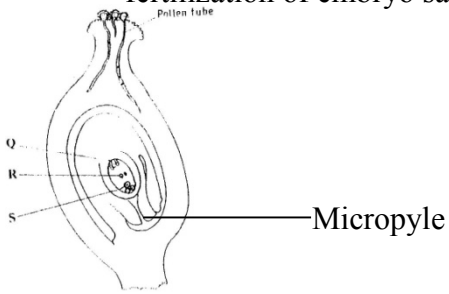
(ii) Self sterility – Pollen grains from the anthers cannot grow on the stigma of the same flower or plant

(b) (i) Q – Antipodal cells
R- Polar body/ polar nucleaus
S – egg cell

(ii) Path the rough which the male gametes reach the embryo sac to enhance fertilization

(iii) Prevent other pollen grains from developing into pollen tubes hence no multiple fertilization of embryo sac.

c)



Type of muscle	Where found
(i) skeletal	Attached bones and skeleton
(ii) Smooth	Walls of tabular structures
(iii) Cardiac	Heart muscles

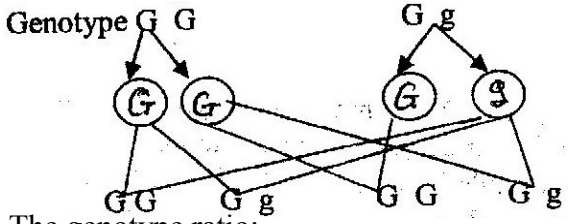
(b) Ball and socket joint- allow movement in all directions i.e 360^0

Hinge joint – Allow movement only on one plane i.e 180^0

(c) It's a slippery fluid that lubricates the joints reducing friction during movement

(d) Prevents drying out of organism
Controls size of the organism
- Provides protection against microbial infections and mechanical injury

5 (a) Parental homozygous X heterozygous
Phenotype purple grains Purple grains



- The genotype ratio:
2 homozygous purple coloured grains
2 heterozygous purple coloured grains

(ii) All purple coloured grained maize plants

(b) Deliberate modification of characteristics of an organism by manipulate genes and DNA by transferring genes from one organism to another

(c) It is when best characteristics are developed from both parents and offspring better than either parent.

6 (a) See graph next page

(b) (i) 15: 45
(ii) 12:45

(c) 0.79 + 0.02 grammes

(d) The food that had been manufactured the previous day had been converted to soluble sugars and was being translocated to other parts of the plant.

(e) 0645 hours and 15 45 hours

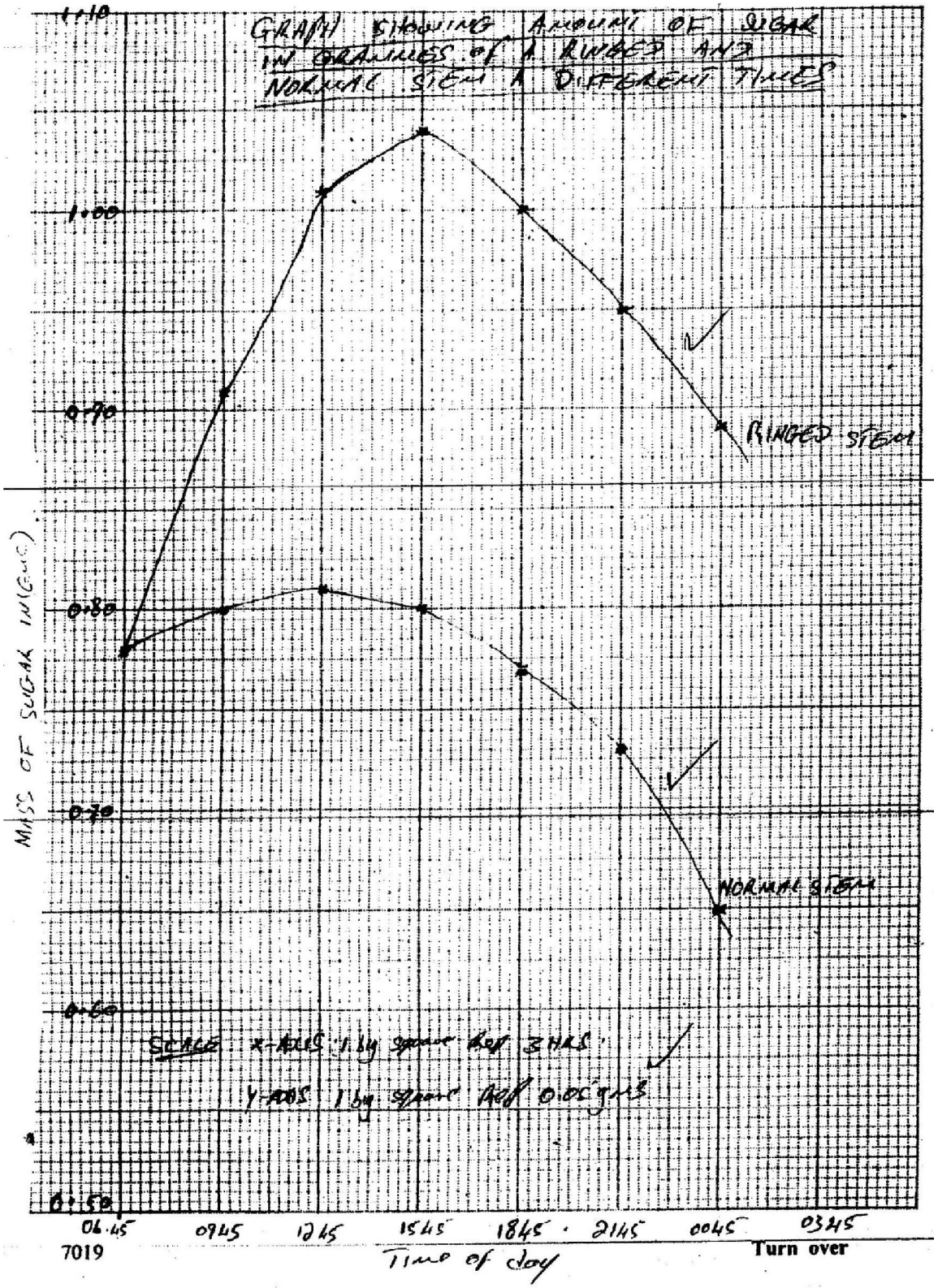
- There was low concentration of sugars early in the morning as there was little translocation
- As day progresses the light intensity increases and more food is manufacture thus more translocation increasing concentration of sugars

(ii) 15 45 hours and 0045 hours

- The light intensity is decreasing reducing rate of photosynthesis. Less food is manufactured hence less is translocation
- As it turns dark there is no photosynthesis reducing concentration of sugars translocated.

(iii) Sieve plates
- Cytoplasm strands

(f) Amino acids
- Soluble fats/ lipids



www.eeducationgroup.com

7. The ear is an organ involved in perceiving sound and maintaining body balance and posture. It is made of the following sections

Pinna – That is funnel shaped structure made of skin and cartilage. It receives sound waves and directs them to the ear tube.

External/auditory meatus – That is a canal lined with air and wax. It allows passage of sound waves to the middle ear. The hairs and wax trap dust particles that enter the ear.

Tympanic membrane – That is a thin flexible sheet-like structure receives sound waves and pass the vibration to the ossicles.

Middle ear that is composed of

Tiny bones known as ossicles – They are anvil and incus. They amplify vibration from the tympanic membrane.

Eustachian tube – That connects the ear to the nasal cavity. It balances pressure on both sides of the tympanic membrane.

Oral window – That is a thin flexible membrane that opens into the inner ear. it receives vibrations from the ossicles and passes them to the inner ear.

Inner ear that is compost of;

Vestibular apparatus- That are the semicircular canals, utricles and saccules. They help in maintenance of body balance and posture.

Cochlea – That is a coiled structure that has sensory cells for hearing. It connected to the auditory nerve that is involved in transmission of sounds to the brain

8. It is addition of substance into water that may cause harm to organisms and are disruptive to ecosystem.

   The causes of water pollution include:

   - Industrial effluents that may be toxic chemicals which may kill the aquatic organisms. It can be controlled by treating the effluents before discharging them.
   - Hot water that reduces concentration of oxygen killing the animals. It is controlled by placing high penalties on factories discharging hot water.
   - Oil spillage from oil tankers that reduces oxygen in water, penetration of light intensity and clog feathers of marine birds. It can be controlled by regular servicing of oil tankers.

   Domestic effluents that include:

   - Untreated sewerage that causes water borne diseases. It can be controlled by treating sewerage before being discharged.
   - Detergents that cause eutrophication causing reduced oxygen concentration. It is controlled by banning phosphate based detergents.

   Agricultural effluents that include:

   - Pesticides and herbicides that have heavy metals that they may cumulates along the food chain killing the higher animals. It is controlled by use of biological control of pests.
   - Inorganic fertilizers that have nitrates and sulphates that cause eutrophication is controlled by use of organic fertilizers.

     Silting due to soil erosion reduces penetration of light to the plants and clog respiratory surfaces of animals. It is controlled by proper methods of soil erosion and proper farming methods.

BIOLOGY PAPER 3 (231/3) 2007
PRACTICAL

1. (a)

3 (a) Leaves with serrated margin/ toothed/ saw like/ teeth like
4 (b) Leaves opposite
5 (a) Leaves pinnate (3 mks)

(b)

Specimen	Identity	Steps followed
P	Compositae	1b, 5a, 6a
Q	Nyctaginaceae	1a, 2a, 3b
R	Commelinaceae	1a, 2b
S	Bigoniaceae	1b, 5b
T	Papilioncea	1b, 5a, 6b
U	Malvaceae	1a, 2a, 3a,4a
V	Verbenaceae	1a, 2a,3a, 4b

(12 mks)

2.

(a) Food Substance: Starch (1 mk)
Procedure: add (2) drops of iodine to solution P (1 mk)
Observation: Bluish black/ blue/ black (1 mk)
Conclusion: Starch present (1 mk)

(b) Food substance: Reducing sugar (1 mk)
Procedure: (1 ml) of solution P, add equal amount of Benedict's solution/S
Warm/ heat/ boil the mixture (2 mks)
Observation: Green to yellow to Orange/ Brown (1 mks)
Conclusion: Reducing sugar present (1 mk)

(c) Procedure: place a drop of solution P into a filter paper. Gently dry over flame (2 mks)
Observation: No permanent translucent spot/ mark (1 mk)
Conclusion: Lipids absent (1 mk)

3.

(a) J - Lungs
K - Gills (2 mks)

(b) Gaseous exchange/ External respiration (1 mk)

(c)

- X - Ring of cartilage
- Y - Lung
- Z - Heart (3 mks)

(d) (i) 1: Gill rakers
2: Gill arch/ bar
3. Gill filament (3 mks)

(ii)

- Rake like/ projections for trapping solid particles
- Rake like/ pointed / tooth like/ needle like projections for trapping/ sieving/ filtering solid particles form reaching and damaging the filaments
- Many/ numerous/ long filaments to increase surface area for gaseous exchange

(4 mks)

K.C.S.E 2008 MARKING SCHEME
BIOLOGY PAPER 1

1. (a) xylem
   (b) Phloem
   (c) Apical meristems

2. (a) To remove toxic/ harmful substances/ urea nitrogenous waste from the blood streams

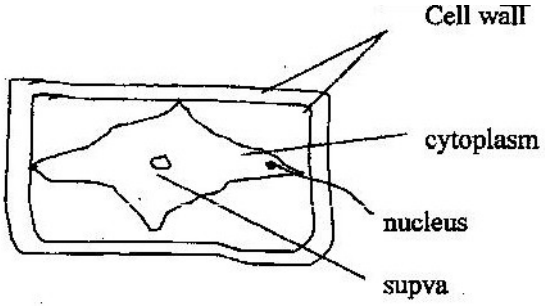
   (b) To return useful substances/ glucose and Amino acids loose into the Bloodstream.

3. (a) Hepatitis (A- E lipids)
   (b) (i) Vibria chlerae
   (ii) Canida/ candida albinism

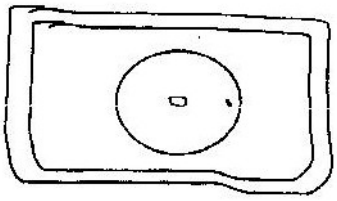
4. (a) The red blood cell was placed in a hypotonic solution it lost water by Osmosis

   (b)

Start of plasmalysis



End of Plasmalysis



5. (a) Temperature PH co- factors, co- enzymes; enzyme product concentration; substance concentration/ metabolic poison

   (b) Temperature- increase in temperature increases rate of enzymatic activity upto an optimum/ low temperature increases enzymatic activity/ too high temp about optimum point denatures enzymes/ enzymatic activity occur at optimum temp.
   Ph- Enzymes work best at optimum ph/ or extreme for ph denatures enzymes.
   Enzyme con – Increase in con increase enzymatic activity occur at optimum temperature
   Co- enzymes – denatures enzymes increasing rate of activity
   Strate/ enzyme cone- increase in concentration increase enzymatic activity upto certain level.

6. (a) Failure of homoslogenous same to separate during meiosis/ prophase I
Failure of sister chromosomes to separate during meiosis Prophase II

(b) Height/ skin colour/ weight

7. (a) Premedial remains of dead organisms that lived in accent sample
(b) When two dissimilar species/ structures/ organisms of different embryonic origin; change in same and develop similar characteristics/ or modify to perform similar function

8. (a) Anaphase
(b) Chromatids fails to separate off poles
Sister chromatids separate/ pair of chromatid separate
(c) Root tip/ shoot/ cambium

9. (a) Body size; sex; age

10. (a) Antigen B, Antigen A
(b) Fexible/ able to change in shape

11. (a) Ability of organism to maintain a stable/ constant internal/ tissue fluid
(b) Gaseous exchange; Thermoregulation; Osmoregulation; regulation of blood sugar; regulation of pH of tissue fluid.

12. - Transport of protein
- Synthesis/ transport of lipids/ steroids
- Site for attachment for ribosome.

13. (a) Yellow spot/ cornea (centralis)
(b) inverted; Real; reversed; diminished

14. Growth – increase/ decrease in numbers/ change in numbers
Dispersion – Spread/ distribution of organisms in a habitat
Density – Number of individual per unit area

15. Muscles respire anaerobically; resulting in accumulation of lactic acid in the tissue; causing fatigue/ muscle crumps.

16. (a) Photosynthesis
(b) Carbon (iv) Oxide/ Temp/ chlorophyll

17. (a) Few dividing cells/ cells not adjusted to surrounding environment
(b) Most cells fully differentiated/ rate of cell division equals rate of cells dying

18. Transparent to allow light to penetrate photosynthetic tissue/ single layer of cells/ thin to reduce distance over which light penetrate photosynthetic tissue; presence of stomata for gaseous exchange; closely fitting cells to protect inner tissues

19. (a) Cardiac muscle
    (b) Contraction of the heart

20. (a) Circulatory system in which blood passes through two capillary systems before flowing back to the heart/ blood passes only once through the heart to complete its circuit in the body.
    (b) Fish/ earthworm/ ringworm
    (c) Ostuim/ Ostin
21. (a) State during which a seed cannot germinate/ state of rest before seed germination; rej inability to germinate.
    (b) Absisicic acid
22. Large airspace
    Thin cell walls
23. (a) Canine
    (b) Pointed/ sharp for piercing/ tearing/ cutting food
    (c) (i) C- Absorption of lien/ prevent scurvy/ quick healing of wounds/ best immunity/ ant oxidants/ prevents anaemia/ formation of connective tissues/ K – blood clothing
24. Light reaction – Granum/ lamellae/ mitochondria/ thylokoid
    Dark reaction - Stroma
25. Bean plant - Dicotyledonae
    Reason Leaves have net veined; two cotyledon; tap root system; xylem with phloem in between the arms
    Bat Flying mammal
    Reason Have sweat glands; 3 ear ossicle; presence of fur; mammaring glands
26. (a) Inducing polyploidy/ treatment
    (b) Meat tenderizer

27 (Anaerobics) micro organism/ bacteria breakdown harmful substances in sewage

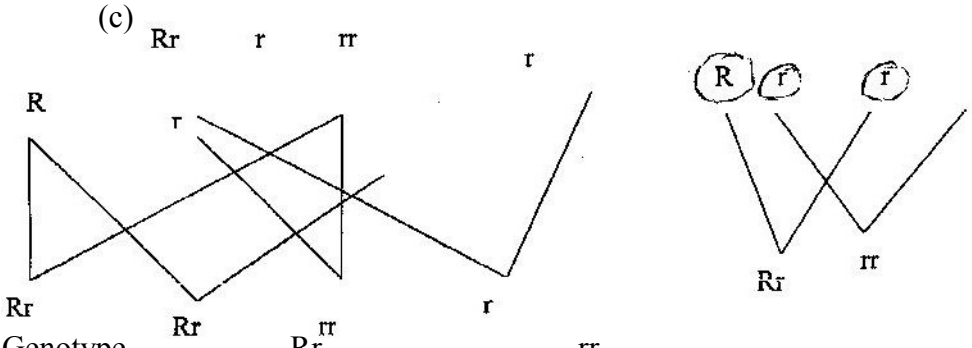
28. (a) Budding
    (b) Protandry - Male parts mature before carpels; Styameic
    Protogyny - Carpels; pistil; female parts mature before stamen; acc. Styme mature before anthers

29. Cushions foetus against shock/ mechanical damage/ provide a suitable medium for embryo to grow/ allows movement of foetus/ support reduces friction/ lubrication/ suspends foetus providing support/ prevents desiccation/ drying of foetus.
30. Pelvic girdle
    (b) (i) Femur
    (ii) Obturatar foramen.

K.C.S.E 2008 MARKING SCHEME
BIOLOGY PAPER 2

1. (a) Oestrogen
Progesterone
(b) Promotes healing (promotes repair (of the uterus)
Causes thickening (of the uterine lining) vasculation
(c) (i) Leutinizing hormone rej LH
(ii) Causes ovulation
Induces graafian follicle to become corpus iterum
Stimulates corpus inteum to release progesterone
(d) 12^{th} , 16^{th} , 14 + 2

2. (a) Round seed plants
Wrinkled seed plants
(b) R and r
r and r / both r / r accept of the gamete are circled
(c)



Genotype Rr rr
Phenotype Roundheads wrinkled seeds

	R	R
r	Rr	Rr
r	Rr	rr

(a) Cross between individuals of unknown genotype with a homozygous receive individual/ organisms
Cross both an individual showing a character for dominant gene with a homozygone recessive individual/ organism

3. (a) Photosynthesis
(b) Light (energy)
Chlorophyll
(c) Oxygen – used in respiration, oxidation
Released into the atmosphere
Glucose – used in respiration
Converted to sucrose or starch for storage
Used in formation of sturdiness allulose cell wall/ cytoplasm

4. (a) **(i) Plants**
Expose the surface area of leaf to sun light for photosynthesis
Ensure flowers are exposed to pollution
Expose fruits seeds to disperse
To resist breakage (due to their own weight and that of the organism)

(ii) Animals
Attachment of other body organs
To protect delicate organs
Maintain body shape/ form
Enable movement/ locomotion
Attachment of muscles

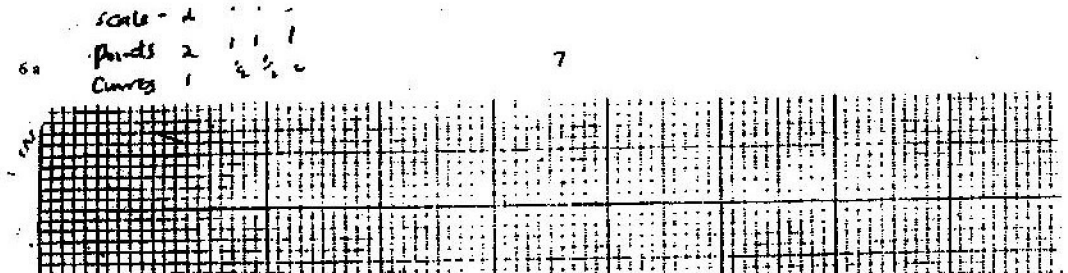
(b) Enable animals to search for funds
Enable animals to search for shelter
Enable animals to search for water
Enables animals to search for breeding
Enables animals to escape predator/ harmful conditions

5. (a) L_1
Inner cells gained water by Osmosis; hence increased in length; epidermal cells did not gain water because they are covered by a water proof cuticle leading to currature.

L_2
Inner cells lost water by osmosis; leading to (flaccidity) decrease in length; epidermal cells did not lose water due to waterproof leading to currature

(b)
Support in (herbaceous) plants
Absorption of water
Opening and closing of stomata
Movement of water from cell to cell
Leading in infectious plants
Folding of leaves in the Mimosa

6. (a) Graph
(b) 17.001- 19.99 hrs
(c) (i) Transpiration
1100 – 17000 (rapid) (in the rate of transpiration) due to high light intensity/ high temperature
(ii) 17000 – 0300 hrs decrease (in the rate of transpiration) due to low light intensity/ absence of light/ in temperature.
(iii) Absorption
11.00 – 1900 hrs. Increase (in the rate of atmosphere) of water to replace water lost- through transpiration.

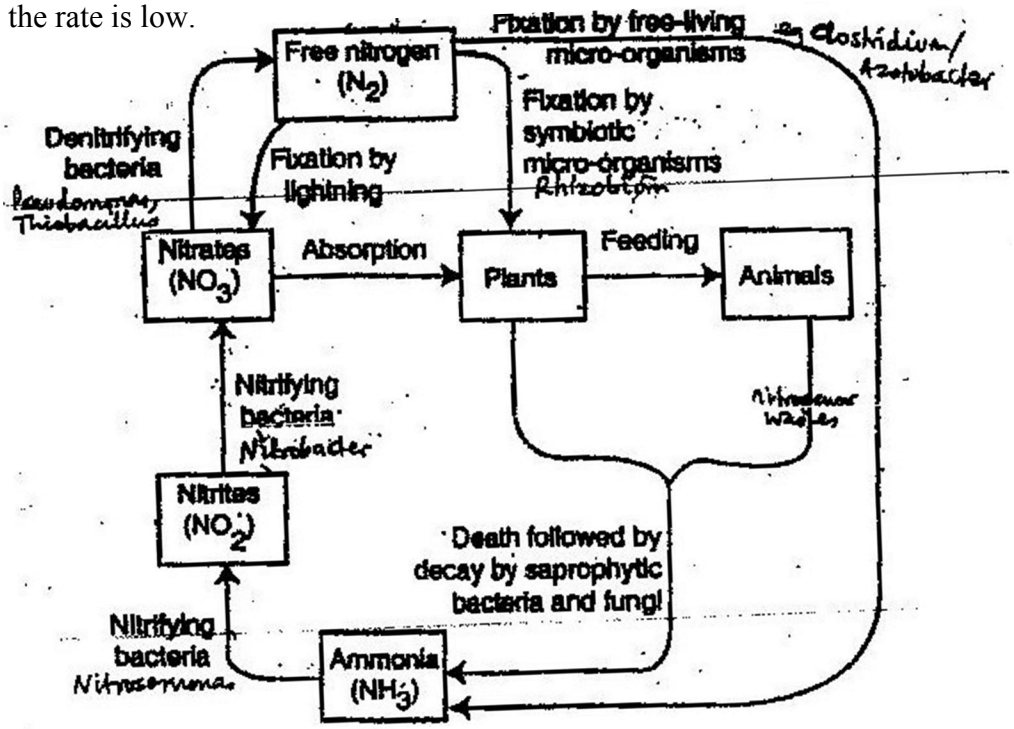


1900 – 0300 hrs; decrease (in the rate of absorption of water) due to the fact that rate of transpiration has declined

(d) Both transpiration and absorption decrease accept decrease

(e) Wind; light, atmosphere pressure, humidity; temperature
Temperature - at high temperature the rate is higher/ at low temperature the rate is Low.

(f) Wind- rate of transpiration is high when it's windy/ lower when air still
Humidity – when humidity is low, the rate of transpiration is faster/ when its
High the rate of transportation is low
Pressure- the rate is high at low atmosphere pressure at high atmosphere pressure
the rate is low.



During thunderstorm/ lightning; nitrogen gas combines with O_2 to form nitrogen oxides; nitrogen oxides dissolve in water to for nitric acid; acid is deposited in the soil by rain, nitric acid combines with chemical substance to form nitrates/ nitric acids dissolves to form nitrates which are absorbed by plants symbiotic bacteria/ such as rhizobium; which are found in root nodules of leguminous plants, fix free nitrogen to nitrates.

Free living bacteria/ clatridium/ azotobacteria fix nitrogen to all rates
Nostoc algae/ chlorella/ anaemia/ ix nitrogen to nitrates.

Plants use Nitrates to form plant proteins
Animals feed on plants and convert plant proteins into animal proteins
Plants/ animals die and decomposed by bacteria/ saprophytes/ fungi decomposing plants/ animals/ release ammonia which is covered to nitrates/ by nitrosomomes nitrococcus bacteria
Nitrates are converted to nitrates; by nitrobacteria
Nitrates in the soil can be converted to free nitrogen/ denitrification by some fungi; pseudomonas/ hulobacillus denitrifying bacteria.

8. (a) Highly vascularized/ network of blood capillaries
L.S.A (for G.E)
Thin membrane/ epithelium/ one cell thick wall/ thin lining; rej thin walls moist lining

(b) **Breathing in**
External intercostals muscles contract; internal, intercostals muscles relax lifting/ raising the ribcage upwards and outwards; muscles of diaphragm contract. It flattens the volume of the thoracic cavity increases; pressure decrease; higher air pressure in the atmosphere forces air into the lungs

Breathing out
External intercostals/ muscles relax; internal intercostals muscles contract moving the ribcage downwards and inwards; the muscles of diaphragm relax, the diaphragm assumes dome shape; volume of thoracic cavity decreases; while pressure increases; higher pressure forces air out of the lungs

K. C. S. E 2008 MARKING SCHEME
BIOLOGY PAPER 3 PRACTICAL

1. (a) A. Liver
B. Stomata
C. Spleen
D. Small intestine/ Eleum
G. Duodenum

(b) E Stores feaces/ undigested material/ indigestible materials
F It contains/ harbours/ store bacteria which produces enzymes/ cellulose which digest cellulose/ digestion of cellulose bacteria that digest cellulose.

(c) Diagram

(d) (i) Male
(ii) Presence of the prostate gland/ testes/ seminal vesicles

(e) (i) $^{9(cm)}/_{15\ (cm)}$ = 0.6 / $_{3/5}$ $^{9.1cm}/_{1\ (cm)}$ = 0.606
9.2 cm / 15 (cm) = x 0.613
NB: Units must be given
NB: mg x 0.6 – 0.613

(ii) Length on photo 14.6 + 0.1 = 14.5 cm/ 14.60c/14.7

(iii) At mg x 0.6 = $^{14.5\ cm}/_{0.6}$ = 24.16 cm/$^{14.6\ cm}/_{0.6}$ = 24.33cm
147 cm
0.606 = 24.257 cm

at mg x 0.61 = 14.5 cm
0.61 = 23.77cm 14.6cm/0.61= 23.934
14.7cm
0.61 = 24.098

(iv) at mg x 0.613 = $^{14.5\ cm}/_{0.613}$ = 23.654

14. 7 cm = 24.098
0.61

14.7/0.613 = 23.980
Length range = 23.654 – 24.5 cm

2.

Substance	Food substance being tested for	Procedure	Observations	Conclusion
S	Proteins	To food substance/ S add sodium hydroxide; add copper sulphate solution	Colour changes to purple/ violet	Protein present
T			No Colour change/ Remains blue	Protein absent
U		Colour changes to (light) purple; violet because its for the extreme	(trace) protein present	

NB. Wrong spelling of reagent or percentage and also observation and conclusion
Wrong chemical formula by underlining

3.

Specimen	Mode of dispersal	Adaptive features
K	Animals (s)	Hooks, persistent calyx alome sauce with hook
L	Animal (s)	Fleshy/ juicy/ succulent
M	Wind	(parachute of hairs/ pappus/ hairy/ hairlike projection
N	Wind	Winged (perricap)/ winglike extension
P	Animal/ animal	Fleshly; juicy
Q	Self mechanism/ self explosive mechanism	Lines of dehiscence/ lines of weaknesses

b). ii) Axile/central; axil/axial. Free central

c). Seed/endocarp.

K.C.S.E 2009 BIOLOGY PAPER 1 MARKING SCHEME

1. (a) Scales/ scale Reject Trail (1 mk)

(b) Most have cell wall made up of cultic (or cellulose) Rej cellulose alone

- Most reproduce by means of spores/ sporulation
- They are eukanyotee/eukaryotic
- They are heterotrophy/ lack chloroplasts / some are saprophytic while others are Parasitic
- Have network of myphae/ mycelia
- Store food inform of glycogen or oil droplets (both must be mentioned)

2. - Obtains food/ nutrients/
- Shelter (Acc Habitat Rej protection)

3. (a) magnification of the object/ image

(b) Regulates amount of light (falling on the object on microscope); Acc: Adjust / control amount of light

4. (a) (seed) dormancy/ Rej Dormincy

(b) (i) Epigeal

(ii) Protection of the delicate plumule; pulls the cotyledons above the ground (Rej shoot

5. (a) (i) production of plants and animals that have superior/ greater productivity/ have beneficial/ characteristics than either of their parents.

(ii) Condition in which an individual has more than two sets of chromosomes

(b) Rej: cosmic rays as mutageous on chromosomes

- Radiations such as alpha, gamma, beta UV and X- rays least one

  (Rej: symbols α, β and increases in temperature)

- Chemicals such as calchicine, phenols, bromate, pesticides At least one
- Heavy metals e.g. lead mercury Rej symbols
- Viruses such as Papilloma Rej: mustard gas- affects gene mutation

6. (a) (i) Dicotyledonous; Rej: Dicotyledonous

   (ii) Vascular bundles arranged in a ring / presence of vascular

   Rej pith- not visible also found in the root of monocots

   Rej intra vascular bundle

   (b) (Divides to) give rise to secondary thickening (growth/ increase in growth/ diameter/ width of stem/ gives rise to new/ additional xylem and phloem tissues

7. (a) site for protein synthesis

   Rej: Autolysis

   NB Must mention effects of lytic enzymes

   (b) Break down worn out cells/ organelles / food materials

8. (a) The placenta/ takes the role of the ovum of producing the hormone

   Progesterone (which maintains pregnancy)

   (b) Production of gametes/ spermatozoa Acc male gamete/ male sex cells

   Production progesterone hormone which maintains pregnancy Acc. Male sex hormones

9. (a) (i) Salmonella typhi; ignore underlining but must be written correct

   (ii) Hystolytic/ Eutamoebia

(b) Malaria

10. (a) (i) Order: ceased to function then reduced in size

Are those structures that have ceased to be functional over a long period of time and hence reduced in size.

(ii) Appendix/ coccyx/tail (tail bone)/ semi - lunar folds of cornea of eye/ nictitating membrane caecum/ ear muscles/ body hair/ Acc. Post and nail

(b) Disease causing organisms mutate; and become resistant

11. (a) auxiliary/ lateral buds spront/ bronches will be formed

(b) Decapitation removes the hormone/ ouxins /IAA which is produced in the terminal bud/ the stem tip; abseul/ removal of the hormone/ auxins/ IAA promote branch/ development of auxiliary lateral buds.

12. (a) scapula; Acc: scapular

(b) (i) Humerus ***Acc Humerous but rej Humourous***

Rej Ball/ socket, Rej socket and ball joint

(ii) Ball and socket joint

(c) Attachment of muscles

13. (a) In diffusion (Rej movement molecules) molecules move from a highly conc. Region to a lowly conc. Region while in active transport molecules move from a lowly concentration region to a highly concentration region; on diffusion molecules move along conc. gradient while in active transport molecules move against conc. gradient. No energy is required in diffusion while energy is required in active transport/ active requires carrier molecules while carrier molecule not required in diffusion;

(Acct if table of companion used

(b)

(i) absorption of water from the soil by root hair cells/ movement of water between plant cells/ from cell to cell/ opening one closing of stomata/ support in herbaceous plants due to turgidity / feeding in insectivorous plant.

(ii) Water reabsorption by blood capillaries from renal tubules/ absorption of water in colour dicututary/ canal/ gut movement of water from cell to cell in animals.

14. Parenchyma/ collenchymas

15. Cytoplasmic streaming / Acc: cyclosis for cytoplasmic streaming

16. (a) Tracheole Rej: Trachea/ Tracheole system

(b) Moist for gases to dissolve (in solution) Branched/ ramify

Numerous tubes to increase surface area (for gaseous exchange)

17. Some wastes e.g gases easily diffuse out

Waste products are mainly made from carbohydrate and (NB: must mention some/ most) hence are not as harmful as proteineous materials/ waste products are formed slowly / little accumulation of wastes/ plants are leas active/ some waster products (such as 0_2 and are usable-recycled; some waste products are store in non- toxic forms in leaves, flowers, fruits and old bark.

18. (a) Rate of photosynthesis increases as CO_2 concentration increases up to a certain level/ optimum level and (vise versa)

NB: Must mention up to optimum level or certain level

Acc: Reverse: The rate of photosynthesis decreases with decrease in CO2 concentration until it stop rate of photosynthesis increases as the light intensity up to an optimum level (and vice versa)

19. (a) Leads to eutrophication; causes water bone disease

- Kill organisms in water;/ reduce amount of oxygen in the water/ reduce the quality of water for consuming change water PH; ? interferes with food charus/ trophic levels.

(b) Respiration/ defecation/ excretion

20. Belt transect/

Line transects

21. Pancreases releases glucagons to stimulate liver cells to convert stored glycogen to glucose; fat converted to glucose/ reduces rate of respiration. Rej if source of glycogen is the liver.

22. Large/ powerful for cracking/ breaking/ crushing bone/ slide past each other/ scissor- like for shearing/ cutting/ slicing (off) flesh/ tendons/ skin from bone

23. A component of haemoglobin/ formation of haemoglobin ACC> myoglobing

24. (a) Young people are actively/ rapidly growing hence require more energy than older people

NB: growth has to be mentioned

(b) Manual workers require more energy than secretary workers

(c)Males are more muscular hence require more energy than females

25. Thin walled for easy diffusion of gases/ store a lot of air/ have large air spaces which store air for buoyancy/ for gaseous exchange

26. Inner membrane is highly folded/ have cristae to provide a large surface area/ for attachment of respiratory enzyme.

27. Baking/ brewing

Rej: Formation of butter, cream, glucose

- Formation of dairy products- cheese, yoghourt, sour milk
- Formation of organic acids- oxalic acid, vinegar (Ethamic acid, citric acid, butyric acid)

28. (a)

Arteries	Veins
- Thick muscular walls - No valves (expect at bases of pulmonary artery and aorta)	- This muscular walls - Have valves - Wide lumen

- Narrow lumen	

(b) Arteriosclerosis/ rej Atheroma – due to the deposition of cholesterol which makes human narrow

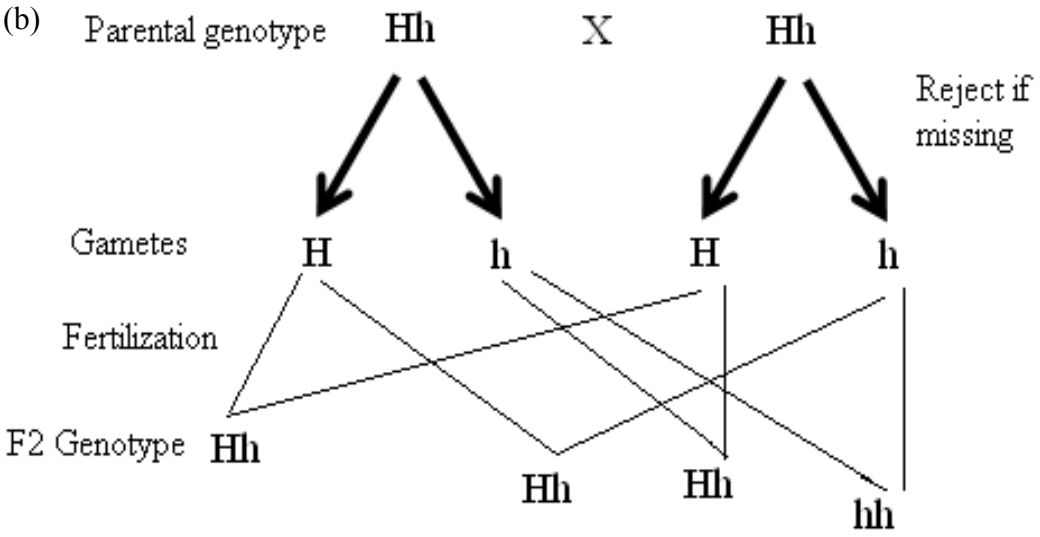
29. When humidity in high the air around the leaf gets saturated with water vapour hence) less space for water vapour from the leaf to occupy/ low saturation deficit/ low diffusion gradient/ the difference in concentration of water vapour in the atmosphere and in the air spaces is greatly/ highly reduced.

K.C.S.E 2009 BIOLOGY PAPER 2 MARKING SCHEME

1. (a) (i) HH; and hh;

(ii) Hh

(b)



(c) The RJ if namation on the left is wrong if give the gene for purple colour is dominant/ gene for white colour is recessive;

2. (a) Herbivorous Rej Herbivore Acc Herbivory

(b) Tooth J is narrow/ sharp/ chisel like while tooth L is broad/ ridged

Accept: J has one root while L has 2/3/4 roots

Functional

Tooth J is used for cutting while tooth L is used for grinding

(Acc cutting for biting)

(c)

(i) Diastema

(ii) For manipulation of blood by tongue

(d) Calcium phosphate; Rj calcium/ phosphorous/ phosphate

3. (a)

(i) Using a living organism to regulate/control/ reduce/ check the population of another organism

(ii) Lady bird (beetle) used to control Aphids in coffee

- Cats used to control rats in the store/ snakes
- Wasps used to control coffee mealy bugs

(b) enrichment of water bodies with nitrates/ phosphates/ sulphates

Acc. NO^{-}_{3} (aq) $NH4^{+}$; due to discharge of sewage/ domestic effluent kitchen water containing water detergents/ run off water fertilizer; leading rapid growth of aquatic plants/ phytoplankton's

(accept: nutrients phosphates)

(ii) (Proliferation of plants) block light from reaching plants underneath which will not photosynthesize the plants die and decompose leading to lack/ depletion of O2; animals also die/ suffocate.

(c) Nitrogen IV oxide/ sulphur iv oxide. Accept nitrogen dioxide sulphur dioxide

4. (a)

(i) Circular muscles of the Iris contract (C/C) while radial muscles relax (R/R) reducing the size of the pupil; hence less light enters the eye.

(ii) The retina is protected from damage

(b) Choroid has a dense network of blood capillary from which nutrients diffuse out to supply the eye.

(c) The blind spot has no photoreceptors/ rods & cones. Hence no impulses are generated to be transmitted to the brain (for interpretation)

5. (a)

Root hairs/ roots absorb water by osmosis; cells of plants become turgid; leaves become firm/ spread out plant becomes firm/ upright

(b)

(i) Collencyma

(ii) Xylem/ tracheid/ vessels/ schlerencyma

(c) - Steering

- Balance

- Braking, changing direction

- Prevent fish from pitching/ up & down movement

6. (b) 33^0C and 51.5 ($\pm$ 0.5^0C)

32.5 - 33.5 and 51.0 – 52.0

(c)

(i) As temperature is increased rate of reaction is increased/ more products are formed (per unit time) because enzymes become more active

(ii) As temperatures increases rate of reaction decreases less products are formed (unit per time) because enzymes become denatured by high temperatures.

(b) Increase in enzyme concentration and substance concentration

Rj. Increasing number of enzymes

Acc. Increasing number of enzyme

(e)

(i) Pepsin, remain/ chymosin

(ii) Wall of stomach/ gastric gland/ oxyntic/ pariental/ cell produced

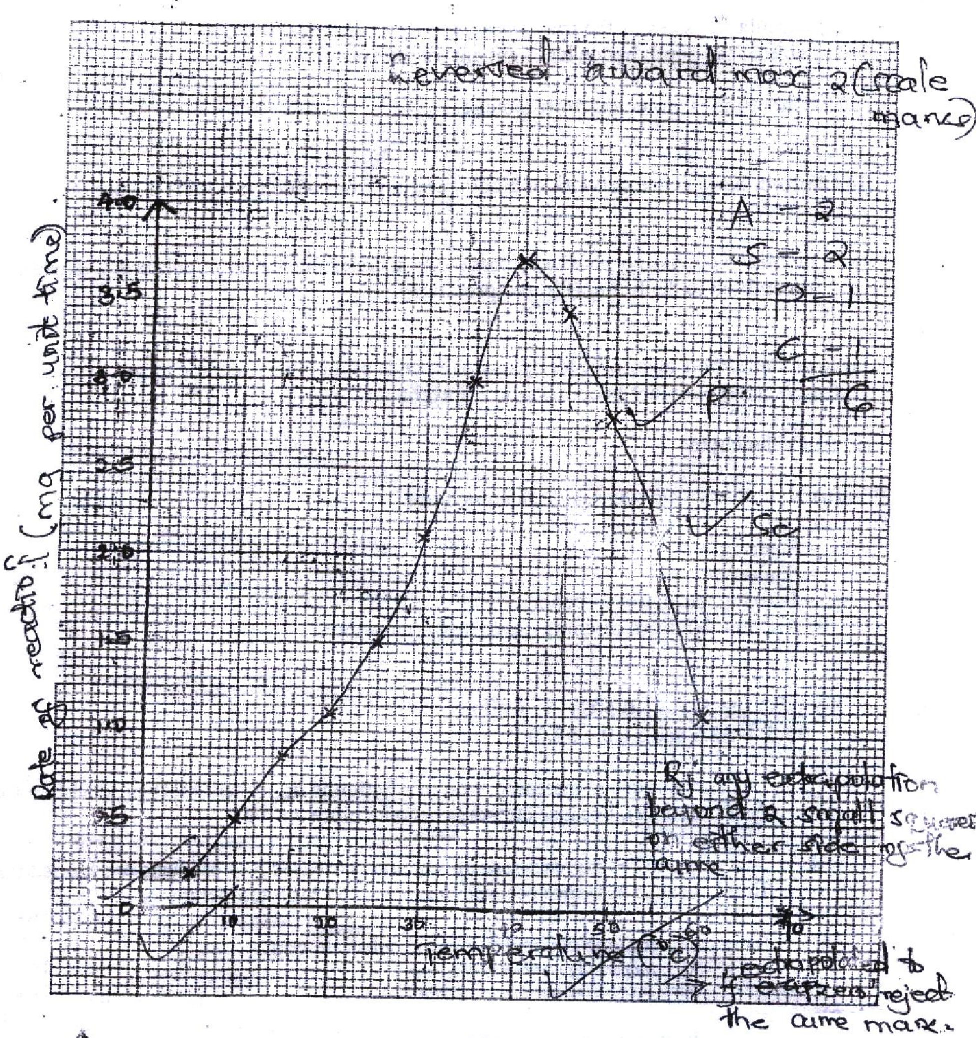
Hydrochloric

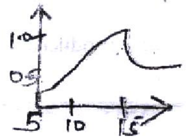
(f)

(i) Duodenum

(ii) Bile juice/ SANS any correct salt e.g. $NaHCO_3$

Acc: Bile





7. **Insect pollination / Entomorphilous flowers**

- are scented to attract insects have stick stigma for pollen grains to stick on. Are brightly coloured to attract insects.
- Have nectarines to secrete nectar; nectar attracts insects
- Have nectar guides to guide the insects to the nectarines
- Stigma/ anthers are located inside the flower / tubular a funnel shaped corolla to increase chances of contact by insects
- Sticky/ spiny/ spiky pollen grains which stick on the body of insects and on stigma
- Large/ conspicuous flowers to be easily seen by the insects/ attract

- Anthers firmly attached to filament for insect to brush against
- Have landing platform to ensure contact with anther and stigma
- Mimiory to attract (male) insects/ flowers mimic female insects which attract
- Anthers firmly attached to filament for insect to brush against
- Have landing platform to ensure contact with anther and stigma
- Mimiory to attract (male) insects/ flowers mimic female insects which attract male insects for mating e.g. orchids. (13 mks)

WIND POLLINATED/ ANEM ORPHILOUS FLOWERS

- Anthers/ stigma hang outside the flowers to increase chances of pollination; style/ filament is long to expose stigma/ anthers
- stigma is hairy/ feathery/ branched to increase surface are over which pollen grains land/ to trap pollen grains;
- Pollen grains are smooth/ dry/ light/ small to be easily carried by wind; large amount of pollen grains to increase chances of pollination
- Anthers are loosely attached to filaments to enable them sway easily to release pollen grains; pollen grains may have structures which contain air to increase buoy any 3 flowers have long stalks holding them out in the wind

(8 mks)

8. **Regulation of blood glucose**

The normal amount of glucose in the blood is 90 mg/ 1000m^3 increase in blood sugar level is detected by cell of the (batacelss) pancreases, which secrete insulin; insulin stimulates the liver to convert excess glucose to glucogen. Further excess glucose is converted to fats. Excess glucose is also oxidized to energy (carbon iv) oxide & water/ respiration.

Decrease in blood sugar level below the normal level is detected by the (alphacells) by the pancreases. Which secretes glucogen that stimulates the liver, to convert glucogen to glucose, fats/ amino acids are converted to glucose, and there is reduced oxidation of glucose until the normal level of blood sugar is attained.

Deamination / excess amino acids are deaminated (removal) of amino acid group, the amino group is converted to ammonia which combines with carbon (iv) oxide to form urea that is excreted through the kidney, urea is excreted through the skin as sweat. (4 mks)

Detoxification/ poisonous substances are converted to less harmful compounds.

(1 mk)

Thermoregulation/ maintenance of body temperature heat is generated (in the liver) by chemicals activities, the heat is distributed (3 mks)

$NH_2 + H \rightarrow NH_3$

$2HH_3 + Co_2 \rightarrow Co\ (NH_2)_2 + H_2O$

Ammonia urea

BIOLOGY PAPER 3 MARKING SCHEME

	BONE	IDENTITY OF THE BONE	WHERE FOUND
1.(a)	K	- Humerus	Fore limb/foreleg/ front leg/ups arm/ upper fore limb rej Hand/ fore arm
	L	-Scapula/ shoulder blade	Shoulder/ pectoral region Rej- pectoral giral
	M	- Femur	Hind limb/ hind leg/ thigh/ Upper hind leg
	N	Tibia/ shin bone	Hind limb/ hind leg/ lower hind limb
	P	Ulna – Radius	Forearm/ fore limb/ arm/ Lower/ fore le/ front leg
		Rej only one answer	

(b) 1. Condyles Rej- Cendyle

2. Glenoid cavity

3. Head/ head of femar Rej. Head of humerous

4. Patella groove Rej: groove alone due to omission

5. Ulna/ shaft of Ulna/ shaft

(c)

(i) Scapula/ shoulder blade

(ii) Ball and socket ii tied to i

Posterior end

(i) Radius and ulna

(ii) Hinge ii tied to i

(e) Muscle attachment limit the movement of radius and ulna/ limit the movement at the joint prevents overstretching O.W. He limits movement in more than one place.

2.

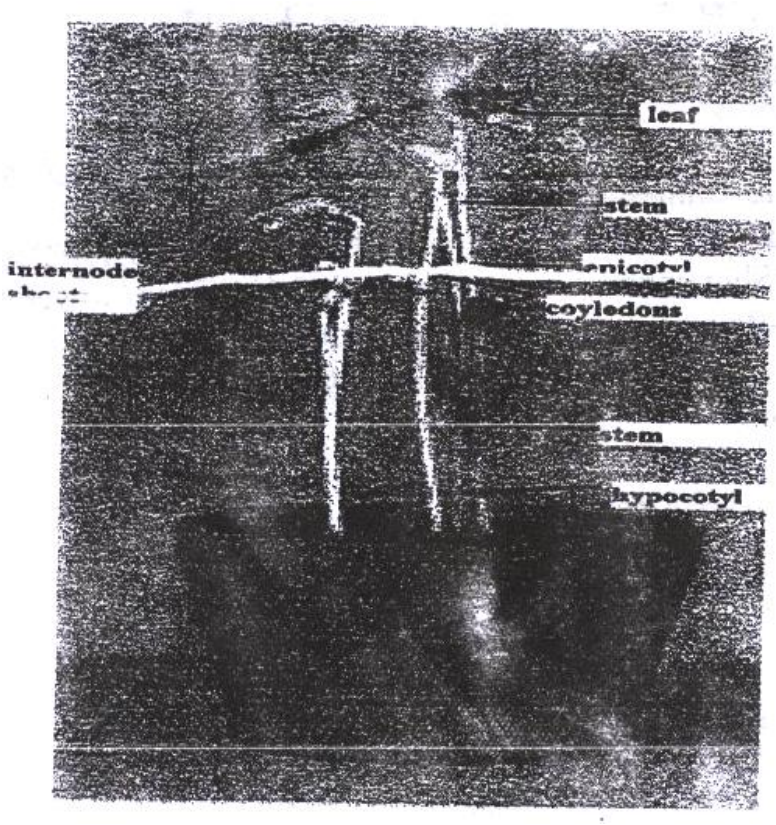
Substance	Food substance being tested for	Procedure	Observation	Conclusion
P	Reducing sugar	Add Benedict's solution hat / boil / warm in hot water bath)	Green to yellow to orange/ brown	Reducing sugar present
Q	Reducing sugar	Add Benedict's solution. Heat/ Boil/ warm in hot water bath)	No colour change/ blue colour remains	Reducing sugar absent/ reducing sugar present after hydrolysis
	Non Reducing sugar	Add dilute hydrochloric acid ix, boil, cool Add sodium hydrogen carbonate until fizzing stops add benedict's heat	Green to yellow to orange/ brown	Presence of non reducing sugars/ reducing sugar present after hydrolysis Rej. Reducing sugar present Rej Reducing

				sugar present

Deny for wrong spelling of benedict's solution

- *In the table, mark reducing sugar, add benedict's solution, heat any once*
- *Led non- reducing sugar under play indication se*

3. (a) Mark 11st three clockwise from top



(b) i. epigeal germination
(ii) Cotyledons above ground/ soil

(c) W- Grow in dark/ insufficient light/ absence of light
X- Grown in light/ sufficient light/ adequate light

(d) (i) Etiolation
(ii) To reach light/ search/ look / get/ obtain/ seek light

	W	X
(e)	- Long intermode/ stems/ tall plant	- Short intermodes/ stem/ plant
	- Thinner stem	- Thicker stem
	- Small leaves	- Big/ large leaves
	- Yellow or light green leaves stem/ cotyledons	- Green leaves/ stems/ cotyledons/ seedlings

(f) Seedlings subjected to unilateral/ unidirectional source of light causing auxins to migrate / diffuse to the dark side of the shoot/ high concentration of auxins on dark side; causing faster growth on that side than the lit side/ faster cell elongation/ faster cell enlargement/ faster cell growth on the side than the lit.

MARKING SCHEME
BIOLOGY - PAPER 1 2010

1. (a) Cytology: Rej cell biology
   (b) Microbiology

2. (a) Stem
   (b) i) Monocotyledonae
   ii) Vascular bundles scattered not arranged in a ring;
   Absence of pith; Absence of vascular cambium.
   (c) Epidermis

3. (a) Protein synthesis (Accept: site for protein symbiosis)
   (b) Destroys worn out organelles/cells/tissues
   Destroys micro-organisms.

4. (a) i) Root hair(cell)
   ii) D – cell wall
   E – cell sap (vacuole)
   (b) Controls the functioning of the cell/ controls cell activities

5. A large surface area for efficient diffusion of gases
   Moist for gases to diffuse in solution form/to dissolve gases
   Thin for efficient/diffusion of gases (across a short distance)
   Most be close to body cells/well supplied with blood vessel to active cells
   Ventilation mechanism for bringing in air rich in O_2 and expelling air rich in carbon(iv) oxide
6. (a) Maintain balance/posture/control/muscular movement
   (b) Control heart beat/ blood pressure/ breathing(rate) control involuntary activities/ response
   Accp. Curved examples of v.a e.g. eating, swallowing e.t.c.
7. Haemolysis – process by which red blood cells take in water till they burst; while
   Plasmolysis – loss of water from plant cells until the cell membrane is detached from the cell wall/ until the cell become flaccid.

Chilopoda	Diplopoda
- A pair of (walking)legs per segment - Body flattened dosoventrally - Body divided into head and trunk Acc. Body divided into two body parts - Posterior genital aperture - Has poisonous claws - Have long antennae	- 2 pairs of(walking)legs per segment - Body cylindrical in shape - Body divided into head thorax and trunk Acc body divided into three body parts - Anterior genital aperture - Lacks poisonous claws - Have short antennae.

8.
- They contain chlorophyll which traps/absorb light (energy)
- They have grana which increase surface area for accommodation of a large number of chlorophyll molecules for photosynthesis
- The stoma has enzymes for photosynthesis

9. - Resistance to diseases/pests/adverse weather conditions (Acc. Correct examples e.g. drought, very high/ low temperatures
- Increased yields
- Earlier maturity Acc. Early maturity

10. (a) Aquatic / fresh water
(b) Large air space/aerenchyma
Sclereids
Stomata on upper epidermis/absence of stomata in lower epidermis
Absence of cuticles
Poorly developed vascular bundles

11. J – sporangium
- Absorption of soluble substances/ digested food
- Secretion of digestive enzymes;
- Anchorage(of mould on substrate); anchorage must be in the right context

12. (a) Place/environment in which (specified)organism lives
(b) A natural unit with abiotic and biotic factors

13. Charcoal in limited supply of air produces carbon(ii)oxide; which combines with haemoglobin forming carboxyhaemoglobin; which is stable/ does not dissolve reducing capacity of the haemoglobin leading to suffocation/ death;

14. a)
X – Starch present
Y – Starch absent
b) X – acts as a control; Y – CO_2 absent absorbed by potassium hydroxide pellets; Acc correct explanation

15. Emulsification / breaking down of fats into (tiny) droplets
Creating alkaline medium for digestive enzymes/ neutralizing acidic chyone (from the stomach)

16. (a) Herbivorous; Rej Harbivores
(b) Lack canines/ incisors on upper jaws

17. Animal form waste products more rapidly than plants/ Produce more metabolic wastes
Animals don't reuse their waste while plans reuse some of their wastes;

18. When temperature is high they dilate; when low they constrict (Acc. Vasodilatation)

19. Higher chances of fertilization
Embryo/gamete is protected from external environment conditions

20. (a) P – sutures
(b) i) Atlas;
ii) Hinge joint

21. (a) Passage of ova/ site of fertilization
(b) Storage of sperms
(c) Hold the testis/ protect the testis

22.

- Absence of nucleus, increase of space for packaging haemoglobin(for carrying oxygen)
- Possession of haemoglobin which has high affinity for oxygen
- Bi-concave shape creates large surface area for combining with oxygen
- Ability to change shape/flexible to enable them pass through capillaries.
- Have carbonic anhydrate which increase CO_2 transportation
- Are numerous/many to be able to carry max amount of oxygen
- Has plasma membrane which allow rapid diffusion of gases

23. (a) Use and disuse
    Acquired traits can be passed on to offspring
    (b) Acquired characteristics cannot be inherited
    No evidence to support the theory
24.
    - Overcrowding
    - Accumulation of toxic wastes
    - Limited resources such as nutrients
25. (a) Provide support
    Enables plants to grow forward light
    (b) In search of nutrients
    Anchorage
26. (a) Failure of homologous chromosomes to segregate during meiosis/ anaphase I/ meiosis I
    Failure of sister chromatid to segregate during meiosis/ anaphase II / meiosis II.
    (b)
    i) Down's syndrome; Turner's syndrome; Klinefelter's syndrome
    Surnerz syndrome
    Acc. Mongolism for Doran's syndrome
    ii) Albinism; single cell anaemia; heamophilia; colour blindness
    Chondrodytrophic dwarfism/ Achondroplasia
27. Arteries have thick muscular walls; veins have thin and less muscular walls
    Arteries have narrow lumen, veins have wider lumen
    Arteries have no valves except at junction with heart; veins have valves at regular intervals.
28. (a) Gymnospermae/ Gymuspermatophyta/ Gymnosperonaphyta;
    (b) Needle-like leaves; thick waxy cuticle
    Naked seeds; sunken stomata.
29. The inhibition of growth of lateral buds; by auxins; produced by the growing apical bud.

MARKING SCHEME
BIOLOGY - PAPER 2 -2010

1. .

a) Respiration (Rej: external respiration/ anaerobic respiration)
Acc: aerobic respiration.
b) i) Rise/ increase in thermometer / temperature reading.
ii) stored starch/ glucose/ carbohydrates in germination seeds are broken down/ oxidized to get energy. Some of the energy is released to get energy; some of the energy is released as heat.
c) To kill bacteria/ fungi/ micro-organisms; that would cause decay/ decomposition / respire. (of the bean).
d) To conserve heat/prevent heat loss to surrounding
e) Use similar set up with dead disinfected seed.
Use dead disinfected bean seed/ use of dry bean seeds; acc formaldehyde / formalin for disinfection sodium hypochlorite.

2. .
a) **P –** tissue fluid / intercellular fluid/ space.
Q – Venule.
b) i) Glucose, oxygen; Rej: formulae
ii) Carbon (IV) oxide, water; Rej; carbon dioxide OR Formula.
c) Blood entering the arteriole has a higher pressure; than that leaving the venule, the pressure force water and small solutes (molecules) in blood to go through capillary wall forming tissue fluid; Nutrients / oxygen in tissue fluid move into the tissue cells by diffusion; Acc. Nutrients like glucose/ mineral salts/ vitamins/ fatty acids & glycerol. (Acc 2 nutrients)
d) Red blood cells/ proteins/platelets; Acc one example of protein e.g. globalin.

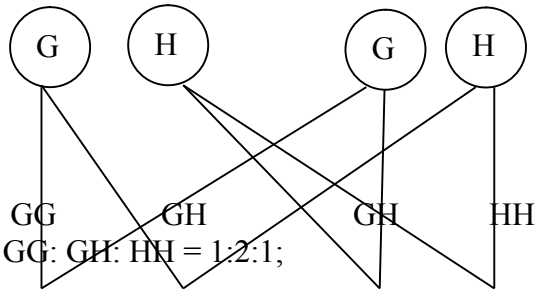
3. .
a) i) Primary consumer
ii) Primary consumer / Secondary consumers;
b) Green plants → Caterpillars → Small insects → lizard
Decaying leaves → Caterpillars → Small insects → lizard
c) i) Hawks;
ii) At each trophic level energy is lost as heat / respiration; and during decomposition; or lost in defecation/ feces/ waste products of metabolism/ excretion; some parts of the organism are not eaten; (hence less biomass as one moves up the tropic levels.

4. .
a) **X –** pupil
Y – circular muscues
b) i) Dimlight / low light intensity/ darkness/ dull light.
ii) Circular muscles in (iris) relax; while radial muscle contract; the pupil becomes bigger allowing more light to enter the eye.
iii) allow one to visualize/ see objects under dim light;

5. .

a) Parental genotype GH X GH - Genotypes

Gametes - Gametes



F2 GG GH GH HH

Genotypic ratio GG: GH: HH = 1:2:1;

Punnet Square

Parental genotype GH x GH NB: use of difference letter away 1mark for fusion lines only.

	G	H
G	GG	GH
H	GH	HH

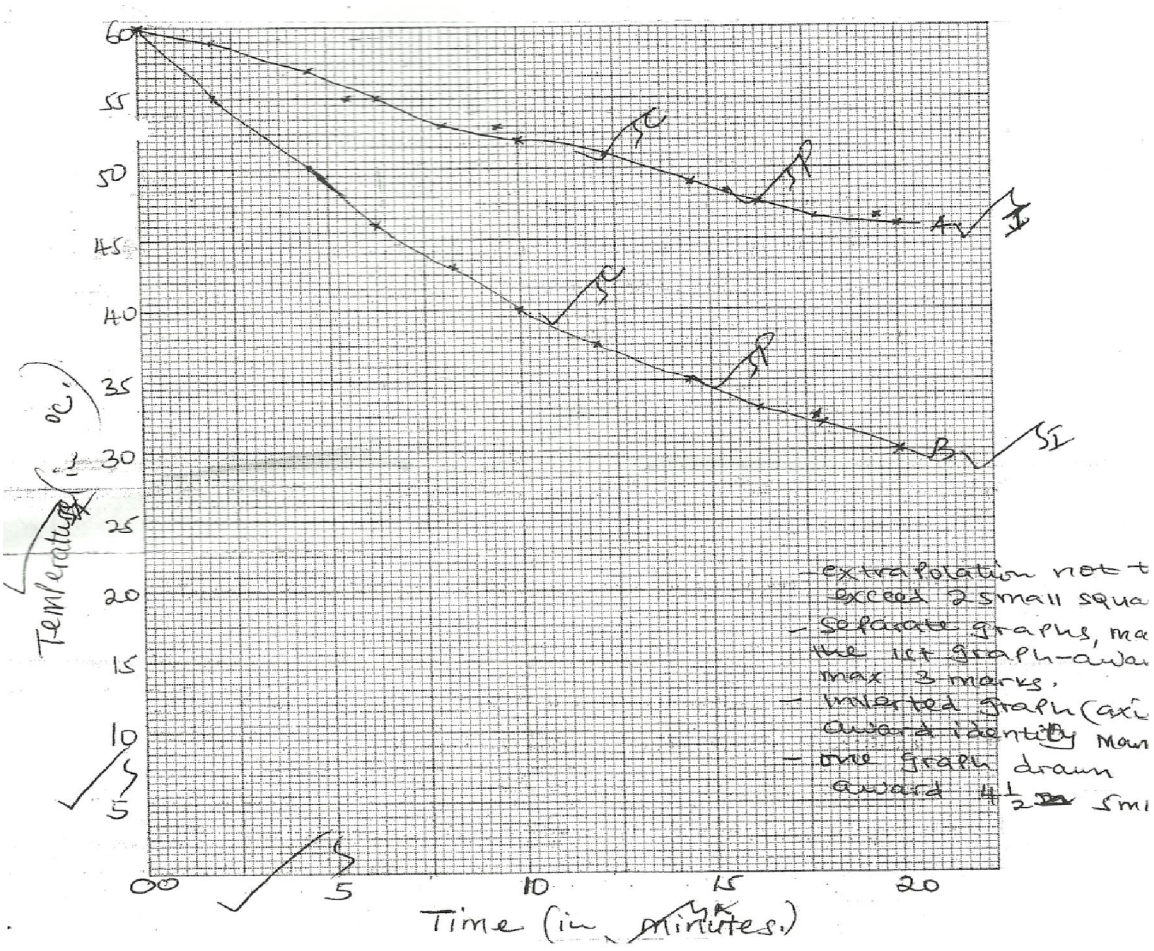
b) Black : Black & white : White = 1: 2 : 1

c) i) Codominance; (Rej: incomplete dominance, partial dominance, equal dominance, blending inheritance.

ii) ABO blood group inheritance. Acc. Blood group(Rej; Rhesus factor sickle cells trait.

6. .

a) .



b) i) **A** $\frac{56 - 48.5}{15 - 5} = \frac{7.5}{10} = 0.75 + - 0.05$ per minute.

B $\frac{48 - 34}{15 - 5} = \frac{14}{10} = 1.4 + - 0.05$ per minute.

ii) B has a large surface area to volume ratio making it to lose heat to the to the surrounding faster; Acc the converse/ viceversa.

iii) A rat has a larger surface area to volume ratio compared to an elephant; making the rate to lose heat at a faster rate than an elephant; Acc: the converse/ Viceversa.

c) i) Insulate against heat loss (to surrounding)

ii) Subcutaneous fat (layer) / Adipose tissue/ Bludder; fur/ hair; Rej: wool.

d) Are active always(even under very cold conditions);

Able to escape from predators/ search for food/ mates (because they are active always)

Can survive in (any habitat) both cold & hot habitat / wide range of habitats.

7. Pollen grains land onto the stigma and adhere to it as a result of the stigma cells secreting a sticky substance . it absorbs nutrients; & germinates forming a pollen tube; the pollen tube grows down the style to the ovary; deriving nourishment from surrounding tissue. The pollen tube has tube nucleus at the tip; and generation nucleus immediately behind it; As the tube grows downwards into the ovary the generative nucleus divided

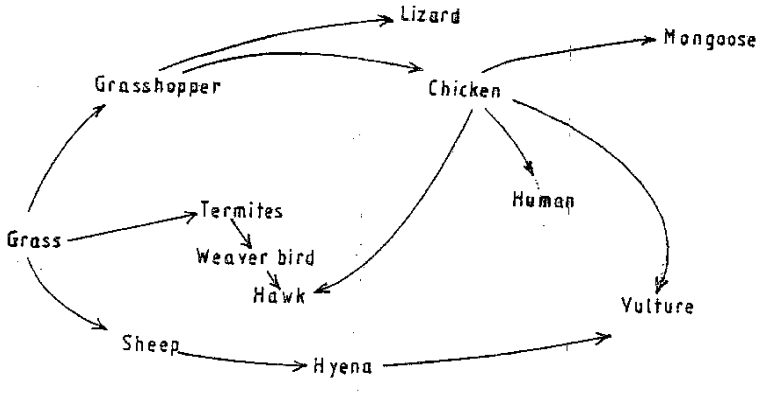
9by mitosis) mitotically, to give rise to two nucleui; which represent the male gametes; the pollen tube penetrate the ovule/ embryo sac/ chalaza through micropyle. After the pollen tube enters the embryo sac the tube nucleus breakdown/ disintegrates/degenerates; leaving a clear passage for the entry of the male nuclei. The (two male) nuclei then enter into the embryo sac; where one fuses with the egg cell nucleus (Acc; egg cell/ ovum/ oosphere, to form a diploid zygote; which develop into an embryo. The other male nuclei fuse with the two / both polar nuclei; to form atriploid nucleus/ primary endosperm nucleus; which becomes the endosperm. This (type of fertilization) is called double fertilization; Acc vegetative nucleus for tube nucleus.

8. Movement of fish in water is by swimming. It involves forward movement and control of the body position in water. Mucus / streamline body shape reduces friction/ resistance (Acc; scale overlapping backwards) to enhance forward movement; forward movement/ propulsion is caused by the tail. The tail is long (almost half the large of the body of the fish) to enable it create enough force(to enable the fish push forward). Propulsion is achieved when the tail pushes sideways against water. Sideways movement is brought about by muscles arranged in segmented blocks/ myotomes on both sides of vertebrate column to swing sideways; when the muscle blocks on the right relax and those on the left contract; the body bends to the left side. When the muscle of the left relax and those on the right contract; the body bends to the right side; the fish uses its fins to control the position of body in water. During forward movement paired fin/ pectoral & pelvic fins). Lie flat on the body surface to reduce friction/ resistance. To change direction the fish uses the paired fins. Paired fins also are used by fish to change its level in water / control pitching. The fish spreads out the pectoral & pelvic fins at 90^0 to the body; to enable it brake. Fish can also use the swim bladder to change its level in water. When the bladder fills up with air the fish become less dense / lighter making it to rise in water; when the air leaves the bladder the fish becomes more dense/ heavier; making it to sink deeper in the water. Water currents may cause sideways swaying of the body of the fish/ yawing. The dorsal and ventral fins (also) prevent rolling / yawing; Acc anal fin for ventral fin.

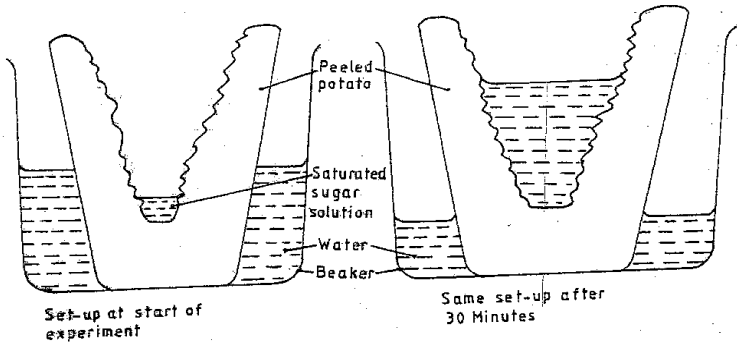
BIOLOGY

PAPER 1

1. Name two kidney diseases.
2. (a) Write the dental formula of an adult human.
3. Give three reasons for classifying organisms.
4. State one use for each of the following apparatus in the study of living organisms.
   (a) Pooter
   (b) Pitfall trap
5. The figure below illustrates a food web in a certain ecosystem.

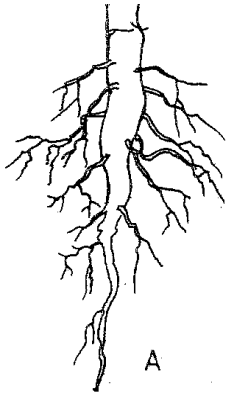


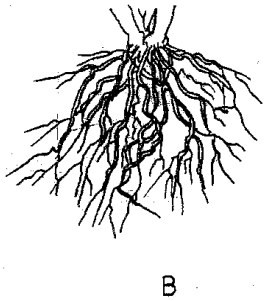
From the food web:
   (a) Draw the shortest food chain;
   (b) identify the organisms with the highest
      (i) Number of predators
      (ii) Biomass
6. What is meant by the following terms?
      (a) Ecology
      (b) Carrying capacity
7. The diagrams below show an experiment set up to investigate a certain process in a plant tissue.



Explain the results obtained after 30 min.
8. State three characteristics of the class crustacean.

9. The diagrams below illustrate the organs of some flowering plants.





State the classes of plants to which each belong.

A

B

10. (a) give two differences in the products of anaerobic respiration between plants and animals.

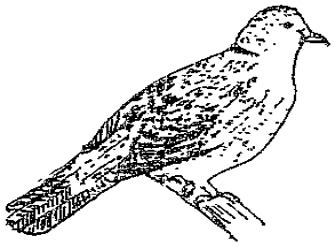
(b) Name the site of anaerobic respiration in a cell.

11. State two functions of the following parts of a light microscope.

Fine adjustment knob

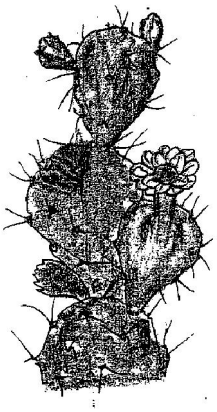
Stage

12. The diagram below represents a certain organism.



State the phylum and class of carbohydrates in the human body.

14. The diagram below represents a certain plan.



(a) What is the likely habitant of the plant?

(b) Give two reasons for your answer in (a) above.

15. Give reasons for carrying out the following procedures when preparing temporary wet mounts of plant tissues.

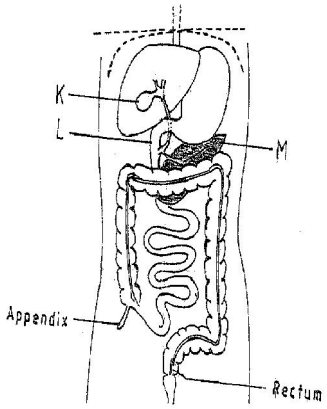
(a) Making thin plant sections

(b) Adding water on the plant section.

16. (a) describe the condition known as varicose veins.

(b) What is the role of blood platelets in the clotting process?

17. The diagram represents part of the human digestive system.



(a) Name the organs labeled L and M.

L

M

(b) (i) Name the substance named in b (i) above.

19. (a) Apart from the lungs, name two gaseous exchange surfaces in a frog.

(b) Write an equation that summarizes the process of aerobic respiration.

20. The number of stomata on the lower and upper surface of two leaves from plant **X** and **Y** were counted under the field of view of a light microscope. The results were as shown in the table below.

Leaf	Number of stomata

	Upper surface	Lower surface
X	4	12
Y	20	23

(a) Which of the leaves would be expected to have a lower rate of transpiration?

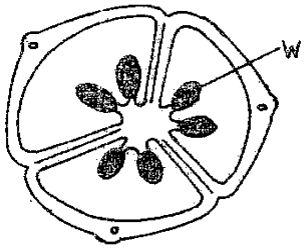
(b) Given a reason for your answer in (a) above

21. (a) what is meant by convergent evolution?

(b) State **two** limitations of fossils as an evidence of evolution.

22. State the difference in content of oxygen and carbon (IV) oxide in the air that enters and leaves the human ling.

23. The diagram below represents a transverse section of an ovary from a certain flower.



(a) (i) name the structure labeled W

(ii) name the type of plantation illustrated in this diagram.

24. (a) Difference between the following terms:

(i) dominant gene and recessive gene;

(ii) continuous variation and discontinuous variation

(b) What would be the expected results from a test cross?

25. State one economic importance of each of the following plant excretory products.

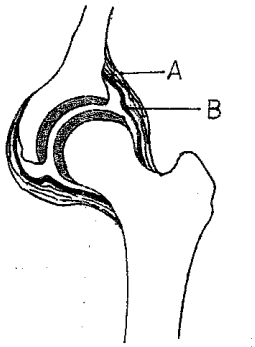
(a) Tannin

(b) Quinine

(c) Caffeine

26. Name the gamete cells that are produced by the ovaries.

27. The diagram below represents features of a joint mammal.



(a) Name the part labeled A

(b) State the function of the part labeled B

28. (a) What is a tropic response?

(b) State **two** ways by which auxins regulate growth in seedlings

29. State **four** reasons why water is significant in seed germination

BOLOGY

PAPER 1

1. Nephritis
   Kidney sytones
2.
   a) $i\ ^{2}/_{2}\ C^{1}/_{1}\ pm\ ^{2}/_{2}\ m\ ^{3}/_{3}$ or $2(i\ ^{2}/_{2}\ C\ ^{1}/_{1}\ pm\ ^{2}/_{2}\ m\ ^{3}/_{3}) = 32$
   b) dental catties; periodenties/ periodontal disease/ pyorihoea
3.
   i) Identify similarities and differences between organisms;
   ii) Organize scientific knowledge in an orderly system
   iii) Monitor emergency presence and disappearance of organism in and from earth;
   iv) Grouping organism for easy study,
4.
   a) Sacking small insects / small animals
   b) A trap into which (small) animals fall and get trapped; Acc' examples of small animals e.g. insect / reptiles, arachnids
5.
   a) Grass grasshopper lizards.
   b) i) chicken
      ii) Grass
6.
   a) This is the study of the inter-relationship between organisms and their environment;
   b) The maximum population of a species/ Total number of organisms that a population habitat/ area/ region/ ecosystem can support. V

      Or

      Total number of population of a species a given habitat/ region/ area/ ecosystem can support without depleting available resources; **rej.** If different species
7. Water was hypotonic to cell sap of adjacent and these cell absorb water through osmosis; and their cell sap became less conc. Than those of next cell; the process was repeated until water reached the sugar solution.

   Or

   Sugar solution was hypotonic to cell sap of adjacent cells; they lost water by osmosis; cell sap became more conc. than those of next cell; the process was repeated until water was drawn from the beaker.
8.
   - Fused head and thorax/ capholothorax (often) protected by carapace.
   - Gaseous exchange through gills
   - Two pairs of antennae
   - Five more pairs of limbs/ five to twenty pairs of limbs; **rej** five
   - A pair of compound eyes
   - Three pairs of mouth parts (consisting of labial pulps / maxillae)
9. A – Dicotyledonae
   B – Monocotyledonae

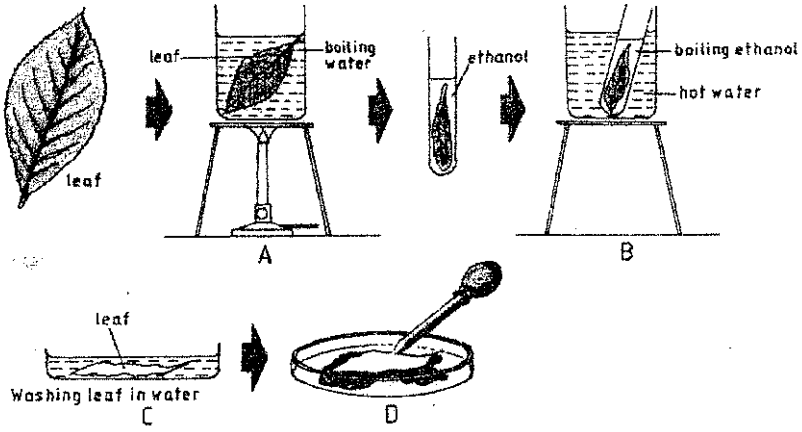
10.
    a) i) lactic acid in animals while plastic is ethanol / alcohol
       ii) No CO_2 produced in anaerobic respiration in animals while anaerobic respiration in plants produces CO_2
    b) Cytoplasm
11. **Fine adjustment knob**
    Moves the body tube through smaller distances to bring image/ specimen/ object into sharper/ Sharpe focus.
    Stage
    Platform where specimen (on slide) is placed.
12. Pylum – Chordate
    Class – Aves
13. Source of energy
    Storage of materials
14.
    a) Dry /arid/ semi-arid/ desert
    b) Succulent/ freshly stem; reduced leaves/ leaves reduced into throrne/ spines; **Acc.** Thick stem for storage of water.
15.
    a) (To reduce layers of cells) to allow light to pass through
    b) To make the cell torpid/ prevent drying up;
    c) To protect lens on objective; exclude air/ dust/ foreign particles;
       Hold specimen in position/ place
16.
    a) Weakened/ defective valves in veins; causing blood/ body fluid/ tissues fluid to accumulate; (leading to swelling)
    b) (when exposed to air) they disintegrate/ burst; releasing thromboplastin/ thromborinase.
17.
    a) L – Duodenum
       M – Pancreace
    b) i) bile
       ii) emulsification/ emulsification of fat; neutralize acidic chime from stomach; provides alkaline media(for enzyme to work)
18.
    a) Sublingual; sublmaxillary/ submandibular; parotid
    b) Lubricating food; digestion of starch; moistens food; provides alkaline medium; soften food; dissolves food**. Acc,** for correct component of saliva to correct function
19.
    a) Skin
       Buccal cavity/ mouth cavity; **rej** mouth
    b) Glucose + Oxygen Carbon IV oxide + water + enery
       $C_6H_{12}O_6 + 6O_2$ $6CO_2 + 6H_2O$ + ATP/ enery
20.
    a) X
    b) X has fewer stomata; most stomata in leaf X are concentrated on the lower side

21.
   a) Where different structure evolve to perform different functions (e.g. wings of insect / birds, eye of human and octopus) **rej;** if wrong example given **Acc;** if no example given
   b) Missing links; distoration of parts during sedimentation
      Destruction of fossilsa by geolopical activities **Acc;** correct e.gs
22.
   - Air that enter the lungs has high content of oxygen than air that leaves
   - Air that enter lungs has lower content of CO_2 than air that leaves

     Acc; air that enter lungs has 20% – 21% Oxygen, air that leaves has 15% - 17% Oxygen
     air that enter lungs has 0.03 – 0.04% CO_2, air that leaves has 4.0% CO_2
23.
   a) i) Ovule; **rej;** ovules
      ii) Axile
   b) orange or any other citrus fruit; lemon, tangerine, grape, lime, tomato, Sodom apple, irish potato, egg plant, thorn apple, banana
24.
   a) i) dominant gene expresses itself in both its homozygous and heterozygous state whole recessive gene can only express itself in the homozygous state.
      ii) continous variation is a characteristic for which there is continuum or range while discontinuous variation is a characteristic for which there are discrete/ distinct/ separate/ definite categories or units;
   b) (either) all offsprings show dominant characteristics; **or** half offsprings show the recessive while the other halve show dominant characteristics.
25.
   a) **Tannin –** softening of leather/ convertion or treatment of hides or skins to leather/ tanning leather/ treatment of leather; manufacture of ink/ printing of fabrics/ dying of clothes/ printing patterns in pots
   b) **Quinine –** treatment of malaria
   c) **Caffeine –** stimulant in beverages/ increase mental activies/ reduce fatigue
26. Egg/ ovum/ ova; **rej;** ovula
27.
   a) Ligament
   b) Secretes synovial fluid; contains/ holds the synovial fluid in place
28.
   a) It a growth movement in plastic/ part of a plant in response to a unidirectional stimulus; **rej;** unilateral
   b) Accelerates growth in shouts
      Can inhibit growth in roots **Acc;** High Conc
      Promote growth in roots
      Inhibit growth in shoots **acc;** low Conc
29. Activate enzyme; provide a medium for enzymatic activities (to break down stored foods to soluble form); Hydrolyses; dissolves food materials; a medium of transportation of dissolved food substances / Oxygen/ nutrients of growing region (of redicle and plumule); soften seed coat to facilitate emergence of radical

BIOLOGY PAPER 2
MARKING SCHEMES

1. The set-up below illustrates a procedure that was carried out in the laboratory with a leaf plucked from a green plant that had been growing in sunlight.



(i) What was the purpose of the above procedure ?

Testing (a leaf) the presence of starch ……

1 (mark)

(ii) Give reasons for carrying out step A,B and C in this procedure. (3marks)

A. *kill the leaf /cells/ protoplasm/ breakdown starch granules/ stop enzymatic activity*
B. *Removal of chlorophyll/ dissolve chlorophyll /desclorise the leaf*
C. *Soften leaf / makes less brittle.*

(iii) Name the reagent that was used at the step labeled D . (1mark)

Iodine solution ……

……

(iv) State the expected result on the leaf after adding the reagent named in (iii) above.
Stain dark blue/ Blue dark

2. In humans,hairly ears is controlled by agene on the Y Chromosomes .

(a) Using letter Y^H to represents the chromosome carrying the gene for hairly ears, work out a cross between a hairy eared man and his wife.

(4 marks)

Male female
Parent/ genotype; $X\,Y^H$ X XX ;
Gametes ; X Y^H X

Fertilization
F_1 *genotype* XX XX XY^H XY^H

(b) (i) What is the probability of the girls having hairly ears? (1 mark)

0/2 = zero or nil

(ii)Give reason for your answer in (b (i) above. (1mark)

The gene for hairly ears is on the Y chromosome which girls do not inherit from their fathers

(c) Name two disorders in humans that are determined by sex linked genes (2marks)

Haemophilia; colour blindness ; premature boldness ;

Duchene muscular dystrophy Award first two correctry given . Rej. colourblind

(d) Explain how comparative embryology is an evidence for organic evolution . (2marks)

Vertebrate embryo have similar morphological feature ; which suggest a common ancestry; For vertebrates accept any 3 classes of individual s of vertebrates to mean the same as vertebrates, For morphological features accept any two correctry given e.g viscerod /pharyngeal cleft segmented pyotomes motorchords , tail , single circulatory system ,gill slips or all

3. (a) Name the causative agent for the following respiratory diseases. (2marks)

(i) whooping cough.

Bodetella pertyssis

(iii) Pneumonia

Streptococcus pneumonia / influenza virus ; mycoplasma pneumonia 9older children pneumocytis staphylococcus aurens (in adults) chlomydophilar pneumonia

(b) Describe how oxygen in the alveolus reaches the red blood cells . (4marks)

Inhaled oxygen dissolve in moisture in the alveolus; since the oxy gen concentration in the blood is lower

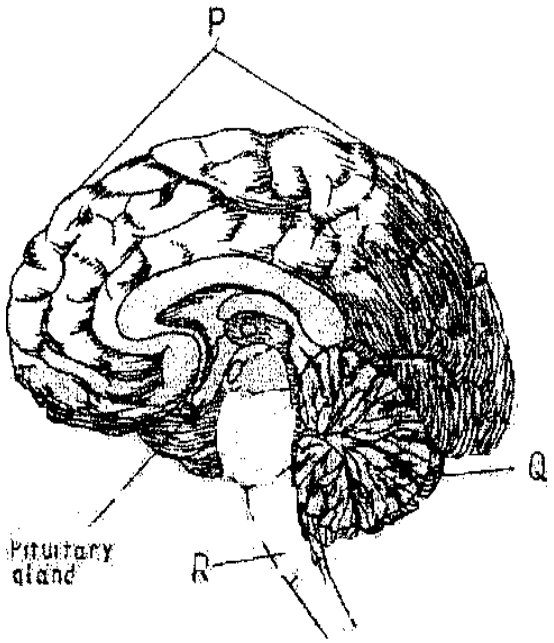
Than in the alveolus; oxgen diffuses ; through the alveolus epithelium , capillary wall enter the plasma/blood /red blood cells

(c) How are the pnematophores adapted to their function ?

(2marks)

Grow in to the air above mud / water ; Have lenticels (are in contact with the air) for gaseous exchange

4. (a) the diagram below represents a section of the human brain.



(i) Name the structure labeled Pand R.

P - cerebral hemisphere /cerebrum / celebral cortex
R- medulla oblongata

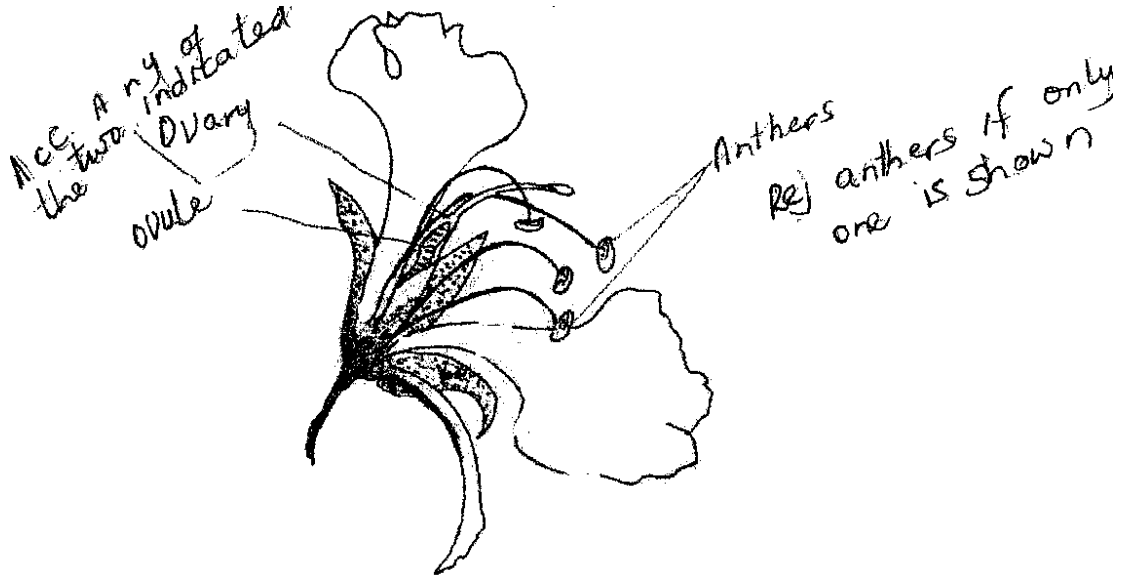
(ii) State two functions of the part labeled Q

Muscular co-ordination /maintaining body posture/ balance
Motordexterity/skul/ and ease in using the hands

(b) (i) Name two reproductive hormones secreted by the pituitary gland in women. (2marks)
Follicle stimulating hormone ;luteinizing hormone ;oxytocin ; proloctin

(ii) State one function of each of the hormones named in (b)(i) above (2marks)
FSH- stimulates secretion of oestrogen ;stimulates developmemt of grafian follicle ;
LH- brings about ovulation ; causes devptof corpus
Luteum / stimulate production of progesterone by corpus luteum;
Oxytoxin- causes contraction of uterus /causes expulsion releases of milk from mammary glands

5.(a) The diagram below represents a flower.



(i)On the diagram , name two structures where meosis occurs. (2 marks)

……..

……

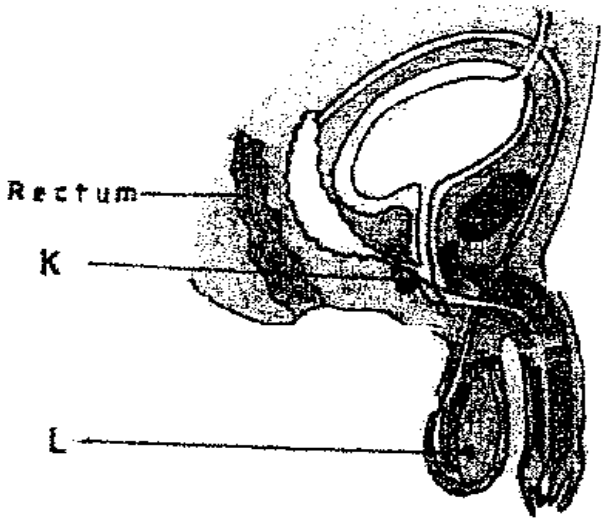
(ii) How is the flower adapted to prevent self-pollination?

Anthers are below the stigma ; (to minimize pollination)

Petals are large / conspicuous for insects to land on / attract insects (encourage cross pollination)

Acc. Stigma is above the anther

(b)The diagram below represents a human reproductive organ.



(i)Explain two adaptations of the structure labeled L to its functions (2 marks)

It is hanging outside the body to ensure optimal temperature for sperm production / spermatogenesis

It has (many long and coiled)seminiferous tubules to increase the surface area)for production of sperms

(iii) Explain the role of gland labeled K

Produces an alkaline fluid that neutralizes acid in the vagina / urethra; Rej. Female urethra
This fluid contains nutrients for the sperms and also activates sperms

SECTION B (40 MARKS)

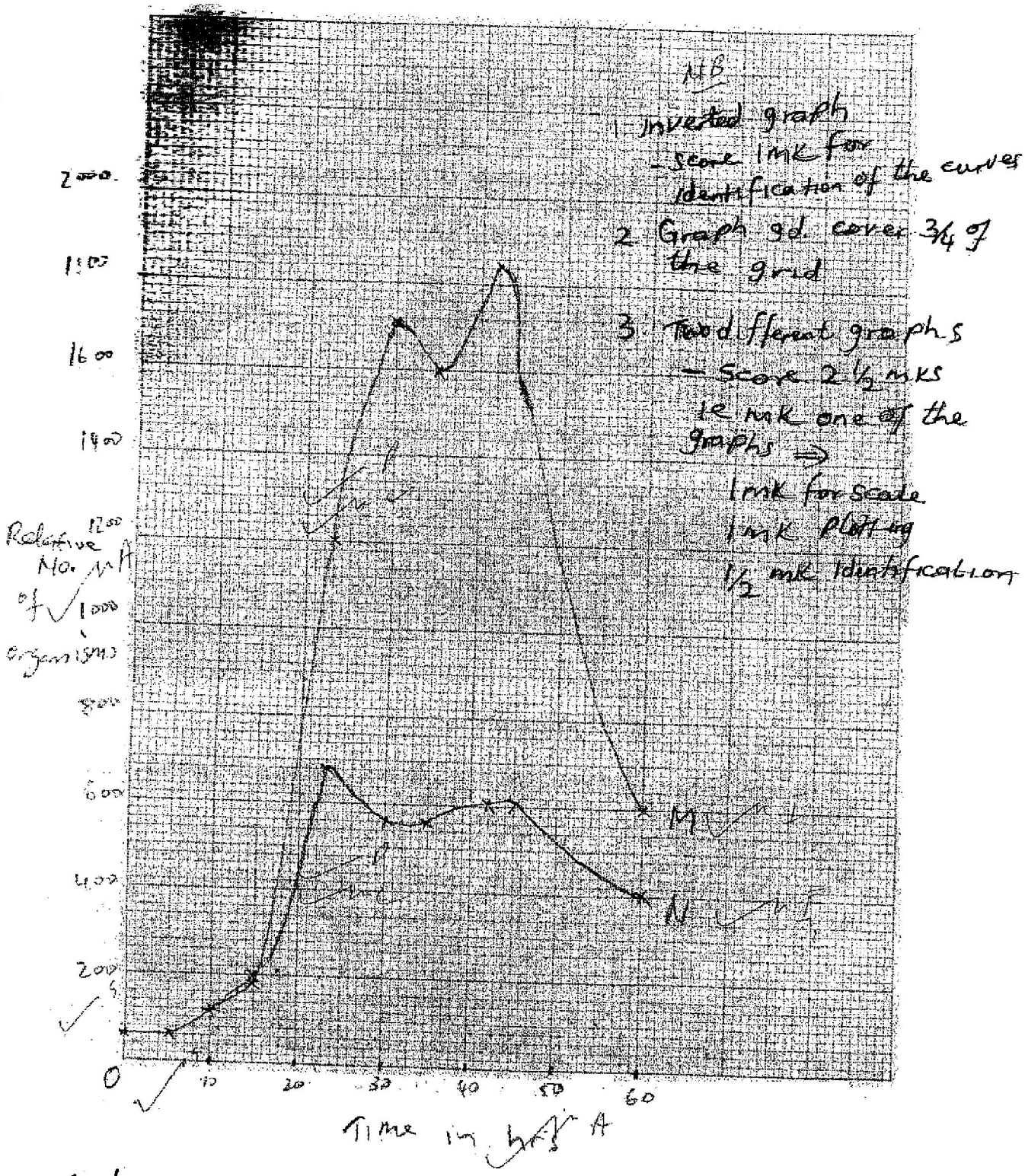
*Answer **6(compulsory**) and either question 7 or 8 in the spaces provided after question 8.*

6. (a)An experiment was carried out to investigate the population of a certain micro-organism. Two petri-dishes were used . into the petri-dish labeled m ,60cm^{3}of a culture medium was placed while 30cm^3 of the same culture medium was placed in petri-dish labeled N.Equal numbers of the micro-organisms were introduced in both petri-dishes . The set-ups were then incubated at 35^{0}c. The number of micro-organisms in each petri-dish was determined at irregular intervals for a period of 60 hours . The results were as shown in the table below

(i)

Relative number of micri-organisms	M	40	40	180	280	1200	1720	1600	1840	1560	600
	N	40	40	120	200	680	560	560	600	600	400
Time in hours		0	5	10	15	23	30	35	42	45	60

e same axes , draw the graphs of relative number of micro-organisms against time on the grid provided.
(7 marks)



Scale
* check origin
* intervals
* Highest Pt

Plotting
- All Pts should be there

Curve
- Free hand

(ii)After how many hours was the difference between the two populations greatest ? (1 mark)
42 hours

(iii)Work out the difference the two populations at 50 hours (2 marks)
m-1220+20(1200-1240)
n-540 +20+(520-560)
1220-540=680+40(640-720)

(iv) With a reason state the effect on the population of micro-organisms in petri-dish M if the temperature Was raised to 60^0c after 20 hours . (2marks)
Population (growth) decreases /reduces /cease ; High temperature kill the micro-organisms / denature enzymes

(v)Account for the shape of the curve for population in petri-dish N between 46hours and 59 hours. (3marks)
Population growth rate decreases; death rate (of micro-orgasms) is higher , than their rate of multiplication ;
Due to exhaustion of nutrients; and accumulation of toxic wastes; shortage of oxygen ; overcrowding/ Shortage of space

(b) Explain how osmotic pressure in the human blood is maintained at normal level. (5marks)
When the osmotic pressure of the blood increases beyond the normal level (osmoreceptors)hypothalamus detects this and stimulates the pituitary gland to /secrets / release more ADH vasopressins which make kidney tubules more permeable to water ; and more water is reabsorbed into the blood ; reducing the osmotic pressure to the normal level ; Acc reverse
When osmotic presser falls below the nomal level the (osmoreptors) in the hypothalamus detect this the pitituary gland is less stimulated Non /little /less permeable to water hence less water is absorbed into the blood ; increasing the osmotic level
when op is high
when there is too much $Na^+_{(aq)}$ – the blood adrenal cortex responds by secreting less aldosterone; which causes less $Na^+_{(aq)}$ to be absorbed from the kidney tubules into the blood; lowering the sodium ions level
when op is low
when there is too low Na^+ ions /or $Na^+_{(aq)}$ in the blood adrenal cortex responds by secreting more adolsterone which causes more Na^+ to be reabsorbed from the kidney tubules into the blood ; raising the Na^+ level

7.(a) Explain how structural features in terrestrial plants affect their rate of transpiration . (13 marks)

(b)Explain how the human skin brings about cooling of the body on a hot day . (7marks)

8.(a)Describe the exoskeleton and its functions in insects . (13marks)

(b) Describe how accommodation in the human eye is brought about when focusing on a near object . (7marks)

Q7

(a) plants in arid /semi arid /desert habitats have leaves covered with thick / waxy cuticles that are water proof/ impermeable to water ; allowing for reduced rate of transpiration ; sunken stomata ; in some desert/ semi arid

areas plants have water vapour accumulating in the pits is not carried away by wind ;most plants have few or no stomata on the upper surface of the leaf/ more stomata on the lower surface sheltered by from direct sunlight; the fewer the stomata the less the water loss from the plant . some plant have small stomata / small stomatas size ; thus

reducing transpiration rate plants with small needle like / spine ; expose less surface area hence reduce the rate of transpiration leaves with shiny surfaces; refrect light resulting in reduce d leaf temperature thus reducing the rate of transpiration . some plant have leaves covered with hairly /scales ; which trap a layer of moisture ; (on the leaf surface) reducing the rate of transpiration . plants growing in wet habitats / mesophyets have athin layer of cuticle which allow high rate of transpiration broad leaves ; expose a large surface area ; many stomata on both sides of the leaves ; have a large stomata.

Q7

(b) Light rays from a near object are more divergent ;and need to bend more refrect ; muscles contract ; suspensory ligament slackens ; the lens become thicker / increase in curvature / becomes more convex/ reducing focal length ; light from the object is refrected more ; in order to be focused more sharply on the retina / to form an image of the object on the retina .

Q8

(a) The exoskeleton 12 made up of chitin ; chitin is not evenly distributed / chitin is thin &(flexible) at joints ; hence it allows for movement ;,exoskeleton is secreted by the epidermal cells ; when still soft it allows for growth of the insect when(in contact with the air) it hardens limiting growth ;it shed regularly ;thus regulating growth of insects it also supports the internal structure ;because it is hard it protects internal organs from mechanical damage ;it is water proof ;preventing / reducing water loss / desiccation ; of the insect it also provide a surface for attachment of muscels / apodem projection in which mulscels are attached ; it is light modified into wings / has low density ;for flight ; can be modified to form hand jaws / mouthparts ;for bitting/piercing /sucking / gliding ; it is pigmented ; for camonflage ; can be transparent in some places ; allowing entry of light into the eyes ; for camonflage in water

(b) Light rays from a near object are more divergent ; and need to bend more / refrect muscels contract ;suspensory ligament slackens ; the lens becomes thicker /increase in curvature /becomes more convex / reducing focal length ; light from the object is refracted more; in order to be focused more sharply on the letina / to form an image of the object on the retina

K.C.S.E 2012 BIOLOGY

MARKING SCHEMES

PAPER 1

1. Plants make their own food from carbon (iv) oxide and water in the presence of light photosynthesize/ autotrophic; while animals eat ready made food (some plantsand animals heterotrophic;
   - If photosynthesis described all ran materials must be mentioned;
   - Carbon (iv) oxide the (iv) must be bracketed.
   - If sources of food for animals is mentioned then both plants and animals must appear.

2. a) Crustaceae/ Crustacea;
b) - Head fused with thorax/ has cephalothorax; (Reject 2 body parts)
   - Have two parts of artermae
   - Have compound eyes/ a pair of compound eyes;
   - Have five two twenty pairs of limbs;
   - Have external gills;

(Mark first 3 only)

3. a) A - Nucleopore; Accept. Nuclear pole. Reject pole in nucleus
   Note: It must be a name, not a description
   B - Rough endoplasmic reticulum;
   Reject endoplasmic reticulum attenae.

b) Surface covered with ribosomes; for protein synthesis;
   - Have interconnected channels; for transport of proteins;
   - Part (b) is tied to (a), reject if labelling of "B" in above is incorrect.
   - Interconnected/owlet, and channels must be there to score;
   -Feature tied to function

4. a) - The solution was hypotonic/ less concentrated compared to cell sap of pawpaw cylinder cells. Accept the converce.
   - The tissue/ cells gained water by osmosis.
   - Becoming turgid/ longer/ stiff.
   - Reject if contradiction occurs in paint I/ Note the sequential marking but proceed *if* proceeding paint is not contradictory.
   - Reject use of potato instead of pawpaw;
   - Pawpaw cylinders of same size/ length; placed in isotonic solution; Reject if same length or size and isotonic is missing.
   - Boiled pawpaw cylinders of same size/length; placed in similar solutions. Accept same/ <u>hypotonic/</u> hvpetonic solution in this case. Note: Osmosis must not occur in the control:

5. a) Plant C;
b) Thick cuticle reduce water loss;
   - Low number of stomata reduces water loss;
   - Least number of stomata on upper surface reduces water loss

- Reject less/ low juice in all species have the feature.
- Large root surface area enhances water absorption.

6. a) F- Bronchiole; Reject bronchioles;
G - Intercostal muscles/ external intercostal muscles;
- Reject internal intercostal muscles.

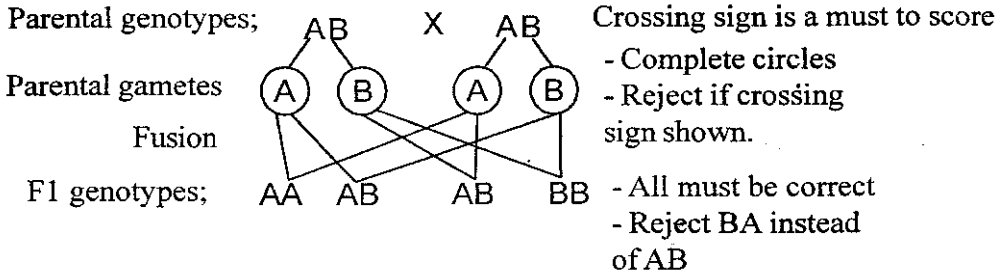
b) H- (Pleural membranes) secrete/ enclose pleural fluid (to lubricate lungs);
- Protect the lungs;
J - (Diaphragm/ diaphragm muscles) separates chest/ thoracic cavity;
- Accept it works to effect volume;/ pressure changes in chest cavity necessary for inhalation and exhalation/ ventilation.
- Accept relevant explanation for the working except that both inhalation and exhalation must be brought out clearly to score;
* Mark first one only;

7. a) Respiration/Aerobic respiration;

b) (Potassium hydroxide, removes/ absorbs/ takes away carbon (IV) oxide from the atmospheric air);
* Accept Co_2/ Reject carbon dioxide;
* Reject if the carbon (IV) oxide is without IV bracketed.

c) L - Lime water remains clear because carbon (IV) oxide has been removed;
- Must explain why carbon (IV) oxide is absent/ missing;
N - Lime water forms a white precipitate because the respiring cockroaches produce carbon (IV) oxide;
- Idea of respiration must come out;
- Reject milky;

8.



Crossing sign is a must to score
- Complete circles
- Reject if crossing sign shown.
- All must be correct
- Reject BA instead of AB

- Probability is $^1/_2$ or 0.5/ 50%
- Reject probability if not simplified

Using a punet square;

Genotype AB X AB

♂ \ ♀	A	B
A	AA	AB
B	AB	BB

-If diagonal line probability is missing or wrongly placed penalize for gametes;

9. - Reduces dehydration/ desiccation; (Reject prevents)
   - Avoid predators;
   (Mark first correct one)

10. Ability of an organism to detect/ perceive/(interprete) and respond to changes in the environment/ stimulus;
    - Detection/ perception and response must BOTH be present to score;

11. a) Can contract continuously without fatigue;
    Their contractions are started by the muscles themselves (and not nerves) They are myogenic. Reject not controlled by nerves,
    b) - Smooth muscles; Reject visceral muscles.
    - Skeletal muscles;

12. a) Fuse adjustment knob;
    Rej fuse adjusting knob/ adjustment knob alone/ coarse adjustment knob;
    b) Avoid refraction of light
    - Prevent melting of the slide;
    - Accept any one
    - Wrong answers negates the correct one:
    - Rejects prevents rusting.

13. - Temperature
    - Surface area;
    - Distance the particles have to travel/ thickness of the membrane. Accept thinness.
    - Diffusion/ concentration gradient;
    - Size/ density of molecules/ particles;
    - Medium of diffusion;
    - Surface area to volume ratio; reject ration for ratio;
    Mark first three

14. a) - Aerobic respiration;
    b) It releases more energy (per unit mass).
    Reject alot of energy alone/ comparison aspect must come cut.
    If units given, they must be correct/ 2880kj/g.

15. - Anhyrogens; accept androgen;

16.- - The plant/ flower is self-sterile/ incompatible/ owtte/ not success/ self pollinated; covering prevents pollination in flower P; flower Q received pollen from other plants/ cross pollination/ pollinating wind/ insect; -

17. Carbon (IV) oxide; Nitrogenous wastes/ urea;
    - Reject if (IV) is not bracketed/ if (IV) is in small letters;
    - Reject metabolic wastes/ uric acid/ ammonia

18. - Most of the waste products are harmless;
    - Waste products are converted into harmless products;
    Mark the first one

19. Passing urine frequently/ poly uria;

- Glucose in urine/ gylcocuria/ excess glucose in blood/ hyperglycemia:
  Reject glucose in blood/ alot of glucose alone; Reject sweet urine, Ace. sugar in urine;
  Reject sugary urine/ sugar particles in urine
- Constant feeling of thirst// frequent dehydration. Reject if constant/ frequent missing
- Loss of weight
- Excessive eating/ polyphagia/hyperphagia;
- Poor resistance to diseases;
- Mark only the first 4;

20. - Dry mass/ mass/ weight; Reject Biomass;
    - Height/ length;
    - Surface area;

21 - Nitrogen fixation; Reject nitrification;

22. - Results in adaptations that enable organisms to exploit different ecological riches; leading to the formation of new species/ speciation;
    - Aspect of features undergoing modification must come out; ie Accept structures become modified to enable organisms exploit different ecological riches;

23. a) Cellulose; accept cellulose and pectin; Rej pectin alone
    b) Lignin;

24. -Small/round;
    - Central/ prominent nucleus;
    - Dense cyptoplasm;
    -No vacuoles;
    - Continously/rapidly dividing cells;
    - Thin cell walls;
    Mark only first 4

25. Ecdysone cause metamorphosis/ causes moulting/ ecdysis;
    - Maintains larval characteristics/ formation of larval cuticle/ inhibits metamorphosis/ inhibits moulting/ ecrlysis;

26. a) Natural selection; Accept complete correct explanations; Theory of environmental influence in inherited characteristics/ inheritance of acquired characteristics;
    Rej use and disuse/ accept complete correct explanation

b) i) Similar organelles performing similar functions in different organisms suggest a common ancestry/ cell Biology;
   ii) Fossil records/ paleontology/ by comparing the fossils of different organisms/ originate from a common ancestry.

27. Removes excess water/ waste products/ homeostasis/ osmoregulation/ excretion;

28.

Open	Closed
-Blood flows in haemopel/ body cavity/ coelom/ schuses (directly in contact with cells)	Blood confined in vessels;

- Blood flows at low pressure — Blood flows at high pressure;
- Blood lacks pigment for transport of O_2 vs CO_2 — Blood has pigment for transport of O_2 and CO_2

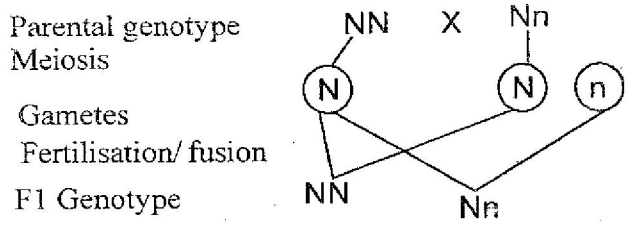
29. - water
    - Mineral salts
    - Vitamins: — Mark first 2
30. a) Smooth endoplasmic reticulum;
    b) Golgi bodies/ golgi body/ golgi apparatus;

K.C.S.E 2012 BIOLOGY
PAPER 2 MARKING SCHEME

SECTION A (40MARKS)

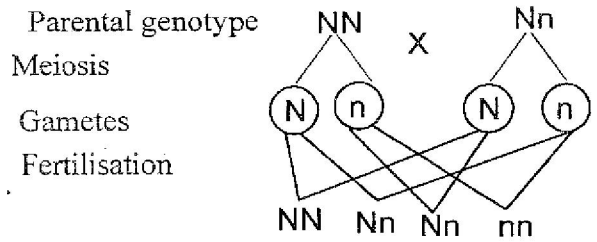
1. a) Lack of chlorophyll the plants do not manufacture food/ photosynthesis; plants die as soon as stored food reserves get depleted;

b)



Punnet square
Genotypes NN x N
or

♀ \ ♂	N	n
N	NN	Nn
N	NN	Nn



Maturing Proportion is $^{3}/_{4}$ / 75% ace. 0.75;

2. a) Glomerulus; rej glomeruli

b) - It is long to increase surface area for re-absorption of water;
- It is lined with a network of blood capillaries to enhance re-absorption of water;
- It is U- shaped to bring about a counter current multiplier effect/ to concentrate salts in the medulla to bring about re-absorption of water;

(Mark any 2 correct) (Structure tied to function)

c) Vasoconstriction; Hair rises; shivering:
metabolic rate increases:

(Mark the 1st three)

- Highly vascularised ace. dense network of blood capillaries.

3. i) -chlorophyll; ii)
- Oxygen; rej. symbol,

iii) - Test tube - H is at optimum temperature for enzyme activity; In test tube J most enzymes have been denatured by the high temperature;

b) - The villus epithelium is thorny; for faster diffusion/ dissolved/ soluble/ digested food substances/ nutrients/ A. A/ glucose/ vitamins;
- The epithelium has goblet cells; which secrets mucus lubricate food helping its passage/ prevent digestion of wall by enzymes;
- They have microvilli; which increases their S.A for absorption dissolved/ soluble/ digested food substances/ nutrients/A.A/ vitamins/ g/
- Has lacteals;..for absorption of fatty acids & glycerol transport lipids; Highly vascularised; for absorption / transport of digested food substances; has penes cells to produce lysozymes which are antibacterial.
- Has crypts of lieberkuhn; which produce intestinal in which-contain digestive enzymes;

(Mark the firstt2)

4. a) i) K -Ulna;
L- Humeruos

ii) Movement takes place at the elbow/ ocecranon process between the ulna and the humerus; bisepts/ flex or muscles contract; while the trices/ extensor muscles relax; (bringing about the movement of the lower arm upwards.)

b) - The (rigid) midrib holds leaf from the stem;
- Have lignifiec[1] xylem (cells);
- Turgidity in spongy mesophyll/ palisade cells;

5. a) The external intercostal muscles contract while internal intercostal muscles relax; ribcage is pulled upwards and outwards; the diaphragm flattens; the volume of the thoracic cavity/ lungs increases/ the pressure in the thoracic cavity decreases; air rushed into the lungs; from the atmosphere through the nose.

(4rnks)

b) Osmotic pressure of guard cells increases when sugar glucose is manufactured during photosynthesis/ starch converted to sugar in low acidity/ potassium ions moves into guard cells during the day; water enters guard cells from the surrounding cells by osmosis; because the guard cells have thin outer walls and thick inner walls the thin outer walls stetch/ expand more as the cell become turgid; thus the thick inner wall curves; causing the stomatal aperture to open.

(max 4mks)

SECTION B (40marks)

6. a) i) Scale = 2mks - correct/ workable intervals
- must have an origin
- graph less $^1/_2$ of grid - deny scale p/c

Curves - Irnrk- smooth curves continous -

Plotting = 2mrks (all must be correct)

Identity = Imrk

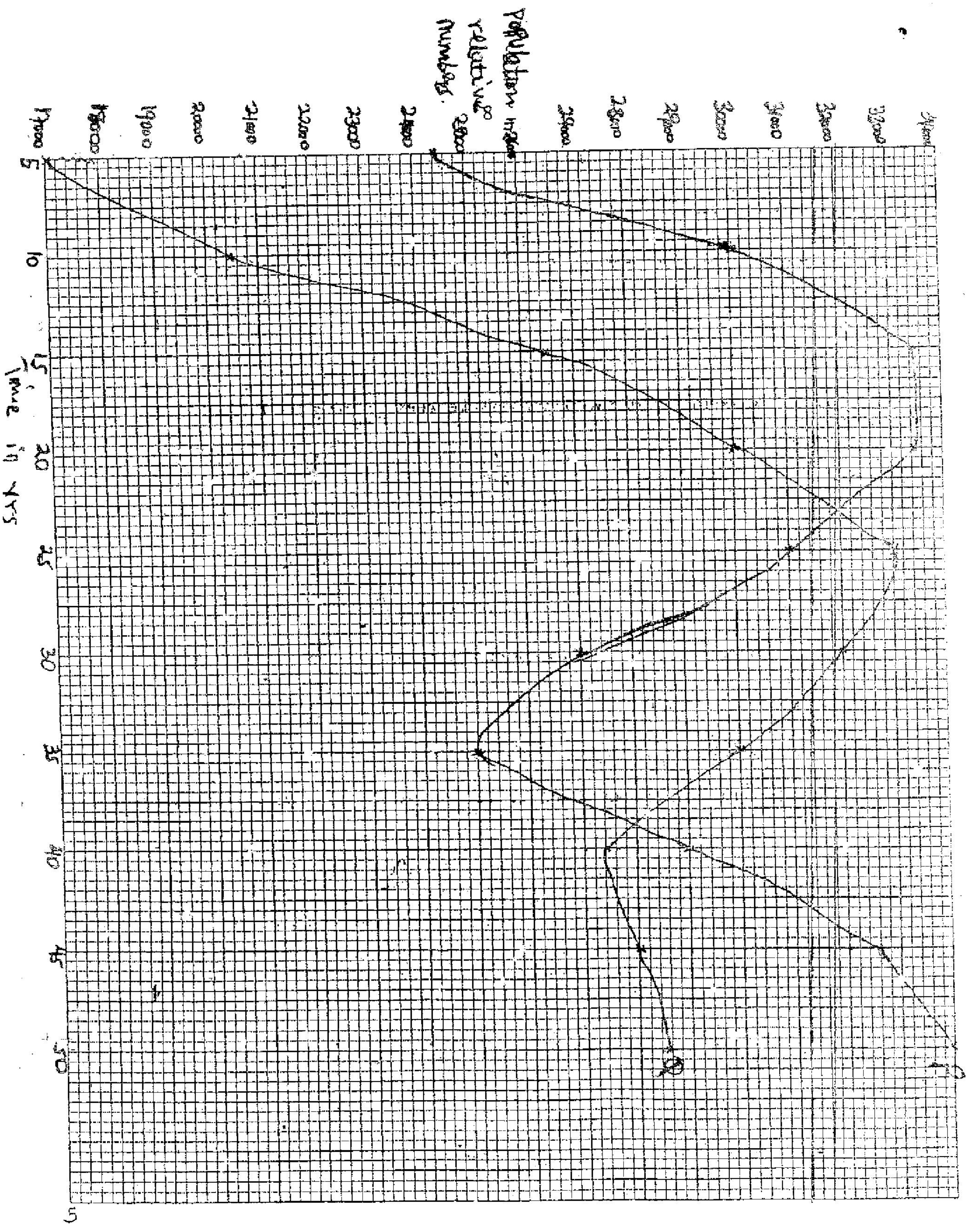
Axis (labelling) = Imk

- Identity = 1
- Label axis = 1

- Separate graphs mark 1st graph

-Award max of 3mrks ie

- (S - axis. L, X - axis. Identity = $2^1/_2 = 3$) - Inverted graph/ axis - award Imrk for identity only)- Extra position should not go beyond two small squares.



ii) - P represents the prey;
- prey population is initially higher/ prey population usually starts falling earlier;

iii) - Both populations decrease; prey is not enough to sustain predator/ population ental stress limit population of prey;

iv) 23 ± 0.5; (22.5 _____23.5)
39 ± 0.5; (38.5 _____39.5)

v) Less food for the prey/ competition for food; competition (for other resources); Emigration or migration of the prey out of the habitat; diseases; parasitism; human activities; eg pollution/ hunting/ deforestation/ culling/ poaching/ trans location.

(mark any 3)

acc pathogens/ cm

b) Causes respiratory diseases; poisons plants; forms acidic rain; which soil PH; corrodes metals/.buildings/ machines/ sculptures/ statues/'Stones/; acid rain poisons/ damna
kills plants/ animals/aquatic animals; Acid rain causes leaching of alluminiurn/ calcium/ magnesium ions; in high cone, sulphur (IV) oxide gas can kill human being/ animals/ damage plants;
ace. (for death of plants/ animals, (ace chlorosis/ yellowing in plants)

(max 4mks)

7. Simple reflex action eg. withdrawal of finger from a sharp object/ hot object; its an automatic response to a specific stimulus; when the finger touches sharp object/ hot object, the pain receptors/ thermoreceptors in the skin are stimulant; and trigger off a nerve impulse; the nerve impulse is transmitted via the senses neurone; to the grey matter of the spinal cord/ CNS/ brain; the impulse is then transmitted via synapse; to the relay neurone; and then through another synapse; to the motor neurone; and then through another synapse; to the motor neurone; the impulse is then transmitted to the effector muscles in the hand;
ace - efferent neurone for motor neurone
- afferent neurone for sense neurone
- intermediate/ associative/ connector/interauncial neurone - for relay
The effector muscles/ biceps contract; and the finger is withdrawn from the hot object/ sharp object; conditioned reflex action - salivation in a dog/ human being (ace. any other relevant example) student in response to sound; it is an automatic response evoked from an animal by unrelated stimulus; substituted for the one which normally elicits the response; it develops from a past experience; and involves modification of behaviour/involves learning; it weakens with time; and must be reinforced by repeating the related stimulus; the dog/ student salivates when the bell (for meals) rings; because they have learn to associate the ringing of the bell at meal time with food; everytime it rings (accept use of other relevant examples) they are offered food.
(max 20 mks)

8. a) An allergic rxn of a hypersensitive response; eg asthma/hay fever/ any other Rxn to a specified allergy; Allergic people are hypersensitive to materials like dust/ pollen grains/ some foods/ some drugs/ some pollutants/ (fungal spores/ feathers/ fur/ strong perfumes/ smoke; to an antigen by the body immune system; the body immune system responds by over producing antibodies; against harmless antigens; the antigen - antibody rxn occurs on the surface of the body cells; which burst/ open; and release histamine; cause inflamation,' itching/ swelling/ pain/ breathing difficulties/ constriction of bronchi/ dilation of capillaries/ excessive secretion of mucus/ anaphylaxis/ diarrhea vomiting/ sneezing./ coughing; which damage the body;