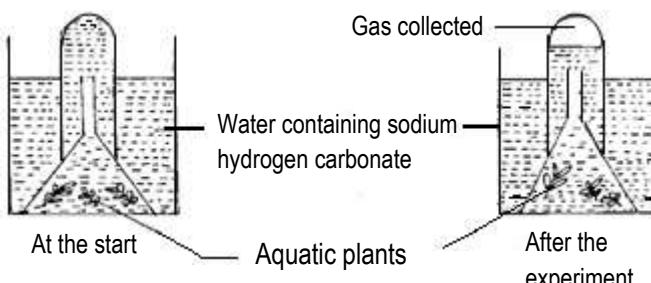


CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015**Kenya Certificate of Secondary Education****BIOLOGY****PAPER 1****(THEORY)****JULY/AUGUST, 2015****TIME: 2 HOURS**

1. (i) What biological knowledge or study is required in dealing with locusts that infest a maize crop. (1 mark)
(ii) State the functions of the following cell structures. (2 marks)
 - (a) Sap vacuole.
 - (b) Nucleolus.
2. Which **two** classes of phylum arthropoda have their head fused with the thorax? (2 marks)
3. (a) Name the part of the eye in which the light sensitive cells are located. (1 mark)
(b) List the **two** types of sensory cells found in the part named in (a) above. (2 marks)
4. (a) Name **two** raw materials for the dark stage process of photosynthesis. (2 marks)
(b) The set up shows an experiment to investigate photosynthesis.



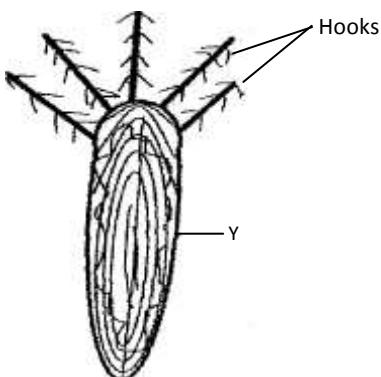
- (a) What gas was collected in the test tube? (1 mark)
(b) What was the role of sodium hydrogen carbonate in the experiment? (2 marks)
5. State **three** adaptations of the phloem tissue. (3 marks)
6. (a) State **one** structural and one functional difference between motor and sensory neurone. (2 marks)
(b) What name is given to the gap between the sensory neurone and intermediate neurones. (1 mark)
(c) Name the transmitter substance found in the gap named in (b) above. (1 mark)
7. Name **two** enzymes and **one** metal ion that are needed in the blood clotting process. (3 marks)
 - Enzymes.
 - Metal ion
8. Name causative agents of each of the following diseases.
 - (a) Typhoid
 - (b) Malaria
9. Name **three** properties of the cell membrane. (3 marks)
10. (a) Define the term carrying capacity. (1 mark)
(b) The table below gives information about an aquarium community which is ecologically balanced.

Type of organism	Dry weight (g)
Insect larvae	500
Fishes	5000
Water plants	5000
Bacteria	10

- (c) What do you understand by term ecologically balanced? (1 mark)
11. List the changes that takes place during inhalation in the breathing cycle of mammal in the following. (4 marks)
 - (a) Ribcage and thoracic cavity.
 - (b) Diaphragm
 - (c) External intercostal muscles.
 - (d) Internal intercostal muscles.
12. Name the fins that prevent the following movements of fish during swimming. (3 marks)
 - (i) Yawing
 - (ii) Pitching
 - (iii) Rolling
13. (a) Give an example of a sex linked trait in humans. (2 marks)
 - Y chromosome.
 - X chromosome.
- (b) Write the types of gene mutation represented by the following analogues. (2 marks)
 - (i) Intended message BRING THERMOS ON OUTING

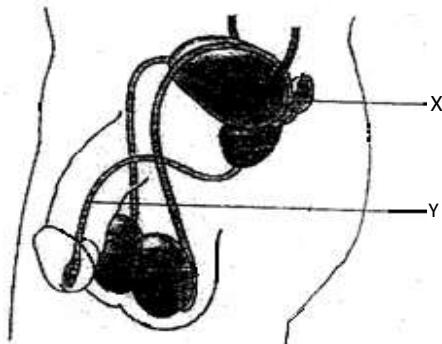
	Actual message Type	BRING MOTHERS ON OUTING
(ii)	Intended message	PLEAS SAY WHERE YOU ARE
	Actual message Type	PLEASE STAY WHERE YOU ARE

14. Use the diagram below to answer the questions that follow.



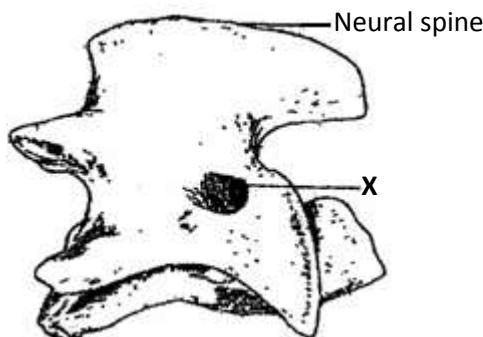
- (a) Name structure labelled Y. (1 mark)
- (b) (i) State the agent of dispersal for the structure above. (1 mark)
- (ii) Give a reason for your answer in b(i) above. (1 mark)

15. The diagram shown below represents a male reproductive system.



- (a) Name the structure labelled X. (1 mark)
 - (b) Name two substances that pass through structure labelled Y. (1 mark)
16. Name the type of response shown by:
- (a) Leaves of Mimosa pudica when they fold after being touched. (3 marks)
 - (b) Sperms when they swim towards ovum.
 - (c) Euglena when they swim towards the source of light.
17. Give two reasons why the pressure of blood is greater in the arteries than in the veins in mammals. (2 marks)
18. What happens when respiration exceeds photosynthesis in the guard cells of terrestrial plants? (3 marks)
19. The leaf of a potted green plant which had been kept in dark for 24 hours was smeared with petroleum jelly on its lower surface and then exposed to sunlight for 6 hours. Starch test on the leaf was negative. Account for the observation. (2 marks)
20. State the importance of the structure given below in a seed.
- (a) Endosperm. (1 mark)
 - (b) Testa. (1 mark)
21. (a) State two disadvantages of self pollination in plants. (2 marks)
- (b) Explain why the tube nucleus disintegrates just before reaching the embryo sac. (1 mark)
22. (a) State the circulatory system found in members of the class insecta. (1 mark)
- (b) Name the blood vessels that transport blood from:
 - (i) Small intestine to the liver. (2 marks)
 - (ii) Lungs to the heart.
23. Two populations of the same species of birds were separated over a long period of time by an ocean. Both populations initially fed on insects only but later it was observed that one population fed entirely on fruits and seeds although insects were available. Name;
 - (a) The type of isolation. (1 mark)
 - (b) The type of evolutionary change. (1 mark)

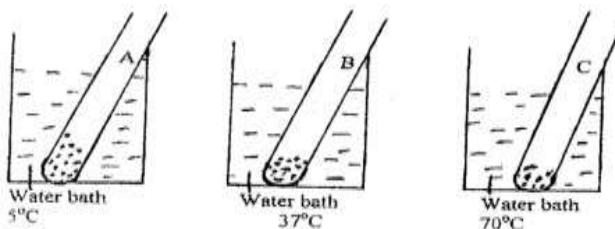
- (c) What are vestigial structures? (1 mark)
(d) Name **one** vestigial structure in man. (1 mark)
24. Eight potato cylinder of the same size were used to investigate a certain physiological process. Four of the potato cylinders were placed in solution S. The other four potato cylinders were placed in solution T. After 2 hours, the potato cylinders from solution S were found to longer and stiff, while those from solution T were found to be shorter and flexible. Explain the results in solution S and T. (2 marks)
- (b) Distinguish between active transport and diffusion. (2 marks)
25. Why is the pancreas considered a dual gland? (2 marks)
26. List **two** enzyme that are secreted in their precursor forms. (2 marks)
27. State **two** effects of gibberellins on shoots of plants. (2 marks)
28. The diagram below represents a type of bone in the mammalian skeleton.



- (a) Identify the bone illustrated in the diagram. (1 mark)
(b) Give a reason for your answer in (a) above. (1 mark)

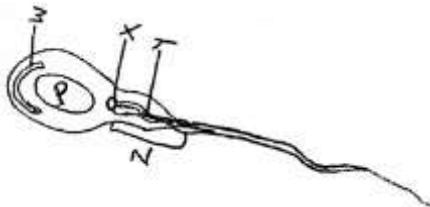
CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015***Kenya Certificate of Secondary Education*****BIOLOGY****PAPER 2****(THEORY)****JULY/AUGUST, 2015****TIME: 2 HOURS****Answer all the questions in this section in the spaces provided:**

- Sickle cell anaemia is a hereditary disease due to a recessive gene which changes normal haemoglobin (Hb – A) to abnormal haemoglobin (Hb – S). The red blood cells of people with sickle cell anaemia are sickle shaped.
 - What are the possible phenotypes of the offsprings of a man who is heterozygous and a woman who is also heterozygous? Show your working. (5 marks)
 - Sickle cell trait is more prevalent in tropical countries than in temperate countries. Give an explanation for this observation. (3 marks)
- Three tubes each containing 1ml saliva and 1ml water were incubated in water baths at different temperatures as shown in the diagram below for 30 minutes. Another one tube containing 1ml starch solution was incubated for the same length of time in each water bath. The contents of the two tubes in each water bath was then mixed and incubated for further 30 minutes. The content of each tube was then tested for starch using iodine solution.



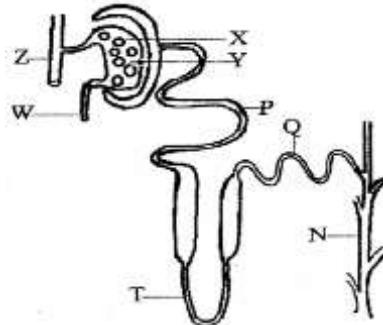
- What was the aim of the experiment? (1 mark)
- Why was it necessary to incubate the tubes for 30 minutes before mixing their contents? (1 mark)
- State the colour changes you would expect to observe after adding iodine solution. (3 marks)
- Account for the expected observations. (3 marks)

- Below is a diagram of a sperm cell.



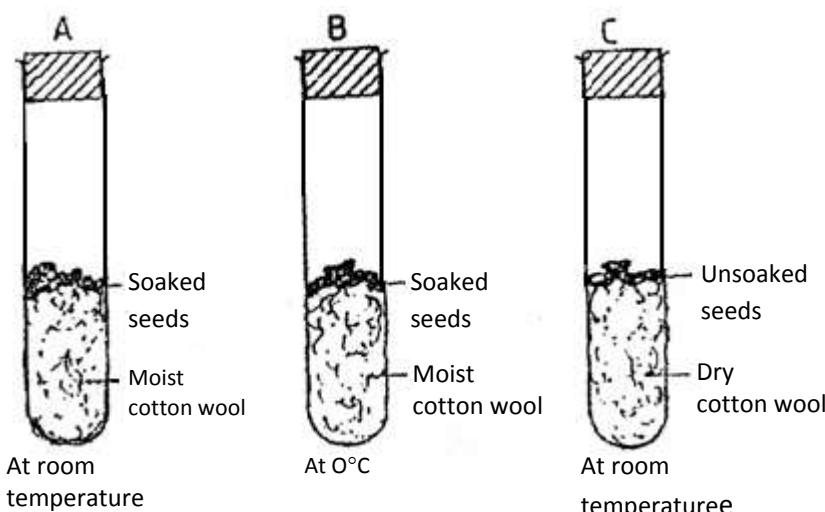
- Identify parts labeled **X** and **Y**. (2 marks)
- Explain how parts **W** and **Z** adapt the cell to its function. (4 marks)
- Using letter **P** identify or label on the diagram the part of the cell rich in DNA. (1 mark)
- State the function of part **X**. (1 mark)

- The figure shown below represents a kidney nephron. Use it to answer the questions that follow.



- (i) **X** is made up of a tuft of capillaries. How do they differ from other capillaries in the body? (1 mark)
 (ii) What structural difference exist between **W** and **Z**? (1 mark)
 (iii) State the significance of the difference stated in (a) (ii) above. (1 mark)
- State **three** adaptations that enable **P** to perform its function. (3 marks)
- What is counter flow and in which part of the nephron does it occur. (2 marks)

5. The diagrams below represent a set up to investigate the conditions necessary for seed germination.



The set was left for 7 days.

- (a) What conditions were being investigated in the experiment? (2 marks)
- (b) State **three** reasons for soaking seeds in set ups A and B. (3 marks)
- (c) What were the expected results after seven days? (3 marks)

Step A

Step B

Step C

SECTION B: (40 MARKS)

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

6. An experiment was carried out to investigate the effect of hormones on growth of lateral buds of three pea plants.

The shoots were treated as follows.

- (a) Shoot A – Apical bud was removed.
- (b) Shoot B – Apical bud was removed and gibberellic acid placed on the cut shoot.
- (c) Shoot C – Apical bud was left intact.

The lengths of the branches developing from the lateral buds were determined at regular intervals. The results obtained are shown in the table below.

Time in days	Length of branches in millimeters		
	Shoot A	Shoot B	Shoot C
0	3	3	3
2	10	12	3
4	28	48	8
6	50	90	14
8	80	120	20
10	118	152	26

- (i) Using the same axes, draw graphs to show the lengths of branches against time.(8 marks)
- (ii) (a) What was the length of the branch in Shoot B on the 7th day? (1 mark)
 - (b) What would be the expected length of the branch developing from Shoot B on the 11th day?
- (iii) Account for the results obtained in the experiment. (6 marks)
- (iv) Why was Shoot C included in the experiment? (1 mark)
- (v) What is the importance of gibberellic acid in agriculture? (1 mark)
 - State **two** physiological processes that are brought about by the application of gibberellic acid on plants.
- 7. Describe the role of hormones in the mammalian female reproductive cycle. (20 marks)
- 8. Explain how structures of the human ear are adapted to their functions. (20 marks)

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015

231/3

BIOLOGY

PAPER 3

(PRACTICAL)

JULY/AUGUST 2015

TIME: 1 $\frac{3}{4}$ HOURS

CONFIDENTIAL TO SCHOOLS:

Each candidate will require the following:

- 15ml of 5% Bromothymol Blue.
- Lime water (calcium hydroxide) labeled solution X.
- A drinking straw.
- 2 test tubes.
- 10ml measuring cylinder.
- Boiling tube.
- Large bean seed soaked overnight labeled R1.
- Large maize grain soaked overnight labeled R2.
- Scalpel or razor blade.
- Iodine solution provided with a dropper.
- Dilute hydrochloric acid.
- Dilute sodium hydroxide.
- Hand lens.
- Distilled water provided in a wash bottle.
- 2 droppers.

NB: Bromothymol blue stock solution is 0.04g in 6 – 4ml N/100 NaOH, 73.6ml distilled water and 20ml absolute ethanol 5% Bromothymol blue is made by adding 95ml of distilled water to 5ml of stock solution.

CENTRAL KENYA NATIONAL SCHOOLS JOINT MOCK - 2015**Kenya Certificate of Secondary Education****BIOLOGY****PAPER 3****(PRACTICAL)****TIME: 1½ HOURS**

1. You are provided with the following:

- 25ml Bromothymol blue.
- Solution X.
- A drinking straw.
- 2 test tubes.
- 10ml measuring cylinder.
- A boiling tube.
- Dilute hydrochloric acid.
- Dilute sodium hydroxide.

- (a) Place 2ml of Bromothymol Blue (B.T.B) in a clean test tube. Add dilute hydrochloric acid drop by drop and shake after each drop till there is a permanent colour change.
- State the resulting colour. (1 mark)
 - To the mixture obtained above, now add sodium hydroxide solution drop by drop until there is a colour change. Record your observation. (1 mark)
 - From your observations in (a)(i) and (a)(ii) above what is the nature of Bromothymol blue. (1 mark)
- (b) Place 10ml of fresh Bromothymol blue in a boiling tube. Using the drinking straw, bubble air through the bromothymol blue until there occur colour change.
- Record your observation. (1 mark)
 - What does the colour obtained in (b)(i) above suggest about the nature of the gas breathed out? (1 mark)
- (c) Rinse the measuring cylinder and use it to place 2ml of solution X in a clean test tube. Rinse the drinking straw used in (b) above and use it to bubble air through solution X.
- Record your observation. (1 mark)
 - Suggest the identity of solution X. (1 mark)
 - Suggest the identity of the gas that gave rise to the observation above. (1 mark)
- (d) (i) Name the physiological process in cells that leads to formation of the gas named in c(iii) above. (1 mark)
- (ii) Write down a word equation for the process named in d(i) above. (2 marks)
- (iii) What is the importance of the identified process in cells of living organisms? (1 mark)

2. Study the photographs and answer the following questions.



PLATE 5



PLATE 6

PLATES 7

- (I) The photograph in Plate **5** shows the germination process in a species of legume.
- (a) (i) Name the type of germination shown in the photograph. (1 mark)
(ii) Give a reason for your answer. (1 mark)
- (b) Other than germination the seedling have shown some responses.
(i) Name **two** responses shown in the photograph. (2 marks)
(ii) State **one** survival value of each of the response named above. (1 mark)
- (II) Examine the photograph in Plate **6** and Plate **7** which show different essential parts of a flower of a species on two different plants.
- (a) Name the flower parts shown in Plate **6** and Plate **7**. (2 marks)
- (b) (i) Name the phenomenon described in the statement above. (1 mark)
(ii) Explain the significance of the phenomena stated in (a)(i) above. (1 mark)
- (c) (i) State the mode of pollination of the flower shown in the photograph. (1 mark)
(ii) Give a reason for your answer. (1 mark)
(d) (i) State the type of pollination of the flower shown in the photograph. (1 mark)
(ii) Give **two** reasons for your answer. (2 marks)
3. The photographs in Plate **J**, **K** and **L** shows the anterior part of two different animals,
Plate **L** shows the longitudinal dissection of Plate **K**. Examine the photographs and answer the questions below.



PLATE J



PLATE K



PLATE L

- (a) (i) State the class to which the animal organ in Plate **J** belongs. (1 mark)
(ii) State the habitat of the animal. (1 mark)
(iii) Give a reason for your answer in (ii) above. (1 mark)
- (b) (i) Name the organ shown in the photograph in Plate **J**. (1 mark)
(ii) State the function of the organ named above (i). (1 mark)
(iii) Name the structure that protects the organ named in (b)(i) above from mechanical damage . (1 mark)
(iv) From observable features only explain three adaptation of the organ to its function. (3 marks)
- (c) (i) Identify the structure in the photograph Plate **K** and **L**. (1 mark)
(ii) Give a reason for your answer. (1 mark)
(iii) Using observable features only state three adaptations of the structure to its functions. (3 marks)

CENTRAL KENYA NATIONAL SCHOOLS JOINT EXAM 2015**231/1****BIOLOGY****PAPER 1****MARKING SCHEME**

1. (a) (i) Entomology
(ii) Sap vacuole - store sugars (in plants)
- (b) Manufacture ribosomes.
2. Arachnida;
Crustacea;
3. (a) Retina
(b) Cones and rods
4. (a) Carbon (IV) oxide, hydrogen ions / atoms
(b) Oxygen gas
(c) dissociate in water to provide carbon (IV) oxide; which is necessary for photosynthesis;
5. Have cytoplasmic filaments to enhance mass flow; sleeve plate has pores for passage of organic material;
Have companion cell which provide energy; presence of plasmodesmata to communicate between sieve tube elements and companion cells.
6. (a) Structural:-

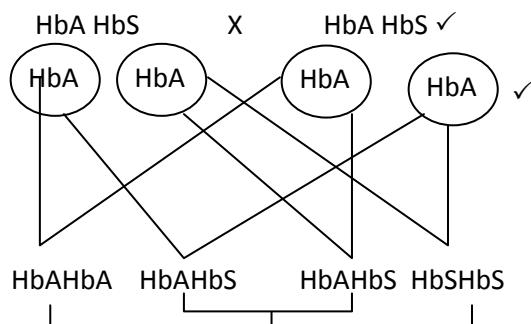
Sensory	Motor
Cell body outside CNS	Cell body inside CNS
Unipolar	Bipolar
Functional:-	
Transport impulses from the receptor to the CNS	Transport impulse from the CNS to effectors

(b) Synapse, neuro junction
(c) Acetylcholine;
Noradrenaline;
7. Thrombin;
Thromboplastin / thrombokinase;
Calcium ions;
8. (a) salmonella typhi
(b) plasmodium spp, plasmodium vivax, plasmodium falciparum, plasmodium ovale, plasmodium malariae
9. Sensitive to change in temperature; pH;
Has electrical changes, positive and negative changes;
Selectively permeable;
10. (a) Maximum number of organisms which can be supported by a habitat without depleting the available resources.
(b) Both consumers and producers are at equilibrium;
Number of organisms in the trophic levels can support one another in terms of nutrition.
11. (a) Volume increases, pressure decreases; rises upwards and (slightly) outwards;
(b) Flattens
(c) Contracts
(d) Relaxes
12. (i) Dorsal, / anal fins
(ii) Pectoral / pelvic fin
(iii) Dorsal / ventral / caudal fin
13. (a) Tuft of hair in the nose and ear pinna; premature baldness;
Colourblindness ; Haemophilia
(b) (i) Inversion.
(ii) Insertion
14. (a) Pericarp/fruit wall
(b) (i) Animals
(ii) It has hooks that get attached on the animals bodies and get moved away from the mother to plant.
15. (a) Seminal vesicle.
(b) Urine; semen; rej. Sperms
16. (a) Nastic / haptonasty / thigmonasty
(b) Positive (chemo) taxis
(c) Positive phototaxis
17. Arteries have narrow lumen to maintain pressure;
Have muscular walls;

-
- Blood pumped at high pressure;
18. Carbon(IV)oxide increases in the guard cell; pH increases leading to conversion of glucose to starch; starch is osmotically inactive compared to glucose; this leads to guard cells loosing water to the surrounding epidermal cells; guard cells becomes flaccid and hence stoma closes.
19. The leaf had stomata on the lower side only ; which were blocked by petroleum jelly; cutting supply of CO₂, hence no photosynthesis.
20. (a) stores food for the embryo
(b) Protects the inner parts from injury / micro-organisms / desiccation.
21. (a) There is no variation in characteristics;
No hybrid vigour;
Undesirable characteristics are retained within the species;
(b) To allow the male nuclei to enter the embryo sac.
22. (a) Open / Lacuna
(b) (i) Hepatic portal vein
(ii) Pulmonary vein
23. (a) Geographical.
(b) Adaptive radiation / Divergent evolution.
(c) Structures which have been greatly reduced in the course of time due to disuse.
(d) Coccyx, Appendix
- 24 (a) Solution S is hypotonic to cell sap of potato cylinder cells; the cells drew in water by osmosis increased in size and became turgid hence increase in length and stiffness in cylinder.
Solution T was hypertonic to cells of potato cylinder; the cells lost water by osmosis to solution T and became flaccid leading to decrease in length and becoming flexible.
(b) Active transport refers to movement of molecules or ions (across a semi-permeable membrane) against the concentration gradient with use of energy, diffusion is the movement of molecules or ions from region of high concentration to region of low concentration.
25. Produces hormones / endocrine organs / produce digestive pancreatic juice.
26. Trypsin
Pepsin
27. Promotes cell division and cell elongation in dwarf plants thus greatly increasing their length; ends dormancy in lateral buds thus promoting formation of side branches; affects expansion and shape of the leaf and retards leaf abscission.
28. (a) Axis
(b) Has odontoid process.

CENTRAL KENYA NATIONAL SCHOOLS JOINT EXAM 2015**231/2****BIOLOGY****PAPER 2****MARKING SCHEME**

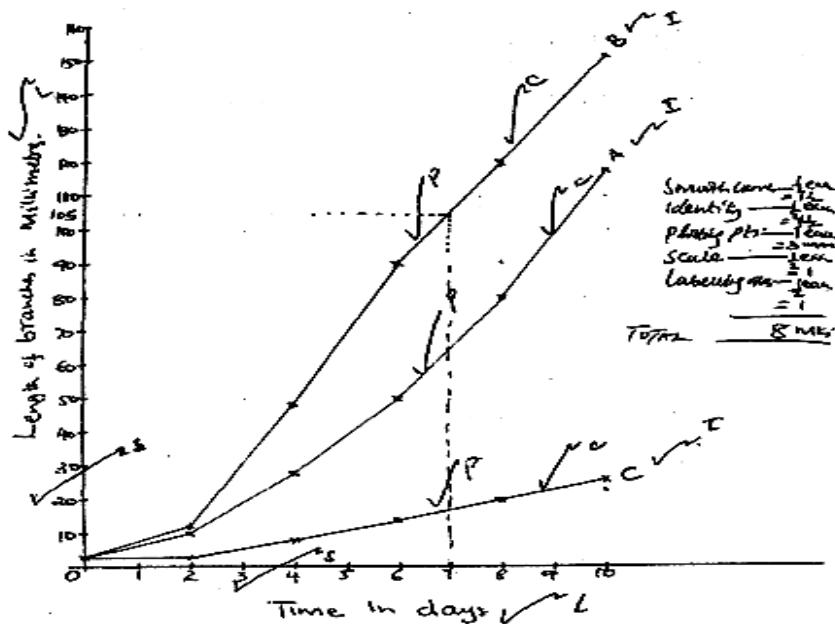
1.



Normal ✓ Sickle cell trait! ✓ Sickle cell anaemia ✓

- (b) In tropical countries malaria incidence is high ; those who are heterozygous have immunity to malaria; this is called heterozygous advantage. or
In tropical countries malaria incidences is high; those who are heterozygote have some red blood cells with crescent shape thus low oxygen carrying capacity plasmodium content therefore survive in such conditions making them to have an immunity ;
2. (a) Effect of temperature on enzymes ;
(b) So that contents of the tubes will have attained the temperature of the waterbath.
(c) A - Would turn blue black
B - Would turn brown / colour of iodine remained
C - Would turn blue black
(d) A - Very low temperature which inactivated enzyme / ptyalin / salivary amylase thus no digestion of starch.
B - Suitable temperature / favourable temperature / optimum / best temperature for activity of enzyme / salivary / amylase / ptyalin thus starch digested.
C - Temperature high / above optimum thus denaturing enzyme thus no digestion of starch.
3. (a) X Centriole
Y Axial filament
(b) W / acrosome release (hydrolytic) enzymes which digest the plasma membrane of ovum enabling the penetration of sperm.
Z / middle piece has many mitochondria; to generate energy; (used in swimming of the sperm cell towards ovum)
(d) Formation of spindle fibres / play a role in cell division
4. (a) (i)They are more permeable to water than capillaries.
ii) Z has a wider lumen than N (acc converse)
iii) This increases high blood pressure within the glomerulus.
(b) - One cell thick to reduce distance for reabsorption.
- Cells have numerous mitochondria to produce energy for active transport ; have microvilli to increase surface area for re-absorption ; Highly coiled to reduce spread of flow to increase time available for reabsorption.
- (c) A condition where fluids flow in opposite directions / glomerular filtrate flow opposite direction to blood in capillaries; parts T and Q.
5. (a) Water, temperature, moisture (Acc. warmth)
(b) Mobilise /hydrolyse stored food / activate enzymes / breaking of dormancy.
Softening the testa / seed coat (acc. as a solvent / transport media)
(c) Those in set A will germinate
Those in set up B will not germinate
Those in set up C will not germinate

6.(a)(i) (Graph)

(ii) (a) $104\text{mm} \pm 1\text{mm}$ (from 103mm to 105mm)

(b) 164 mm

- (iii) A. Removal of apical bud led to less auxin synthesis hence less auxin migrated to the stem; leading to increase in length of lateral bud;
 B. Removal of apical bud led to less auxin migrating to the stem but with addition of G. A (Gibberellic acid) there is more cell elongation leading to increase in length of the lateral branches;
 C. Presence of apical bud led to more synthesis of Auxin; leading inhibition of elongation of lateral buds hence to slow rate of increase in length of lateral branches;
- (iv) To act as a control experiment.
- (v) - Help / stimulate formation of side branches.
 - Ends dormancy in buds.
 - Activate growth of adventitious root.
 - Brings about parthenocarpy / initiated flowering / setting fruits without fertilization.
 - Break seed dormancy
 - Affect leaf expansion.
 - Retard leaf abscission.
 (vi) - Activates enzymes during germination thus breaking seed dormancy.
 - Promote cell division / elongation.

7. Follicle stimulating hormone (FHS); is secreted from the anterior lobe of the pituitary gland just after menstruation; It causes Graafian follicle to grow in the ovary; FSH also stimulates tissues of the ovary to produce oestrogen;
 Oestrogen; brings about healing and repair of endometrium; destroyed during menstruation; Accumulation of oestrogen; stimulates pituitary gland produce Luteinising hormone (LH);
 Luteinising hormone (LH); stimulates maturation of graafian follicle; The matured graafian follicle releases an ovum into funnel shaped part of the ovary; This is known as ovulation; LH also brings about changing of graafian follicle into corpus luteum; LH then stimulates corpus luteum to secrete progesterone;
 Progesterone; stimulates thickening of the endometrium and increases blood supply to the endometrium; in preparation for implantation. When fertilisation has taken place, progesterone levels increase and this inhibits secretion of FSH; hence no more growth of graafian follicle; **TOTAL 22 MAX 20**
8. The pinna; is funnel shaped; cartilaginous structure that collects and directs sound waves into the ear; The external auditory canal; - a tube that directs sound waves from the pinna to the eardrum lining the auditory canal; The canal contains wax-secreting cells; and hair which traps dust particles; and pathogenic bacteria hence prevent them from getting into the ear;

The eardrum; - has a thin tough membrane; that easily vibrates when hit by sound waves; transferring them into vibrations.

The ear ossicles; - they act like a layer and they easily move forward and backward to amplify sound vibrations that hit them;

The suspensory ligaments; - suspends the ear ossicles and prevents excessive vibration that would otherwise damage the inner parts of the ear;

The eustachian tube - it connects the middle ear with the pharynx; and it equalises air pressure between the middle and the outer ear so as to prevent distortion of the eardrum;

The oval window; - has thin membrane that transmits sound vibrations into the endolymph;

The cochlea; - highly coiled to occupy a small area but to accommodate a large number of sensory cells;

The perilymph and endolymph; - these are fluids that absorb mechanical shock; hence protect the delicate parts in the inner ear; They also transmit vibrations to the inner parts of the ear;

The sensory cells; - when stimulated, they generate nerve impulses; which are transmitted by the auditory nerve to the brain;

The semi-circular canals; - these are tubular cavities that maintains body balance and posture; They contain special cells that are sensitive to changes in gravity;

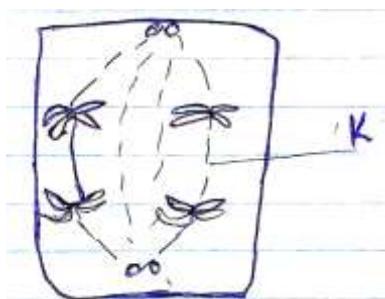
TOTAL 29 MAX 20

CENTRAL KENYA NATIONAL SCHOOLS JOINT EXAM 2015**231/3****BIOLOGY****PAPER 3****MARKING SCHEME**

1. (a) (i) Yellow ;
 (ii) Blue ;
 (iii) PH indicator;
 (b) (i) Colour changes from blue to green / yellow;
 (ii) The gas is acidic;
 (c) (i) White precipitate formed;
 (ii) Lime water / Calcium hydroxide;
 (iii) Carbon (IV) oxide;
 (d) (i) (Aerobic) respiration ;
 Reject anaerobic respiration.
 (ii) Glucose + Oxygen; → Carbon (IV) Oxide + Water + Energy
 (iii) For provision of energy.
2. I (a) (i) epigeal
 (ii) - cotyledons are above the ground
 (b) (i) - positive hydrotropism in roots
 - positive phototropism in shoot.
 (ii) Positive phototropism
 Light causes lateral migration of auxins away from the light side, towards the darker side; high auxin concentration stimulates growth in the shoot ; thus the cells on darker side grew and elongated faster than the cells on the illuminated side ; causing the curvature towards light;
 (iii) Provides yield energy required by the cell for various functions;
Positive hydrotropism.
 Water causes auxins to migrate towards the side with water / moisture, auxin, are positively hydrotropic; low auxin concentration stimulates growth in roots, auxin high concentration inhibit growth in roots; the cells on the side away from the water grow and elongated faster; leading to curvature towards water.
 (ii) Phototropism enables plants (shoot) to obtain optimum light for photosynthesis.
 Hydrotropism by roots enables plants to absorb water and mineral salts for metabolic processes.
- II (a) plate 6 - stamen plate 7 - pistil
 (b) (i) dioecium
 (ii) facilitates pollination leading to variation within the species and increase in hybrid vigour.
 (c) (i) wind pollination
 (ii) Small inconspicuous bracts; that are dull coloured
 (d) (i) cross pollination.
 (ii) - male and female parts occur in different plants.
 - the plant pollen grains are sterile to the stigma of the same plant.
3. (a) (i) Pisces
 (ii) Aquatic
 (iii) Have gills for gaseous exchange
 (b) (i) fish gills, gills
 (ii) Site for gaseous exchange
 (iii) Operculum
 (iv) - Have numerous gill filaments to increase the surface area for gaseous exchange.
 - Have gill rakers to trap food particles and solid materials which may damage the delicate gill filaments.
 - Have thin epithelium (blood visible) to reduce diffusion distance hence faster exchange of respiratory gases.
- (c) (i) Trachea
 (ii) It is tubular; hollow ; it has ring of cartilage.
 (iii) - Tubular/hollow to transport respiratory gases ;
 - Have rings of cartilage to keep the trachea open / prevent from collapsing.
 - Have smooth muscles to allow for stretching hence bending of the neck.

GATUNDU SUB COUNTY DISTRICT FORM FOUR 2015 EVALUTION EXAMINATION**231/1****BIOLOGY****PAPER I****(Theory)****JULY/AUGUST 2015**

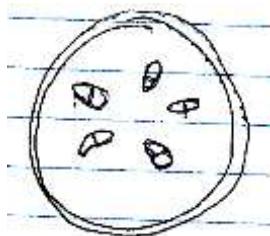
1. State the importance of each of the following in living organisms. (2 marks)
 - i) Respiration
 - ii) Reproduction
2. State function of the following in seed. Germination. (3 marks)
 - i) Water
 - ii) Enzymes
 - iii) Oxygen
3. Distinguish between identical twins and fraternal twins. (2 marks)
4. The diagram below represents a stage during cell division.



- i) Identify the stage of cell division. (1 mark)
- ii) Give two reasons for your answer (a) above. (2 marks)
- iii) Name the structures labeled K. (1 mark)
5. State three roles of Gibberellins hormone in plant. (3 marks)
6. (i) The diameter field of view of a light microscopic is 6.5mm. Plant cells lying across the diameter are 12. Determine the size of one cell in micrometers. (2 marks)
 - (ii) Explain how drooping of leaves on a hot sunny day is advantageous to a plant. (1 marks)
7. Distinguish between diffusion and osmosis. (2 marks)
8. State the changes that occur in a nerve axon to produce an action potential. (3 marks)
9. (i) Name the gaseous exchange surface in insects. (1 mark)
 - (ii) State two ways the surface named in (a) above is suited to its function. (2 marks)
10. $5C_{51}H_{98}O_6 + 145 O_2 \longrightarrow 102 CO_2 + 98 H_2O$

The above equation shows an oxidation reaction of food substances.

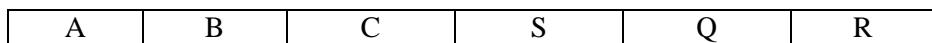
- a) What do you understand by the term respiratory quotient? (1 mark)
- b) Determine respiratory quotient of the oxidation of food substances. (1 mark)
- c) Identify the food substances. (1 mark)
11. State one function of each of the following parts of a mammalian ear.
 - a) Pinna (1 mark)
 - b) Tympanic membrane (1 mark)
 - c) Vestibule (1 mark)
12. State one structural and one functional difference between motor and sensory neurones. (2 marks)
 - Structural difference –
 - Functional difference –
13. i) Distinguish between a community and a population (2 marks)
 - ii) State two measures that can be taken to control infection of man by protozoan parasites. (2 marks)
14. i) Pregnancy continues if the ovary of an expectant mother is removed after 4 months. Explain. (2 marks)
 - ii) What is the role of testes in the mammalian reproductive system? (2 marks)
15. i) State two ways in which skeletal muscles fibres are adapted to their function. (2 marks)

- ii) State two structural differences between biceps muscles & muscles of the gut. (2 marks)
16. a) Explain why Lamarck's theory of evolution is not accepted by biologists today. (2 marks)
- b) State two pieces of evidence that support the theory of evolution. (2 marks)
17. The diagram below shows a section through plant organ.
- 
- a) (i) Name the class of the section was obtained. (1 mark)
(ii) Give a reason for your answer in (a) above (1 mark)
- b) What is the role of vascular bundles in plant nutrition? (2 marks)
18. The following is a dental formula of a dog and rabbit, state two differences between them. (2 marks)

Dog: I 3 C 1 PM 4 M 2
3 1 4 3

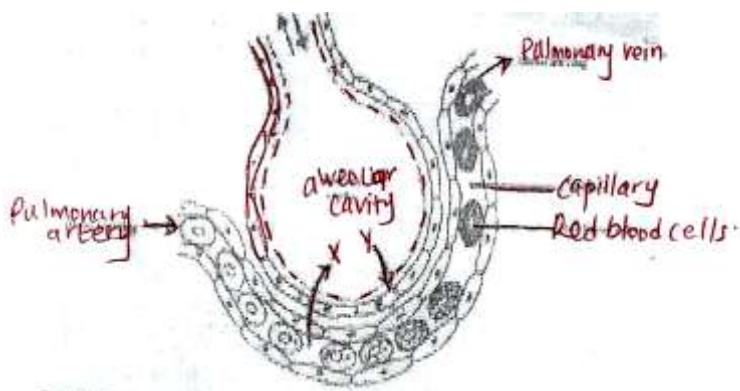
Rabbit: I 2 C 0 PM 3 M 3
1 0 2 3

19. The figure below illustrates a portion of a chromosome with genes named A, B, C, S, Q and R



Use the diagrams similar to the one above to illustrate the changes if the above chromosome undergoes the following mutations affecting only gene C and S.

- (i) Deletion (1 mark)
(ii) Inversion (1 mark)
20. Name the disease characterized by
Glycosuria (2 marks)
Diuresis (1 mark)
21. State the importance of each of the following features in animals; (2 marks)
- a) Solid food being broken down into small pieces.
b) Presence of caecum in herbivorous mammals.
22. Lance that accumulates in muscles when respiration occurs with insufficient oxygen. (1 mark)
23. The diagram below represents gaseous exchange in the alveolus



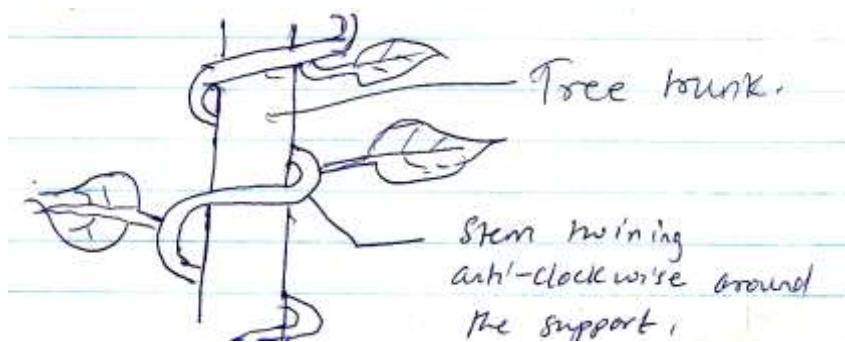
- a) Mention the path followed by gas y from alveolar space until it reaches the red blood cells.
24. Explain how water from the soil is gained by root hair in plants. (2 marks)
25. In what form is carbon IV oxide transported in blood. (1 mark)

26. The diagram below shows a section of a dicotyledonous stem.



Name the type of cells found in part labeled E. (1 mark)

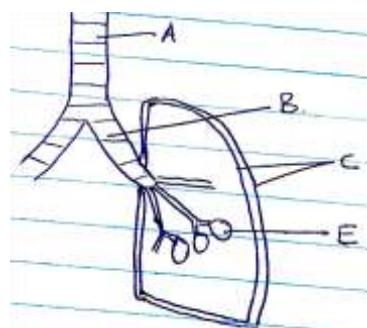
27. State three features that a grasshopper, a crab, a spider and a millipede have in common. (3 mark)
28. State two characteristics of Eukaryotes. (2 marks)
29. A cell organelle can be thought of as a “bag” full of “liquid”, the “liquid” being the “background” substance that holds other structures within the “bag”. Distinguish between the “background” substance of a mitochondria and that of a chloroplast. (2 marks)
30. The figure below shows a stem of a plant growing round a tree trunk



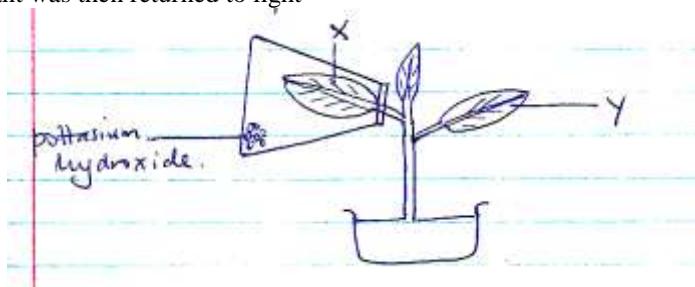
- a) What is the name of the response which causes such a twisted growth? (1 mark)
- b) Explain how twisting process is accomplished (2 marks)

GATUNDU SOUTH SUB-COUNTY FORM FOUR 2015 EVALUATION EXAM**231/2****BIOLOGY****PAPER 2****(THEORY)****JULY /AUGUST 2015****2HRS**

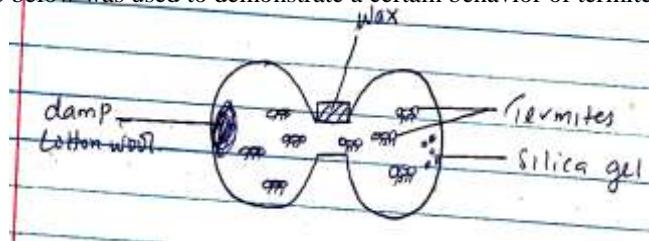
1. The genetic disorder hemophilia is due to a recessive sex linked gene .A man who is hemophiliac marries a woman who is carrier for the condition.
- Using letter H to represent the normal condition and letter h for the hemophiliac condition. (2marks)
 - What is the genotype for the man and the woman? (3marks)
 - Work out a cross between the man and woman
 - What is the chance that both the first and second sons will be hemophiliac? (2marks)
 - Hemophiliac is more common in males than in female human .Explain (1mark)
2. Study the diagram below and answer the questions that follow.



- Name the part labeled A and B (2marks)
 - State the function of the part labeled C (2marks)
 - How is the part labeled E adapted to its function (2marks)
 - Identify the structure that perform the same function as one illustrated above in
 - Amoeba --- (2marks)
 - Fish ---- (2marks)
3. A health plant was kept in the dark for 48 hrs .Then one of its leaves (x) was enclosed in a glass flask as down below .The whole plant was then returned to light



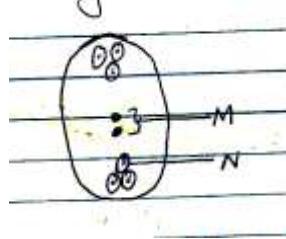
- After 48 hrs the leaves were tested for starch .What observations do you expect. (2marks)
 - i) What conclusions can you draw from this observation (1mark)
 - ii) Explain your conclusion in b (i) above (2marks)
 - Why was the plant kept in the dark for 48 hrs (1mark)
 - State two ways in which the green leaves are adapted for gaseous exchange (2marks)
- 4) The set up below was used to demonstrate a certain behavior of termites



- State the function of the following in this experiment (1mark)
- Damp cotton wool (1mark)
- Silica gel (1mark)
- Wax (1mark)

- b) What result were obtained from this experiment after 12 hrs (1mark)
 c) Account for the results in (b) above (1mark)
 d) Name the type of response shown by termites (1mark)
 e) What material wound is missing in a control experiment (2marks)

5 Below is a diagram of a structure found in plants



- a) (i) Identify the structure (1mrk)
 (ii) Name the parts labeled M and N(2mrks)
 b) Explain why cross pollination is more advantageous to a plant species than self –pollination (2marks)
 c) Explain how double fertilization takes place in the above structure. (3marks)

SECTION B;(40 MRKS)

Answer question 6(compulsory)and either question 7 or 8 in the space provide after question 8.

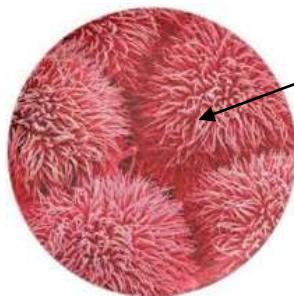
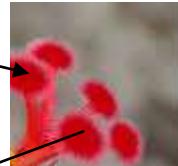
- 6 An investigation of haemolysis of human red blood cell was carried out .Red blood cells were placed in sodium chloride solution and percentage of haemolysed cell established.
- | Sodium chloride concce .g/cm ³ (%) | 0.33 | 0.36 | 0.38 | 0.39 | 0.42 | 0.44 | 0.48 |
|---|------|------|------|------|------|------|------|
| Haemolysed red blood cells (%) | 100 | 91 | 82 | 69 | 30 | 15 | 0 |
- a) (i) Using the data above, plot a graph of haemolysed red blood cell against salt concentration (6marks)
 (ii) At what percentage of sodium chloride was the number of haemolysed cells equal to those that are not haemolysed. (1mark)
 (iii) What is the percentage of cells haemolysed at salt concentration of 0.45 percent. (1 mark)
- b) Account for the result obtained at
 i) 0.33% salt concentration (2marks)
 ii) 0.48% salt concentration (2marks)
 iii) Suppose the red blood cells were placed in 0.50%salt concentration .Explain what would happen (2marks)
- c) i) Distinguish between lymphocytes and phagocytes (2marks)
 ii) State two ways in which white blood cells defend the body against infections. (2 marks)
- d) State two adaption of red blood (2marks)
- 7 a) Explain the role of the following hormones in growth and development of plants.
 (i) Auxins (4marks)
 (ii) Gibberellins (4marks)
- 8 Explain the adaptation of the small intestine to their functions. (20marks)

GATUNDU FORM 4 EVALUATION EXAM**BIOLOGY PRACTICAL 231/3****CONFIDENTIAL.**

1. The photographs must be coloured.
2. Each student to be provided with a ripe tomato labeled as specimen K.
 - a small beaker
 - a scalpel
 - a dropper
 - at least 3 test tubes
 - access to; Iodine solution
Benedict's solution
DCPIP
 - Source of heat and a test tube holder.
 - Source of heat.

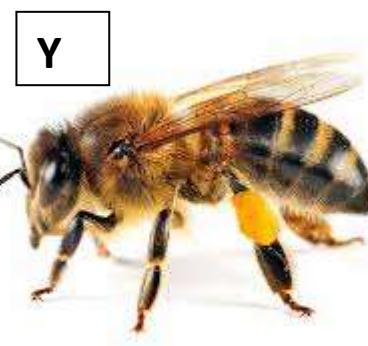
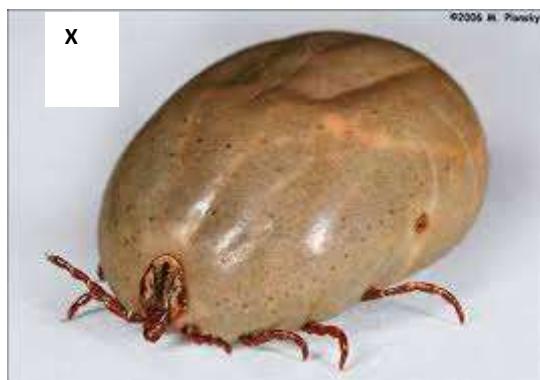
GATUNDU FORM 4 EVALUATION EXAM**BIOLOGY****PRACTICAL****231/3****JULY/AUG 2015**

1.

A**B**

- a) Name the sub-division of the plant from which the photo was taken. (1 mark)
- b) Using observable features on the photograph give reasons for your answer in (a) above. (2 marks)
- c) Name the agent of pollination for the flower in the photograph (1 mark)
- d) State three observations on the photograph that supports your answer in (c) above. (3 marks)
- e) Name the class of the plant from which the photo was taken. (1 mark)
- f) Using observable features on the photograph, give three reasons for your answer in (e) above. (3 marks)
- g) Give two adaptations of the part labeled B to its pollination function. (2 marks)

2.



- (i) To which phylum does organisms x,y and z belong to. (1 mark)
(ii) Name the classes to which X, Y and Z belongs to. (3 marks)
(iii) Give two important economic roles of specimen Y. (2 marks)
(iv) Give three harmful effects of specimen X to animals. (3 marks)
(v) With reasons identify two modes of locomotion of specimen Y . (4 marks)
3. (i) What part of plant is specimen K? (1mark)
(ii) Give a reason for your answer in 3 (i) above. (1mark)
(iii) Make a cross section of specimen K. Draw and label the parts. (3marks)
(iv) State the type of placentation in specimen K. (1mark)
(v) Name the agent of dispersal of specimen K and give a reason for your answer. (2marks)
(vi) Squeeze the juice from specimen K. Using the reagents provided, carry out food tests. (6marks)

FOOD/TEST	PROCEDURE	OBSERVATIONS	CONCLUSION

GATUNDU SUB COUNTY FORM FOUR 2015 EVALUTION EXAM**231/1****BIOLOGY****PAPER I****JULY/AUGUST 2015****MARKING SCHEME**

1. a) Respiration: Process whose organism break down food to produce energy.
b) Reproduction: Give rise to young ones of same ensuring continuity of the group.
2. Factors necessary for germination.
 - (i) Water/moisture:- soften seed coat. Transport medics
 - (ii) Enzymes: Breakdown insoluble food substances to soluble.
 - (iii) Oxygen for respiration
3. (i) Identical twins :- fertilized eggs divides;
(ii) Fraternal twins:- Two different eggs (ovum) are fertilized by two different sperms.
4. (i) Anaphase I
 - (ii) Homologous chromosomes separate at the equator.
 - (i) Chromosomes start migrating to opposites poles.
 - (ii) Sister chromatids attached at the centromere.
 - (iii) Spindle fibres
5. Roles of gibberellins
 - i) stimulates flowering in plants
 - ii) elongation of internodes
 - iii) break seed dormancy

(any other correct)
6. (i) Cell size = Diameter of field view x 1000
No of cells

$$= \frac{6.5 \times 1000}{12} = 540\mu\text{m}$$

(ii) The leaves exposes a smaller surface area to the sun, thus reducing transpiration/excessive water loss.

Diffusion	Osmosis
<ul style="list-style-type: none"> - Involves movement of particles of molecules of liquid or gas - It may be through a membrane or air. - Not affected by PH changes. 	<ul style="list-style-type: none"> - Involves movement of solvent molecules - It takes place through a semi-permeable membrane. - Rate affected by pH changes.

- 7.
8. Action potential: When an impulses passes along the axon, the membrane of the axon becomes depolarized to sodium ions thus they diffuse into the axon; the inside of the axon, becomes positively charged relative to the outside and action potential is generated.
9. (i) Tracheoles
 - ii) Adaptation of tracheoles
 - Lack chitin and are thin walled to reduce distance of diffusion of gases.
 - Have a liquid at the tip to dissolve the diffusing gases
 - Highly branched/divided to increase surface area for diffusion of gases.
 - They are in direct contact with tissue cells hence increasing rate of diffusion of gases.
10. (a) RQ ratio of carbon dioxide produced to oxygen used during breakdown of a food substrate.

$$(b) \quad \text{R.Q} = \frac{\text{CO}_2 \text{ produced}}{\text{O}_2 \text{ used up}}$$

$$\text{RQ} = \frac{102}{145} = 0.7$$

(c) fat/lipid

11. Pinna: It collects and concentrates sound waves to the auditory meatus.

Tympanic membrane: thin tough membrane that transforms sound waves into vibrations.

Vestibule – Consists of utriculus & Sacculus that have sensory cells.

- ii) Maintains body balance & posture in relation to gravity.
12. Structural difference: the cell body in motor neurone is terminal (at the end) and inside the central nervous system. While the cell body in sensory neurone is not terminal but has axon on both end i.e. bipolar.
Functional difference: Motor neurone carries impulse from CNS to the effectors i.e. muscles while sensory neurone carry impulse from receptor to CNS.
13. (i) a) Community – It is the total number of plants and animals living together in an area of the number of organisms of different species living in a particular area.
Population – total number of organisms of a given/same species occupying an area at a certain trophic level.
- (ii) Controlling protozoa parasite:
 - Improving sanitation to prevent infection by parasites.
 - Insecticides to kill vector like mosquitoes or tsetse fly.
 - Sleeping under Nets
14. (i) After 4 months of pregnancy the ovary stops secreting the hormones progesterone and the placenta takes over.
The hormone progesterone helps maintain pregnancy.
(ii) Site of production of male gametes/sperms; site of secretion of hormone testosterone that enhances secondary sexual characteristics;
15. a) Skeletal muscles adaptation
 - Have actins and myosin which facilitate contraction & relaxation.
 - Have high density of mitochondria to provide energy for contraction.
 - Have elongated fibres to allow change in length.
b)
- | Biceps(skeletal muscles) | Gut muscles(smooth muscles) |
|--------------------------|-----------------------------|
| Striated | Un-striated |
| Multi nucleated | Un-nucleated |
| Long fibre | Short fibre |
| cyindrical | Spindle shaped |

16. Why Lamarck's theory is not accepted
 - Evidences does not support Lamarck's theory acquired characteristics are not inherited.
 - Inherited characteristics are found in reproductive cells only.
b) Fossils, records, (Palaeontology)
 - Geographical distribution comparative anatomy/taxonomy cell biology
 - Comparative serology,
 - Comparative embryology
 - Comparative immunology
(any two)
17. (i) Dicotyledonae
(ii) Vascular bundles arranged in a ring around the pith.
 - Presence of cambium in vascular bundles.
(iii) Importance of vascular bundles
Xylem transport water and mineral salts to photosynthesizing cells.
Phloem: transport manufactured food from leaves
Veins: Support the leaf to be upright for the maximum absorption of light for photosynthesis.

18. The following is dental formula of a dog and rabbit.

Dog	Rabbit
- Presence of canine	- Absence of canines/presence of diastema
- Has more teeth	- Has few teeth.

19. (i) Deletion

A	B	Q	R
---	---	---	---

- (ii) Inversion

A	B	S	C	Q	R
---	---	---	---	---	---

- (iii) Duplication

A	B	C	S	C	S	Q	R
---	---	---	---	---	---	---	---

20. (i) Diabetes mellitus
(ii) Diabetes insipidus
21. a) To increase surface area for enzymatic action. (1 mark)
b) Contain bacteria that produce cellulase enzyme to digest cellulose. (1 mark)
22. Lactic acid (1 mark)
23. Oxygen (gas y) dissolves into moisture layer and diffuses across the thin epithelium;(1) then across the thin epithelium of capillary; (1) combines with haemoglobin in red blood cells to form oxyhaemoglobin; (1 mk)
24. The cell sap is hypertonic to soil solution/soil water; water is drawn into the root hair cell across the cell membrane by osmosis;. (1mk)
25. Hydrogen carbonates ions/carbonic acid.
26. Parenchyma (1mk)
27. - Exoskeleton (1mk)
- Jointed appendages (1mk)
- Segmented bodies (1mk)
- Reject answers relating to characteristics of living things like growth and development, reproduction etc.
- 28.- Genetic material/chromosomes are enclosed within a nuclear membrane (1mk)
Have membrane bound organelles. (1mk)
29. For Metochondria its – matrix (1mk)
Chloroplast its– stroma
30. a) Thigmotropism/haptotropism
b) The part of the stem in contact with the tree trunk has lower auxin content than the outer part;
High concentration of auxin on the outer part away from the plant promotes faster growth of this side causing the stem of the plant to grow or coil round the tree trunk.

GATUNDU SUB COUNTY FORM FOUR 2015 EVALUATION EXAM**231/2****BIOLOGY****PAPER 2****JULY/AUGUST 2015****MARKING SCHEME**

1. a) (i) Man

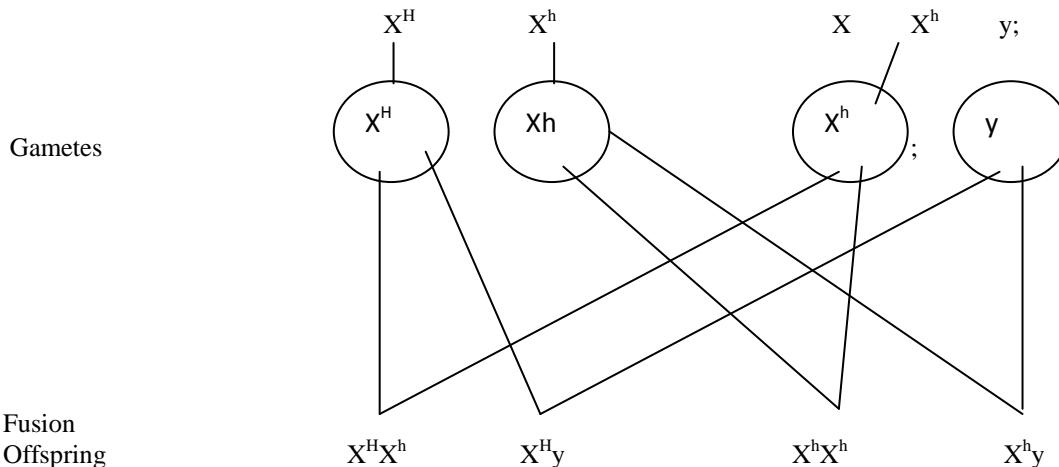
 X^hY ;

Woman

 X^HX^h ;

- (ii) Parental genotype

(2 marks)



b) $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

(2 marks)

c) y chromosome does not have the corresponding allele for the gene that determine or cause haemophilia/y chromosome is almost genetically empty;

(1 mark)

2. a) A – trachea;

(1 mark)

B – Bronchus;

(1 mark)

b) (Pleural membrane) secretes pleural fluid; that lubricates the lungs;

(2 marks)

c) – Sac-like/round to provide large surface area for maximum diffusion of gases;

- Moist to dissolve gases;

- Thin membrane for rapid/faster diffusion of gases;

- Well vascularised/has numerous blood capillaries to transport the gases;

(2 marks)

- d) i) cell membrane

(1mark)

ii) gill

(1mark)

3. a) x-took the color of iodine;

y-turn blue black; (2mrks)

- b) i) starch was present in leaf y but absent in leaf x;

(1mrk)

ii) No photosynthesis occurred in x due to lack of carbon (iv) oxide

(2mrks)

iii) Photosynthesis occurred in y due to presence of carbon (iv) oxide;

(2 marks)

c) To destarched the leaf /ensure all starch was used up

(1mrk)

d) Presence of stomata to allow gaseous exchange/passage of gases;

- Thin broad and flat to reduce diffusion distance;

- Presence of intercellular spaces for free circulation of gases;

(Any 2 (2 marks)

4. a) (i) –to create a moist environment ;

(1mrk)

(ii)-Absorb water and create a dry environment ;

(1mrk)

(iii)-make apparatus air tight (1mrk)

b) Majority were found in the chamber with moist cotton wool

(1mrk)

c) The termite have moved to the chamber with moist to avoid dehydration

(1mrk)

d) Tactic response (1mark)

e) silica gel;

-cotton wool

(2mrks)

5. a) (i) embryo sac (1mark)

(ii)m-polar nuclei;(1mark)

N-egg cell ;(1mark)

b) It brings variation; which enable plant to survive better

(2mrks)

c) Double fertilization is the process by which one male nucleus fuses with the functional egg; to form double zygote; and the other male nucleus fuses with the polar nuclei; to form the primary triploid /endosperm nucleus ;. (3marks)

SECTION B

- 6 a (i) on a graph paper (6mrks)
 (ii) 0.40 ± 0.001 (1mrk)
 (iii) 10.5 ± 0.5 ; (1mrk)
- b (i)-The salt solution is hypotonic /has a lower conc./more dilute than cell cytoplasm ;water drawn into the cell by osmosis and eventually bursting (2mrks)
 (ii)-Concentration of the salt solution is the same as concentration of cytoplasm /isotonic; hence no net movement of water; therefore no haemolysis ;(2mrks)
 (iii)Percentage of haemolysed cell wound still be zero but the cells wound shrink by the process of crenation (2mrks)
- c (i)

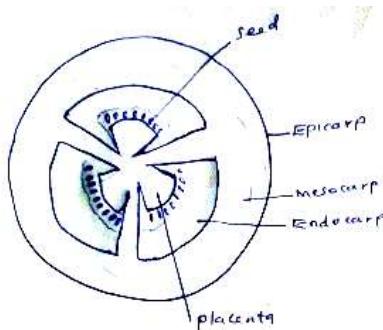
Lymphocytes	phagocytes
-Lack granules in the cytoplasm.	-Has granules in the cytoplasm ;
-Nucleus is spherical/bean shape	-Nucleus is lobed

 (2mrks)
- (ii) -By engulfing /phagocytosis, the disease causing micro-organism;
 -Lymphocytes produce antibodies which inactive pathogens;
- d) -Lack nucleus to create more room for package of haemoglobin
 -Are flexible hence can squeezes in narrow capillaries;
 -Biconcave in shape to increase surface area for gaseous exchange;
 -Thin cell membrane for rapid diffusion of gases;
 -Has carbonic anhydrase for fast loading and offloading of gases;
 -Has haemoglobin that has high affinity for gases
- (any 2 (2mrks))
- 7 (a) (i)-Water (moisture)
 -Activate germination enzymes/breaks seed dormancy
 -Provides medium for enzyme to act;
 -Softens seed coat, which burst open to allow emergence of radicle and plumule;
 -Hydrolysis of food during germination;
- (ii) Oxygen;
 -Oxidation of food during respiration to provide energy for germination/cell division and formation of new tissues.
- (iii) Optimum temperature
 -Suitable for action of germination enzymes which hydrolyse stored food;
 -Low temperature below 0°C inactivate germination enzymes slowing down germination rate ;
 -High temperature above 40°C denatures germination enzymes stopping germination;
- (iv) Enzymes
 Break down food by oxidation;
- (v) Viability
 -Refers to percentage chance that a seed will germinate when planted;
 Only seeds with live and healthy embryo will germinate and grow;
 -Seeds stored for long time lose their viability;
- (vi) Hormones
 -These stimulate certain metabolic pathways in the germination process;
 Max x12
 Every condition identified $1 \times 6 = 6$ mrks
 Every explanation identified $1 \times 6 = 6$ mrks total 12 marks
- b (i) Auxins
 - Promote cell division /elongation /influences tropical movement'
 - Promote fruit formation /Parthenocarpy;
 - Promote formation of abscission layer /brings leaf fall;
 - Causes apical dominance;
 - Promotes growth of adventitious root and lateral branches
 - IAA and cytokines induce formation callus tissue during healing of wounds;
 Any four (max x4mrk)
- (ii) Gibberellins /giberellic acid
 - Promotes cell division /elongation in dwarf varieties;
 - Parthenocarpy /initiate formation of fruits;
 - Formation of side branch /end dormancy in buds;
 - Inhibit growth of adventitious roots;
 - Activates enzymes during germination //breaks dormancy
 - Affects leaf expansion and shape /retard leaf abscission
- Any four (max 4mrks)
- 8 Are long and folded to provide large surface area for secretion of digestive juices;
 - They are long, coiled and folded which allows more time for digestion and absorption;
 - Their inner lining has villi and microvilli, which increase the surface area for absorption;
 - Have opening of ducts through which pancreatic juice and bile get into lumen;

- Have goblet cell and Bruner's glands that secretes mucus for lubrication of food and protection of wall from digestion enzyme;
- Bruner's gland also secretes alkaline fluid which maintains a pH of 7-8 which is optimum pH for action of intestinal enzymes;
- Has intestinal gland that secrete digestive enzyme;
- Has rich network of blood capillaries that supplies oxygen and removes metabolic wastes from the intestinal tissue and transports digested food and offer nutrients;
- The walls have circular and longitudinal muscles whose peristaltic contraction causes movements of food in the gut and mixing of food with digestive enzyme;
- Intestine have a thin epithelium that allows soluble food material to pass through rapidly into the blood stream'
- The villi have numerous blood vessels to transport absorbed nutrients and lacteals to transport absorbed lipids;

GATUNDU FORM 4 EVALUATION EXAM**231/3****BIOLOGY****PRACTICAL****MARKING SCHEME**

1. A) Angiospermae/angiospermaphyta/angiospermatophyta;
 B) Presence of the flower; presence of veins;
 C) Insect;
 D) -conspicuous/brightly coloured /coloured petals,sepals;
 -Tubular corolla/stamen and pistil enclosed in a tube;
 -Landing stage/corolla platform;
 E) -Dicotyledonae; rej dicotyledon,dicotylendon
 F) - Net/ reticulate /net venation;
 -5 petals/5 sepals
 -floral parts arranged in fives/multiples of five;
 G) -Sticky in order to hold the pollen grains;
 -located inside the flower to ensure good contact with the insect ;
2. (i) Arthropoda;
 (ii) X- Arachnida;
 Y- Insecta;
 Z- Crustacea;
 (iii) - Useful in plant pollination;
 -Produce edible food eg. Honey and royal jelly;
 (iv) -Transmits disease causing organisms/disease vector;
 -Sucks blood hence can cause anemia; (any three)
 -Bites on animals destroy the quality of hides and skins;
 -Wounds created become avenues for secondary bacterial infection;
 (v) a) Flight;.....presence of wings;
 b) Walking;.....presence of legs;
- 3 (i) Fruit;
 (ii) Presence of two scars;
 (iii) Award one mark for a well drawn unaided diagram; and two marks for labels.



- (iv) Axile;
 (iv) Agent....animal / animals rej specific animal.
 Reason.....brightly coloured to attract animals
 Fleshy/juicy/succulent to attract animals

Food/test	Procedure	observations	Conclusion
Starch;	To food add iodine;	No colour change/colour of iodine remains;. Rej no change.	Starch absent;
Reducing sugars;	To food add benedict's solution and heat;	Colour changes to green-yellow-orange-brown; rej. Red.	Reducing sugars present;
Vitamin c/ascorbic acid;	To DCPIP add food;	DCPIP is decolourised;	Vitamin c/ascorbic acid present;

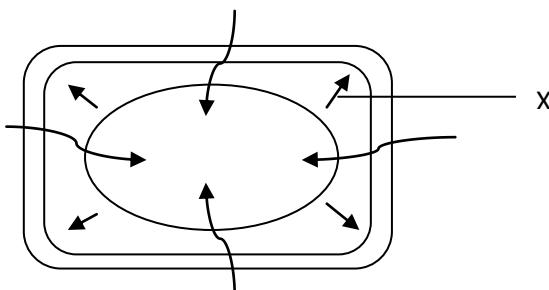
NB .Award half mark for test, procedure , observations and conclusion.

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015**Kenya Certificate of Secondary Education****BIOLOGY**

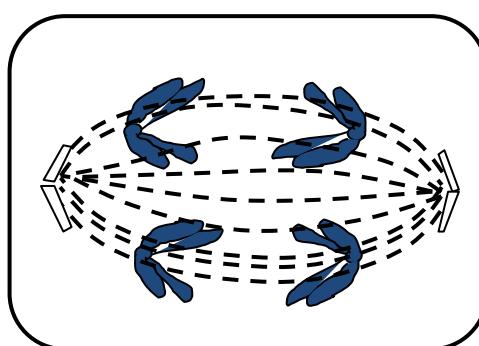
Paper 1

Time: 2 Hours

1. What do the following branches of Biology entail? (2marks)
 - (a) Cytology
 - (b) Entomology
2. State TWO characteristics of kingdom Monera that are not found in other kingdoms. (2marks)
3. Two species in an ecosystem cannot occupy the same niche. Explain. (1 mark)
4. State the significance of metamorphosis to the life of insects. (2 marks)
5. The diagram below shows results of what happens to plant cell when placed in a certain solution.



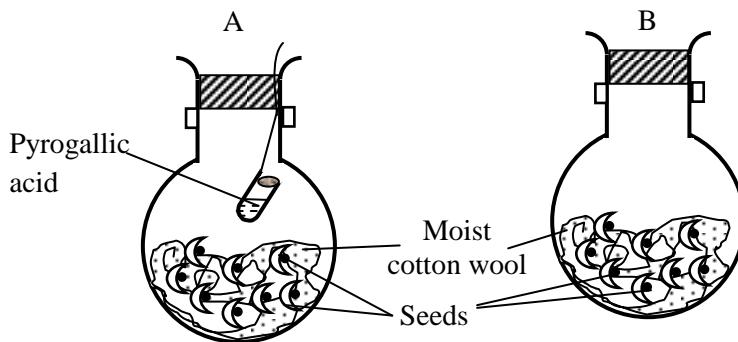
- a) What was the nature of the solution in which the cell was placed? (1 mark)
- b) Identify the force represented by the arrow X and explain how it develops. (2 marks)
6. Which organelle would be numerous in the following cells; (2 marks)
 - a) Liver cell
 - b) Palisade cell
7. The scientific names of three animals leopard, wolf and lion in the family carnivorae are; Panthera pardus, Canis lupas and Panthera leo respectively.
 - a) Why are scientific names given in Latin? (1 mark)
 - b) What does *Canis* refer to? (1 mark)
 - c) Giving a reason, state the organisms that are MOST closely related. (1 mark)
8. The word equation below shows a biological process.
Water \longrightarrow Hydrogen atom + oxygen
 - a) Name the process. (1 mark)
 - b) Where does the process named in a) above take place? (1 mark)
 - c) State two conditions necessary for the process to occur. (2 marks)
9. a) What is the importance of heartbeat in blood circulation? (1 mark)
 - b) If the nerve supply to the heart of a mammal is severed, the rhythmic heart movement will still go on and the heart continues to beat. Explain this observation. (1 mark)
10. The ovaries of an expectant woman can be removed after the first four months of pregnancy without terminating the pregnancy. Explain. (2 marks)
11. The diagram below represents a stage during cell division.



- a) Name the stage of cell division. (1 mark)
- b) Give two reasons for your answer in a) above. (2 marks)
- c) State the significance of this stage of cell division in living organisms. (1 mark)
- 12.) Name the causative agent for the following diseases;
 - a) Typhoid (1 mark)

b) Syphilis (1 mark)

13. A student set up an experiment as shown in the diagram below. The set up was kept at room temperature for one week.



a) What was the aim of the experiment? (1 mark)

b) State the expected observation at the end of the experiment. (2 marks)

c) Account for the observation made in set up A. (1 mark)

14. a) Name the respiratory surface for gaseous exchange in insects. (1 mark)

b) State two adaptations of the site named in a) above. (2 marks)

15. A portion of a nucleic acid is shown below;



a) Name the nucleic acid to which the portion belongs. Give a reason. (2 marks)

b) Write down the sequence of bases of a complimentary strand to the one above. (1 mark)

16. Explain the meaning of the following terms;

a) Basal Metabolic Rate (1 mark)

b) Oxygen Debt (1 mark)

17. In an experiment, the concentration of ions in the cell sap of reeds growing in a swampy area and the water in the swamp were determined. The data below was obtained. Study it and answer the questions that follow:

Sample	Na^+	Mg^{2+}	Cl^-	SO_4^{2-}
Cell sap	50	11	101	13
Swamp water	1.2	30	10.2	0.67

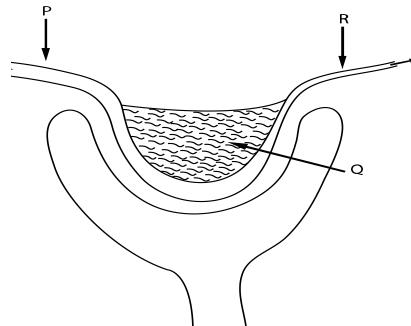
a) Name the process by which uptake of the following ions by the reeds occurs. (2 marks)

 Na^+ ions Mg^{2+} ions

b) What effect would reduced oxygen supply have on the uptake of sulphate ions? (2 marks)

Explain your answer.

18. The diagram below shows a part of a nephron.



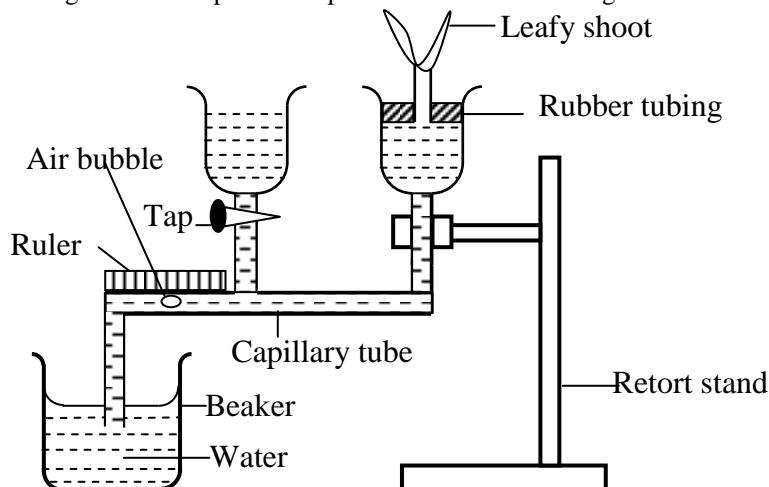
a) State TWO differences in composition of blood in parts P and R. (2 marks)

b) State a characteristic feature of blood capillaries in part Q that is not found in other capillarities (1 mark)

19. (a) Name two types of light sensitive cells found in the human eye. (1 mark)

(b) State ONE functional difference between the cells you have named in a) above. (1 mark)

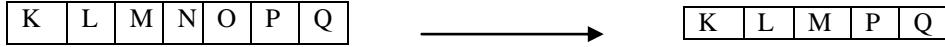
20. A set up was used to investigate a certain process in plants as shown in the diagram below.



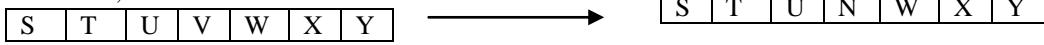
- (a) What process was being investigated? (1 mark)
- (b) Giving a reason, state one precaution that should be taken when setting up this experiment. (1 mark)
- (c) How would changes in temperature affect the rate of movement of the air bubble? (1 mark)
21. Julie observed eight onion epidermal cells across the field of view of a light microscope. If the field of view was 4mm in diameter, estimate the average size of the cells in micrometers ($1\text{mm} = 1000\mu\text{m}$). (2 marks)
22. How is support brought about in herbaceous plants? (2 marks)
23. State the functions of the following parts of the mammalian ear.
- Eustachian tube (1 mark)
 - The utriculus and sacculus (1 mark)
24. In an experiment, a shoot of maize seedling was exposed to light on one side. It was observed that it grew bending towards the direction of the source of light.
- Explain how the bending towards light occurs. (2 marks)
 - State the survival value of the response named in a) above. (1 mark)

25. The diagram below shows various types of gene mutations.

Mutation I;



Mutation II;



- Identify the type of mutations shown above (2 marks)
 - Name one disorder that results from gene mutation II. (1 mark)
26. State THREE adaptations of a leaf to gaseous exchange. (3 marks)
27. Distinguish between analogous structures and homologous structures. For each structure give an example. (4 marks)
28. The diagram below shows a bone that was obtained from a mammal.



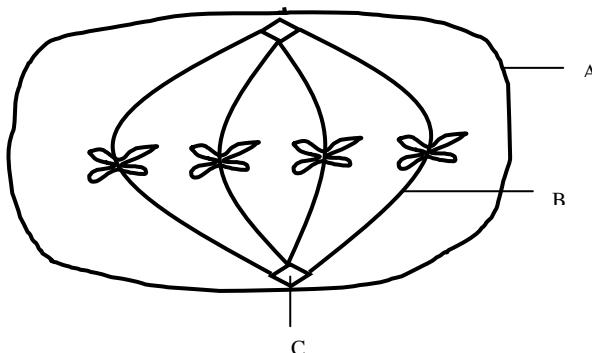
- Identify the bone. (1 mark)
 - i) Name the type of joint formed at the part marked P. (1 mark)
 - ii) State one characteristic of the joint named in b) i) above. (1 mark)
29. What is the importance of the pollen tube in fertilization in plants? (1 marks)
30. a) The action of pepsin stops in the duodenum. Explain. (2 marks)
- b) State two functions of the muscles found in the alimentary canal of mammals. (2 marks)

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015**Kenya Certificate of Secondary Education****BIOLOGY**

Paper 2

Time: 2 Hours

1. (a) Name the organelles that perform each of the following functions in a cell. (4 marks)
 - (i) Synthesis of proteins
 - (ii) Transport cell secretions
 - (iii) Destroy old and worn out organelles or even the entire cell.
 - (iv) Package and transport glycoproteins.
- (b) Using a light microscope, a student counted 55 cells across a field of view whose diameter was $6000\text{ }\mu\text{m}$. Calculate the average length of the cells. Show your working. (3 marks)
- (c) Why is it recommended to keep the stage of the microscope dry. (1 mark)
2. In a certain plant species which is normally green, a recessive gene for colour (n) causes the plant to be white when present in a homozygous state. Such plants die at early age. In heterozygous state, the plants are pale green in colour but grow to maturity.
 - (a) Suggest a reason for the early death of plants with homozygous recessive gene. (2 marks)
 - (b) If a normal green plant was crossed with a pale green plant, what would be the genotype of the F₁ generation? (Show your working) (3 marks)
 - (c) If seeds from the heterozygous plants were planted and the resulting plants allowed to self pollinate. Work out the phenotypic ratio of the plants that would grow to maturity. (2 marks)
 - (d) Give an explanation for occurrence of the pale green colour in heterozygous plants. (1 mark)
3. The diagram below represents a state in cell division. Study it and answer the questions below.



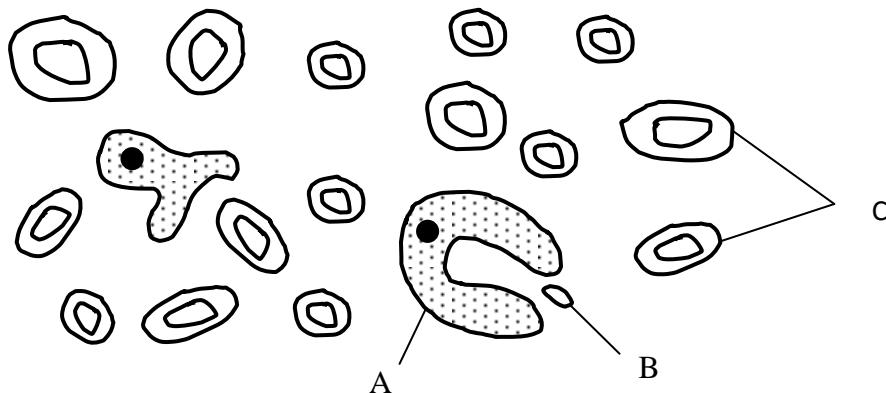
- (a) Name the stage of cell division illustrated in the diagram above. (1 mark)
- (b) Name the parts labelled A, B and C (3 marks)
- (c) State **THREE** differences between mitosis and meiosis. (3 marks)
- (d) Name the process during which the exchange of genetic materials occur at prophase 1 of meiosis. (1 mark)
4. (a) Describe how the quadrant method can be used to estimate the population of various species of plants in a given habitat. (3 marks)
 - (b) To estimate the population size of beetles in an ecosystem, traps were laid at random. 400 beetles were caught, marked and released back into the ecosystem. A week later traps were laid again and 374 beetles were caught. Out of the 374 beetles, 80 were found to have been marked.
 - (i) Calculate the population size of the beetles in the ecosystem. (2 marks)
 - (ii) State **TWO** assumptions that were made during the investigation. (2 marks)
 - (c) What is the name given to this method of estimating the population size? (1 mark)

5. The table below shows the approximate distribution of blood groups in a sample of 100 people in a population.

Blood group	Frequency	Rhesus +ve	Rhesus -ve
A	26	22	4
B	20	18	2
AB	4	3	1
O	50	43	8

- (a) Calculate the percentage of Rhesus negative (Rh-ve) individuals in the population? (1 mark)
- (b) Account for
 - (i) The large number of blood group O individuals in a population. (2 marks)
 - (ii) The small number of individuals with blood group AB. (2 marks)

- (c) The diagram below represents a blood smear on a glass slide.



- (i) State the importance of structure C being large numbers in the blood smear. (1 mark)
- (ii) Give a reason why structure C would be found in large numbers in high altitude than in low altitude. (1 mark)
- (iii) Name the process by which structure A would engulf structure B. (1 mark)

SECTION B: 40 (MARKS)

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

6. An experiment was carried out to investigate transpiration and absorption of water in sunflower plants in their natural environment with adequate supply of water. The amount of water was determined in two hour intervals. The results are shown in the table below.

Time of day	Amount of water in grammes	
	Transpiration	Absorption
1100-1300	33	20
1300-1500	45	30
1500-1700	52	42
1700-1900	46	46
1900-2100	25	32
2100-2300	16	20
2300-0100	08	15
0100- 0300	04	11

- (a) Using the same axes, plot graphs to show transpiration and absorption of water in grammes against time of the day. (7 marks)
 - (b) At what time of the day was the amount of water the same for transpiration and absorption. (1 Mark)
 - (c) Account for the shape of the graph of
 - (i) Transpiration (3marks)
 - (ii) Absorption (3marks)
 - (d) What would happen to transpiration and absorption of water if the experiment was continued till 0050 hours. (2 marks)
 - (e) Name two factors that may affect transpiration and absorption at any given time. (2 marks)
 - (f) Explain how the factors you named in (e) above affect transpiration. (2marks)
7. Describe the
 - (i) Process of inhalation in mammals (10 marks)
 - (ii) Mechanism of opening and closing of stomata (10 marks)
8. How is the human eye adapted to its functions (20 marks)

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015*Kenya Certificate of Secondary Education (K.C.S.E)***231/3****BIOLOGY****PAPER 3****(PRACTICAL)****1³/₄ HOURS**

Each candidate should be provided with the following items.

- ⦿ 80 ml of iodine solution.
- ⦿ 8 cm visking tubing.
- ⦿ 2 pieces of strong cotton thread 20 cm long.
- ⦿ 100ml beaker (glass or plastic)
- ⦿ Means of timing. A wall clock will be appropriate.
- ⦿ 10ml measuring cylinder.
- ⦿ 100ml water is 250ml beaker.
- ⦿ A ruler with mm marking.
- ⦿ Medium size semi-ripe tomato labelled specimen P.
- ⦿ 10ml of 10% starch solution labelled X.
- ⦿ Scalpel.

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015*Kenya Certificate of Secondary Education (K.C.S.E)***231/3****BIOLOGY****PAPER 3****(PRACTICAL)****1³/₄ HOURS**

1. You are provided with specimen P. Make a longitudinal section.
 - (a) (i) Draw and label one of the cut surface of the specimen. (4 Marks)
 - (ii) Work out the magnification of your drawing. (1 Mark)
 - (b) (i) What type of fruit is specimen P? (1 Mark)
 - (ii) Give a reason for your answer. (1 Mark)
 - (c) (i) Suggest the type of placentation found in specimen P. (1 Mark)
 - (ii) Give one reason for your answer. (1 Mark)
 - (d) (i) Name the mode of dispersal of the specimen. (1 Mark)
 - (ii) State two ways in which specimen P is adapted to be dispersed by the mode named in (i) (4 marks)
2. You are provided with iodine solution, visking tubing, a beaker and a solution labelled X.
Tie one end of the tubing provided with a thread tightly. Measure 5ml of solution X. Pour 5ml of solution X into the visking tubing.
Tie the other end of the tubing tightly. Ensure there is no leakage. Rinse the outside of the tubing with distilled water and immerse it with its contents in a beaker containing iodine solution. Allow it to stand for 20 minutes.
 - (a) (i) Record your observation at the beginning and end of the experiment. Record your results in the table below. (4 Marks)

Experimental set up	Solution x inside the tubing	Iodine solution outside the tubing
Beginning of experiment		
End of experiment		
 - (ii) What was the identity of solution x. (1 Mark)
 - (iii) Suggest the nature of visking tube. (1 Mark)
 - (iv) Account for the results obtained in a (i) above. (4 Marks)
 - b) (i) Which physiological process was being investigated in this experiment? (1 Mark)
 - (ii) State two factors which affects the process being investigated (2 Marks)

3. You have been provided with photographs of specimens labelled Q1, Q2 and Q3. Examine them.



- a) By using observable features only, state the phylum and class to which the specimens belong. By using the three specimens, give reasons for each case.
- (a) Phylum _____ (1 Mark)
Reasons _____ (3 marks)
- (b) Class _____ (1 mark)
Reasons _____ (3 marks)
- (c) Using observable features only, give three differences between specimen Q₁ and Q₃. (2 Marks)
- (d) (i) Apart from locomotion, state the other role of the hind limbs of specimen Q₁. (1 Mark)
(ii) How are the hind limbs of specimen Q₁ adapted to perform role named in d (i) above. (2 Marks)

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015*Kenya Certificate of Secondary Education***BIOLOGY**

Paper 1

Time: 2 Hours**MARKING SCHEME**

1. (a) Ans. The study of cells in living organism;
(b) Ans. The study of insects.
2. Ans. The genetic material is not surrounded by a nuclear membrane/genetic material lacks a membrane/ not membrane bound/they are prokaryotic;
 - Organelles are not enclosed by membrane;
 - Lack most organelles e.g. mitochondria Rej. If no example/have few organelles;
 Mark first two.
3. Ans. A stiff competition for available resources sets in, resulting in the elimination of one species;
4. Ans. The adult and larvae occupy different niches/exploit different food hence do not compete for resources;
5. (a) Ans. Hypotonic solution;
(b) Ans. Turgor pressure; the cell gained water through the process of osmosis and becomes turgid; Rej: Absorbed for gained;
6. (a) Ans. Golgi apparatus/body;
(b) Ans. Chloroplast; Rej. Plural
7. (a) Ans. Latin language is fairly static/it does not change with time or locality like most other languages;
(b) Ans. Generic name of wolf; Rej. Genus name
(c) Ans. Lion and leopard, they belong to the same genus *Panthera*;
8. (a) Ans. Photolysis;
(b) Ans. Grana of chloroplast; Rej. Chloroplast
(c) Ans. Sunlight; chlorophyll;
9. (a) Ans. – It ensures sufficient supply of nutrients and oxygen to the cells;
 - It ensures exchange and removal of waste products of metabolism from the body cells to excretory organs;
 - It ensures that blood flows out of the heart to all parts of the body;
 (b) Ans. The rhythmic contractions of the heart arises from within special cardiac muscles/the heart muscles are myogenic;
10. Ans. After four months of pregnancy, the ovary stops secreting the hormone progesterone and the placenta takes over production of the hormone; progesterone maintains pregnancy;
11. (a) Ans. Anaphase I;
(b) Ans. Homologous chromosomes separate at the equator/homologous chromosomes start migrating to the opposite poles; sister chromatids attached at the centromeres;
(c) Ans. It is the reduction phase that results in haploid sex cells/gamete cells;
12. (a) Ans. *Salmonella typhi*;
(b) Ans. *Treponema palladium*;
13. (a) Ans. To show that oxygen is necessary for germination;
(b) Ans. No germination in A; germination occurs in B;
(c) Ans. Pyrogallic acid absorbed all the oxygen necessary for respiration/lacked energy for growth;
14. (a) Ans. Tracheole; Rej. Tracheoles
(b) Ans. It is moist to dissolve gases/for diffusion of gases in solution;
 - It has thin epithelia to reduce distance for diffusing gases;
 - It has numerous fine tubes to increase surface area for gaseous exchange;
 Mark first two correct answers.
15. (a) Ans. Ribonucleic acid;
Reason: It has base U/Uracil;
(b) GGCACG;
16. (a) Ans. The energy produced by an animal when it is resting to maintain its life processes;
(b) Ans. The extra oxygen required to breakdown lactic acid that accumulates during exercise when oxygen supply is less than required;
17. (a) Na^+ ions – Ans. Active transport
 Mg^{2+} ions – Ans. diffusion
(b) Ans. Reduces the rate of active transport due to increased rate of respiration/oxidation of glucose, hence less energy;
18. (a) Ans. P – has more nitrogenous wastes; more water, more mineral salts/ions; more oxygen than R; mark first two correct answers
19. (a) Ans. Rods and cones;
(b) Ans. Rods: Perceives light of low intensity; Cons: Perceives light of high intensity;

- Are not sensitive to colour	- Are sensitive to colour;
- Have low visual acuity;	- Have high visual acuity

 Mark first one
20. (a) Ans. Transpiration.

- (b) Ans. Cut shoot under water/assemble entire set up under water; apply petroleum jelly at the stopper – Glass – shoot connections; to ensure no air enters the leafy shoot xylem/apparatus causing airlock; to ensure apparatus is airtight;
- (c) High temperatures increase the transpiration rate, hence the bubble moves faster;
21. Ans. $1\text{mm} = 1000\mu\text{m}$
 $4\text{mm} = 4 \times 1000\mu\text{m}$
 $= 4000\mu\text{m};$
 Average size of cell = $\frac{4000}{8}\mu\text{m}$
 $= 500\mu\text{m};$
22. Ans. They have high turgor pressure that develops in the stem cell/parenchyma cells;
 The presence of collenchyma cells thickened with cellulose;
23. (a) Ans. It balances pressure in the middle ear with that of the atmosphere to prevent distortion of the ear drum;
 (b) Ans. Maintenance of body balance and posture in relation to gravity;
 Rej: If relation to gravity is not mentioned.
24. (a) Ans. Light causes lateral migration of auxin to the dark side; where high concentration of auxin stimulates rapid cell elongation and faster growth hence the shoot bends towards light;
 (b) Ans. It enables plant shoots to grow towards light for photosynthesis.
25. (i) Ans. I. Deletion
 II. Substitution
 (ii) Ans. Albinism/Sickle - cell anemia;
26. Ans. It has stomata for efficient diffusion of gases; It is thin to allow gases to diffuse through short distances; It has air spaces for easy circulation of gases; it has broad and flat lamina to provide large surface area for absorption; Mark 1st three
27. Ans. Analogous structures, are those with different embryonic origin but have undergone modification to perform similar functions in different organisms; Examples wings of insects and birds/webbed feet for frogs and ducks;
 Homologous structures, Are those with a common embryonic origin but have undergone modifications to perform different functions; example The pentadactyle limb of vertebrates;
28. a) Ans. Ulna
 b) i) Ans. Hinge joint;
 ii) Ans. Presence of cartilage at the articulation areas;
 - Has synovial fluid;
 - Presence of ligaments holding the two bones;
 - Movement in one plane only (180°)
 Mark first correct.
29. Ans. Pollen tube is a passage of male nuclei to reach the ovum in the ovary;
30. a) Ans. Because it is destroyed / denatured; by alkaline medium / bile salts in the duodenum;
 b) Ans. They act as valves to regulate movement of food;
 - They contract and relax to cause churning and push food along the gut / peristalsis;
 - They contain secretory cells which secrete mucus and intestinal juice;
 Mark first two.

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015*Kenya Certificate of Secondary Education***BIOLOGY**

Paper 2

Time: 2 Hours

1. (a) (i) Ribosomes;
 (ii) Rough endoplasmic reticulum/ Rej. RER
 Smooth endoplasmic reticulum; Rej. SER

- (iii) Lysosomes;
 (iv) Golgi apparatus/Golgi bodies;

(b) Cell diameter = $\frac{\text{Diameter of field of view in } \mu\text{m}}{\text{Number of cells in field of view}}$
 $= \frac{6000 \mu\text{m}}{55} = 109 \mu\text{m};$

- (c) - To avoid refraction of light;
 - To prevent wetting of slide;
 (Mark any one = 1 Mark)

2. (a) Homozygous recessive plants do not have chlorophyll/cannot photosynthesize;

- (b) Parental phenotype

Normal green

Plants

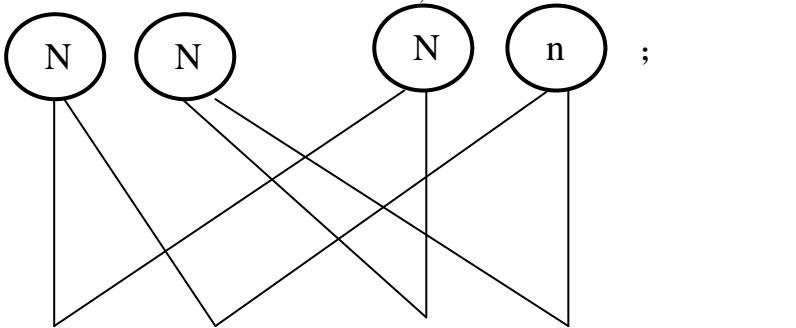
NN

Pale green
plants

Nn ;

Parental genotypes

Gametes



F₁ offspring
genotypes

NN

Nn

NN

Nn ;

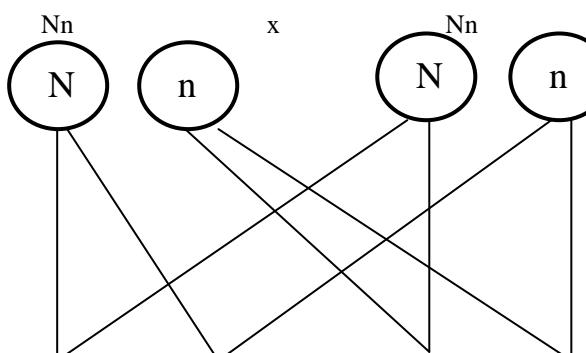
Punnet's Square

Parental genotype NN x Nn;

♀	♂	N	N;
N	NN	NN;	
n	Nn	Nn	

- c) Parental genotype

Gametes



Offsprings

NN

Nn

Nn

nn;

Have chlorophyll survive

lack chlorophyll die early

$\frac{3}{4} \times 100 = 75\% ;$ Grow to maturity

- (d) Due to incomplete dominance of the gene for normal colour;

3. (a) Metaphase of meiosis1;

- (b) A = Cell membrane;
 B – Spindle fibre;
 C – Centriole;

(c)

	Mitosis	Meiosis
(i)	Occurs in all somatic cells	Occurs only in reproductive cells;
(ii)	Occurs in one phase	Occurs in 2 phases;
(iii)	Daughter cells produced are diploid	Daughter cells produced are haploid;
(iv)	Homologous chromosomes do not come together/do not pair	Homologous chromosomes come together/pair;
(v)	No variation at the end	Variation occurs at the end;

(Any first 3 @ 1 Mark = 3 Marks)

(d) Crossing over;

4. (a) - The total area of habitats is measured and the area of study is marked.
 - Quadrant is thrown at random in the study area.
 - The various plant species in the quadrants are identified and labelled.
 - The number of each plant species is counted and recorded.
 - Several throws are made in the study area at random and the process repeated several times. The average number of each plant species per quadrant is worked out.
 - Calculation is made for the population for the total area of study.

(6 x ½ = 3 Marks)

(b) (i) Population size (N) = $\frac{\text{No.of beetles in 1st catch} \times \text{No.of beetles in 2nd catch}}{\text{Beetles marked recaptured}}$

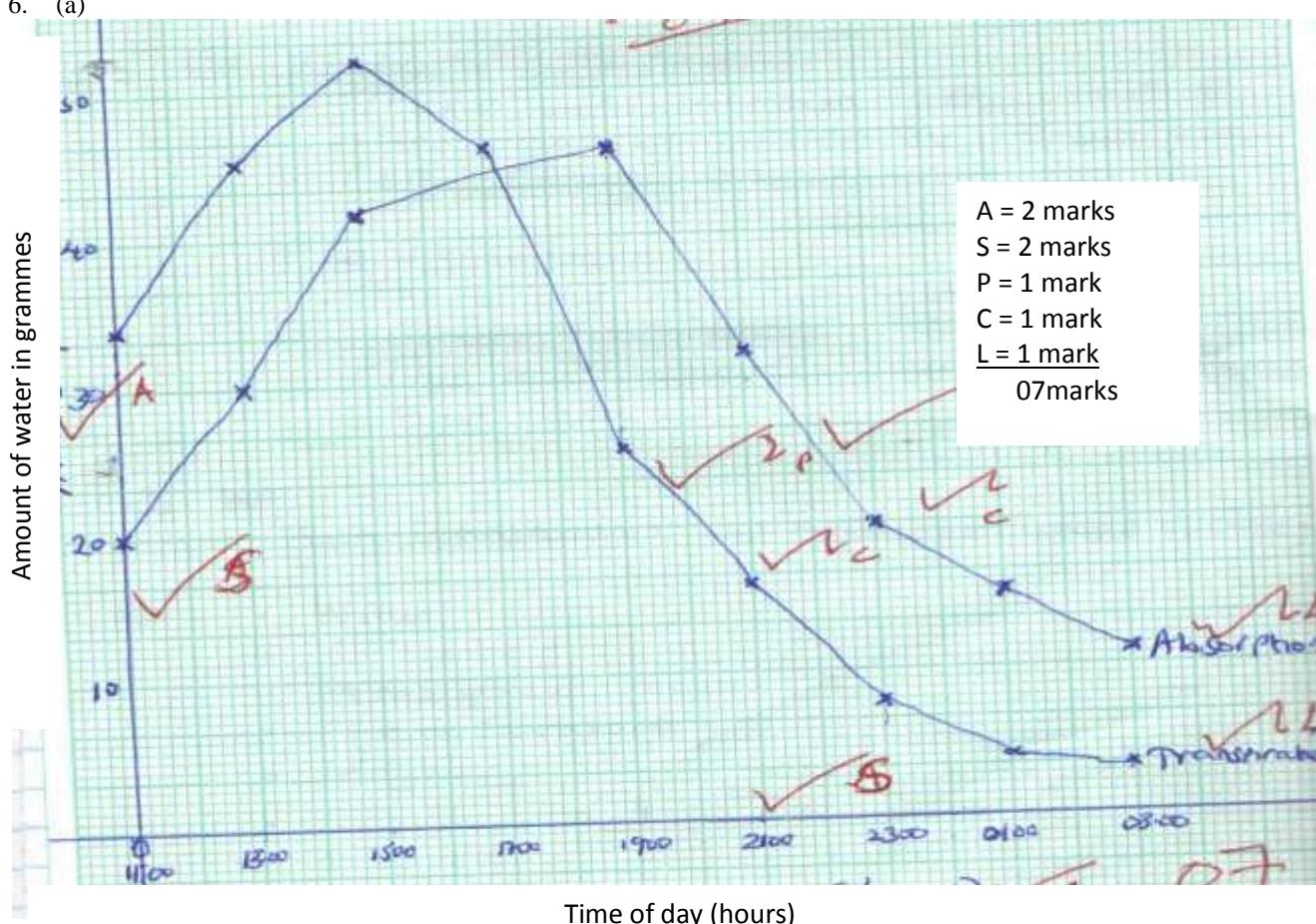
$$= \frac{400 \times 374}{80};$$

$$= 1870 \text{ (beetles);}$$

5. (a) (i) $\frac{15}{100} \times 100 = 15\%$

- (b) (i) The allele O appears in many blood groups/Allele O appears in blood group A, B and O; therefore higher chances of being inherited in a population;
 (ii) Allele A and B are co-dominant; hence express themselves only in blood group AB;
 (c) (i) To increase the surface area for efficient transport/increase efficiency of delivery of oxygen; (to tissue)
 (ii) At high altitude air is less dense/partial pressure of oxygen is low/there is low concentration of oxygen, hence the number of red blood cells/structure C increases to increase oxygen carrying capacity of blood;
 (iii) Phagocytosis;

6. (a)



(b) 17:00 – 19:00

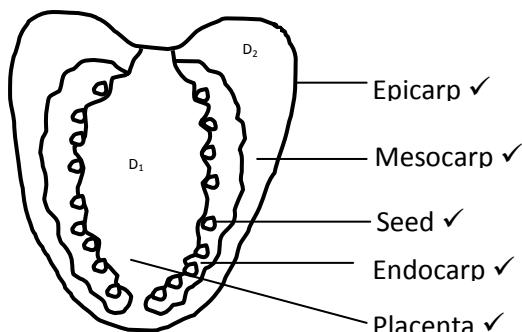
- (c) (i) 11:00 – 19:00 hours
 - There was rapid increase in the rate of transpiration;
 - This was due to high light intensity;
 - Also due to high temperature;
 (ii) 11:00 – 19:00 hours
 - There was increase in the rate of absorption of water to replace water lost through transpiration; 19:00 – 3:00 hours
 - There was decrease in the rate of water absorption.
 - This is because the rate of transpiration had declined;
 (d) Both transpiration and absorption would decline;
 - (e) - Wind;
 - Humidity;
 - Atmospheric pressure;
 - Temperature;
 - Light; (Any 1st two = 2 Marks)
 (f) - Wind – The rate of transpiration is faster when it is windy and lower when air is still;
 - Temperature – Rate of transpiration is high at high temperature and low at low temperature;
 - Humidity – When humidity is low, the rate of transpiration is faster while the rate of transpiration is low when humidity is high;
 - Atmospheric pressure – The rate of transpiration is high when atmospheric pressure is low while at high atmospheric pressure, the rate of transpiration is low;
 - Light intensity – It affects photosynthetic rate hence opening and closing of stomata that allows for water loss;
7. (i) Process of inhalation in mammals
 - External intercostals muscles contract; while internal intercostals muscles relax;
 - (This movement) pulls ribs upwards and outwards;
 - The diaphragm muscles contract; and the diaphragm flattens;
 - (All the above movements) increases the volume of thoracic cavity; and decreases its pressure; Atmospheric pressure being higher than thoracic cavity pressure; Forces the air to rush into the lungs; (through the nose and trachea)
 - The lungs are inflated. (Max. 10 Marks)
- (ii) During the day, chloroplast of guard cells accumulate sugar/glucose produced through the process of photosynthesis;
 - Accumulated sugar/glucose in the guard cells increases osmotic pressure of the cell sap of the guard cells;
 - Water is drawn from the neighbouring epidermal cells by osmosis;
 - Guard cells become turgid and bulges outward;
 - This opens the stomata;
 - At night, sugar/glucose which had accumulated in guard cells is converted to starch;
 - Osmotic pressure of guard cells falls;
 - The cells lose water to the neighbouring epidermal cells and become flaccid;
 - The guard cells are drawn towards one another.
 - The stomata closes; (Max 10 Marks)
8. How is the human eye adapted to its functions. (20 Marks)
 - Conjunctiva – Thin/transparent/tough; allow light to pass through/protect the eye;
 - Sclerotic layer – Is made up of (collagen) fibres/fibrous; It maintains shape of eye (ball)/protect the eye.
 - Choroid – (Is a layer of tissue) with black/dark pigments; Prevents internal reflection of light in the eye; Contains blood vessels; that supply oxygen/nutrients/remove (metabolic) waste from the eye;
 - Cornea – Is transparent/curved; thus refracts light rays/allows light to pass through;
 - Retina – Has rods/cones for colour/bright light vision and rods for low light vision;
 - Fovea/Fovea centralis/yellow spot – has high concentration of cones for accurate vision/visual acuity;
 - Blind spot - Has no cones and rods; place where optic nerves leaves/enters the eye;
 - Optic nerve – Has sensory nerve fibres/neurons; for transmission of impulses to the brain (for interpretation);
 - Lens – Is biconvex/made of elastic/transparent material; adjust to focus for a near object/accommodation/allow light to pass through/for refraction of light rays;
 - Ciliary body – Is made up of muscle fibres/glandular; which contracts/relax; to change shape/curvature of lens/produces aqueous humour;
 - Suspensory ligaments – Are elastic; hold lens in position/attach it to ciliary body;
 - Iris – Has radial and circular muscles; which control the size of the pupil;
 - Pupil – Is the hole at the centre of iris; through which light passes into the eye;
 - Aqueous humour – Is a fluid/transparent/clear; through which oxygen/nutrients pass to cornea/lens/maintain shape of eye (ball) refracts light rays/allows light to pass through;
 - Vitreous humour – Is a fluid/transparent/clear; which maintain shape of eye/refracts light rays/allows light to pass through;

MACHAKOS COUNTY KCSE TRIAL & PRACTICE EXAMINATION 2015

231/3

BIOLOGY**MARKING SCHEME**

1. (a) (i)



NB

 D_1 = Proportionality name

- Features/structures must be of appropriate size. $L = \frac{5}{2} =$ Max 2 Marks

 $D = 2$ Marks

Total 4 Marks

 D_2 = Accuracy

- No broken outlines
- No shading
- All structures must be shown

If D_1 is wrong reject D_2

$$(ii) \frac{\text{Length of Drawing}}{\text{Length of Actual specimen}} = \frac{5\text{cm}}{4\text{cm}} \checkmark \frac{1}{2} = 1.25 \checkmark \frac{1}{2} \quad 1 \text{ Mark}$$

(b) (i) Berry/Succulent \checkmark 1

- (ii) - Juicy \checkmark 1 endocarp
- Has several seeds \checkmark 1 (which develop from fused carpel)

(c) (i) Axile \checkmark 1 placentation/Central placentation. Rej. Free central

- (ii) Placenta is located at axis \checkmark 1 of the fruit.

(d) (i) Animal(s) \checkmark 1 Rej. Insects

- (ii) - Brightly coloured \checkmark 1 to attract animals \checkmark 1
- Juicy \checkmark 1, to attract animals \checkmark 1 which feed on it.
- Seeds are covered with hard testa \checkmark 1, to resist being digested \checkmark 1 by enzymes in animal's gut.

Mark first 2 (2 x 2 = 4 Marks)

NB. -Earth marks are tied.

- Rej. if description of feature is not linked with function.

2. (i)

Experimental set up	Solution x inside the tubing	Iodine solution outside the tubing
Beginning of the experiment	White/cream Rej. yellow	Colour of iodine retained/Yellow/Brown. Rej. Red
End of the experiment	Solution turns Blue black/Black	No colour change/Yellow/Brown

(ii) Starch \checkmark 1(iii) Semi-permeable \checkmark 1(iv) Iodine (molecules) moved into \checkmark 1 starch solution/solution X across the tubing through diffusion \checkmark 1 turning it blue black.Starch (molecules) were too large \checkmark 1 such that they could not \checkmark 1 move across the tubing into iodine solution.

4 Marks

(b) (i) Diffusion/selective diffusion

- (ii) - Size of diffusing molecules \checkmark 1

- Solubility \checkmark 1

- Thickness of the medium/tubing/membrane

- Permeability of medium/tubing/membrane.

Mark first two only 2 Marks

3. (a) Arthropoda \checkmark 1

- Segmented body \checkmark 1

- Exoskeleton \checkmark 1 (made of chitin)

(b) Insecta \checkmark 1

- Three body parts/Body divided into head, thorax and abdomen

- Three pairs of limbs/legs

- Pair of antennae

Rej. Compound eyes and wings because they are missing in specimen Q3.

(c)

Q ₁ (Bee)	Q ₃ (Termite)
- Has pair of wings	- Lacks wings
- Body hairy	- Body not hairy
- Has thick legs	- Has thin legs
- Large in size	- Small in size
- Head with proboscis	- Head with mandibles

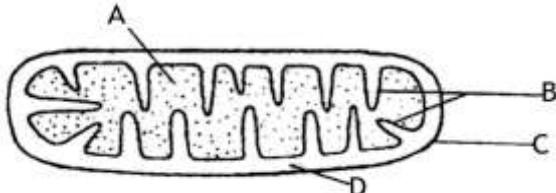
- Max 2 Marks
 - Mark first two only

- (d) (i) - Transport pollen grains
 (ii) - Have pollen basket ✓ (on tibia) for storage ✓ of pollen.
 - Has pollen brush ✓/hairs (on tarsal) for cleaning ✓ pollen from the body into pollen basket.

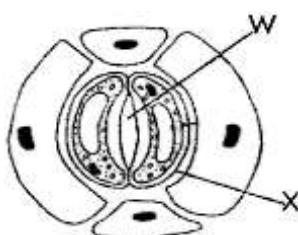
Max 2 Marks

NANDI NORTH SUB-COUNTY JOINT PRE-MOCK EXAMINATIONS 2015**Kenya Certificate of Secondary Education (K.C.S.E.)****BIOLOGY****PAPER 1****TIME: 2 HOURS**

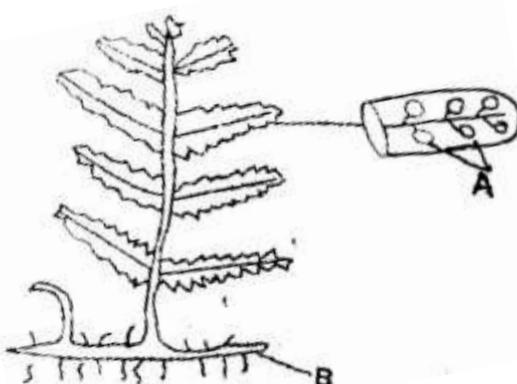
1. Name the causative agent of cholera. (1mk)
 2. The diagram below represents a cell organelle.



- (i) Identify the organelle. (1mk)
 (ii) Name the part labelled B. (1mk)
 (iii) State the function of the part labelled A. (1mk)
 (iv) Condenser (1mk)
 Diaphragm (1mk)
3. (a) Explain **three** ways in which a red blood cell is adapted to its functions. (3mks)
 (b) In which form is carbon (IV) oxide transported? (2mks)
4. State the functions of the following organelles.
 (i) Centriole (1mk)
 (ii) Nucleolus (1mk)
5. The diagram **below** shows part of plant tissue.

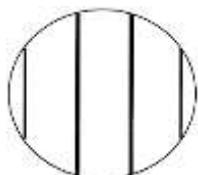


- (i) Name the cell labelled X and part labelled W. (2mks)
 (ii) State **two** adaptations of cell labelled X to its functions. (2mks)
6. (a) Differentiate between hypogeal germination and epigeal germination. (2mks)
 (b) State **two** internal causes of dormancy in seed. (2mks)
7. (a) Define polyploidy. (1mk)
 (b) Name **three** disorders resulting from gene mutations. (3mks)
8. (a) Distinguish between homologous and analogous structure. (2mks)
 (b) Explain the term continental drift as used in evolution. (2mks)
9. The diagram below represents a fern.



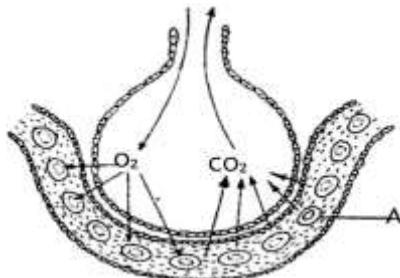
- (a) Name parts labelled A and B. (2mks)
 (b) In which division does the plant belong? (1mk)
 (c) State the function of the part labelled A. (1mk)
10. (a) Name **three** supportive tissues in plants. (3mks)
 (b) Name the type of muscles found in the gut. (1mk)

11. A form one student trying to estimate the size of onion cells observed the following on the microscope's field of view.



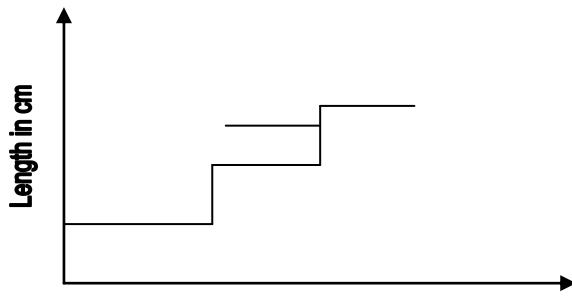
- (i) Define the term resolving power. (1mk)
- (ii) If the student counted 20 cells across the field of view, calculate the size of one cell in micrometers. (2mks)
- 12. (a) Distinguish between transpiration and guttation. (2mks)
- (b) State **two** importance of guttation in hydrophytes. (2mks)

13. The diagram **below** shows the exchange of gases in alveoli.



- (i) State how the alveoli are adapted to their function. (3mks)
- (ii) Name the cell labelled **A**. (1mk)
- 14. (a) Distinguish between respiratory quotient and oxygen debt. (2mks)
- (b) Name the site where anaerobic respiration occurs in the cell. (1mk)

15. Study the graph below and answer the questions that follow.



- (i) What is the name given to the type of graph? (1mk)
- (ii) What is the name used to describe point X? (1mk)
- (iii) What is the importance of part X? (1mk)
- (iv) Name the phylum in which the graph represented in above occurs. (1mk)
- 16. (a) Define the term natural selection. (1mk)
- (b) State **three** evidence of organic evolution. (3mks)
- 17. State **one** adaptation of the following parts of mammalian eye.
 - (i) Fovea centralis. (1mk)
 - (ii) Sclera (1mk)
 - (iii) Ciliary body (1mk)
- 18. Name the strengthening substance in sclerenchyma tissue. (1mk)
- 19. (a) Differentiate between gaseous exchange and ventilation. (2mks)
 - (b) Name the respiratory sites of the following:
 - (i) Fish (1mk)
 - (ii) Insects (1mk)
- 20. (a) Name **two** cardiovascular diseases. (2mks)
 - (b) If the nerve supply to the heart of a mammal is severed, the rhythmic heart contraction and relaxation will go on and heart continues to beat. Explain why. (2mks)
- 21. Name **two** major branches of Biology. (2mks)
- 22. State the functions of the following apparatus.
 - (i) Bait trap (1mk)
 - (ii) Pooter (1mk)
- 23. State **two** structural adaptations of veins to their function.

24. Name the process that results to formation of tissue fluid. (1mk)
 25. What is serum? (1mks)

NANDI NORTH SUB-COUNTY JOINT PRE-MOCK EXAMINATIONS 2015

Kenya Certificate of Secondary Education (K.C.S.E.)

231/2

BIOLOGY

PAPER 2

(THEORY)

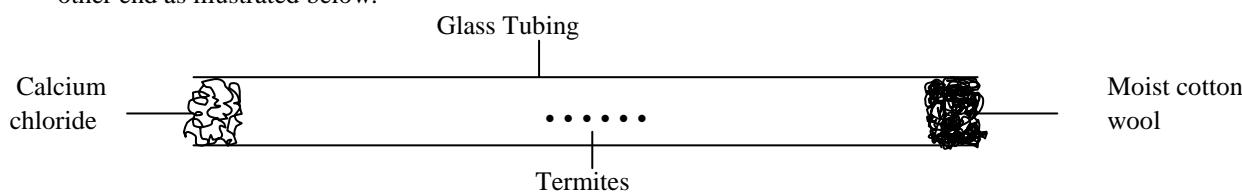
MARCH / APRIL 2015

TIME: 2 HOURS

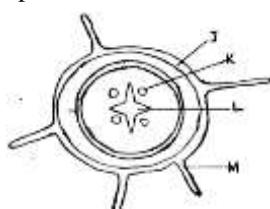
SECTION A (40 MARKS)

Answer all questions in this section in the spaces provided.

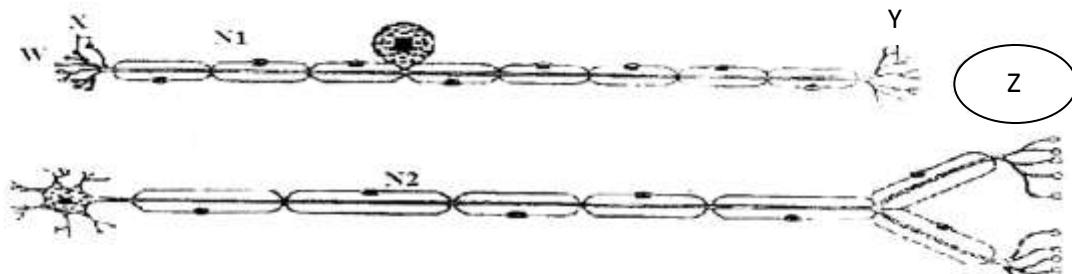
1. A climbing plant twines around the stem of a tall tree.
 (b) (i) Name the type of response exhibited by the climbing stem. (1mk)
 (ii) Explain how the response named in (a) (i) above takes place. (3mks)
 (c) An experiment was carried out to investigate the response of white termites to a certain stimulus. Ten termites were placed at the centre of glass tubing. Calcium chloride was placed on one end of the tubing and moist cotton wool at the other end as illustrated below.



- a. What observations are made after 20 minutes? (1mk)
 b. What type of response is exhibited by the termites? (1mk)
 c. What is the survival value of the above response? (1mk)
 d. What is Phototaxis? (1mk)
2. (a) What is multiple allelism? (1mk)
 (b) A pure breeding black male mouse was mated with a pure breeding brown female mouse. All the offspring had black coat colour.
 i. Explain the appearance of black coat colour in the offspring. (1mk)
 ii. If the black parental mouse was mated with a mouse that is heterozygous for coat colour, work out the genotypic ratio of offspring. Show your working. (4mks)
 iii. State **two** disorders in human beings that are as a result of chromosomal mutation. (2mks)
3. (a) (i) What is meant by the term biological control? (1mk)
 (ii) Give an example of biological control. (1mk)
 (b) (i) What is eutrophication? (3mks)
 (ii) What are the effects of eutrophication? (3mks)
4. The diagram below represents a transverse section of a plant organ.



- (b) From which plant organ was the section obtained? (1mk)
 (c) Give **two** reasons for your answer in (a) above. (2mks)
 (d) Name the parts labeled J, K and L. (3mks)
5. The diagram below illustrates two types of neurons and associated structures. Study the diagrams carefully and answer the questions that follow.



- (a) (i) Identify the type of neurons illustrated in diagrams N1 and N2. (2mks)
(ii) Provide **two** reasons for your identity of the neuron in diagram N1. (2mks)
- (b) Name each of the structures labeled X and Y in diagram N1. (2mks)
- (c) Give the general name of the type of cell position Z in diagram N1. (1mk)
- (d) Give the general name of the substance in position W in diagram N1. (1mk)

SECTION B**Answer question 6 (Compulsory) and any other one question from this section.**

6. An investigation was conducted to compare rate of water loss from twigs of two different species of plants Q and L. The twigs had equal leaf surfaces. The results of the investigation were recorded in the table below.

Time of the day	6a.m	8a.m	10am	1p.m	12pm	1pm	2pm	3pm	6pm	8pm	12am
Water loss gh species Q	0	4	20	40	55	36	26	20	2	0	0
Water loss gh species L	8	20	39	131	198	182	130	81	45	12	12

- (a) On the graph paper provided, plot a graph of Water loss gh^{-1} against time for the two plants. (7mks)
- (i) At what time of the day was 60gh^{-1} of water lost by plant species L? (1mk)
- (b) Name the apparatus which might have been used to investigate the rate of water loss. (1mk)
- (c) State **two** precautions that were taken in setting up the experiment. (2mks)
- (d) Which of the plant species is likely to be adapted to arid conditions? Give a reason. (2mks)
- (e) Suggest how the stomata of species Q are structurally adapted to water loss. (2mks)
7. Describe how the mammalian male reproductive system is adapted to perform its functions. (20mks)
8. Describe the structure and functions of various organelles in a mature animal cell. (20mks)

NANDI NORTH SUB-COUNTY JOINT EVALUATION 2015**231/3 – BIOLOGY PAPER 3****CONFIDENTIAL**

Provide each candidate with:-

- Solution L (Milk)
- Filter Paper
- Funnel
- 100ml Beaker
- 2 Test Tubes
- Bench solutions
- Iodine solution
- Copper (II) Sulphate
- Sodium Hydroxide

NANDI NORTH SUB-COUNTY JOINT PRE-MOCK EXAMINATIONS 2015

Kenya Certificate of Secondary Education (K.C.S.E.)

BIOLOGY**PAPER 3**

(PRACTICAL)

MARCH / APRIL 2015

TIME: 1½ HOURS

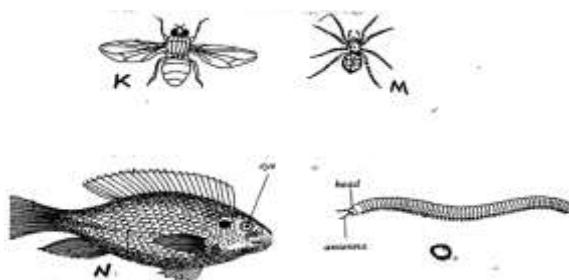
SECTION A (40 MARKS)

Answer all questions in this section in the spaces provided.

1. You are provided with a food sample labelled D in solution form. Using the reagents provided, carry out tests to identify the food substances in the food sample. (12mks)

FOOD SUBSTANCE	PROCEDURE	OBSERVATION	CONCLUSION
Proteins			
Non-Reducing Sugar			
Starch			

2. You are provided with the specimen labelled E. Examine it carefully and answer the questions that follow.
 - (i) Name the class of the plant from which the specimen E was obtained. (1mk)
 - (ii) Using observable features only, name **three** reasons for your answer in (i) above. (3mks)
 - (iii) Name the agent of pollination for the flowers of specimen E. (1mk)
 - (iv) State **four** observations on the specimen E that support the answer in (iii) above. (4mks)
 - (v) Draw and label the pistil of specimen E. (4mks)
3. The photographs below represent different types of animals. Study them carefully and answer the questions that follow.



- (b) State **two** observable differences between K and M. (2mks)
- (c) Classify specimen M into the following taxa giving reasons for each case.
 - (i) Phylum (1mk)
Reasons (3mks)
 - (ii) Class (1mk)
Reasons (3mks)
- (d) Name the type of skeleton found in the specimen O. (1mk)
- (e) (i) Name the class to which the specimen N belongs. (1mk)

(ii) Give **three** reasons for your answer in (d) (i) above.

(3mks)

NANDI NORTH SUB-COUNTY JOINT PRE-MOCK EXAMINATIONS 2015**231/1 – BIOLOGY PAPER 1 - MARKING SCHEME**

1. *Vibrio cholerae*; (1 mark) Rej. if binomial rules not applied.
2. (a) Mitochondrion rej. mitochondria. (1 mark)
(b) Cristae; (1 mark)
(c) Site where respiration occur;
(habours respiratory enzymes); (any one) (1 mark)
3. (a) Concentrates light from the source and directs it to specimen. (1 mark)
(b) Aperture below the condenser that regulates amount of light passing the condenser: (1 mark)
4. (a) - Have biconcave disc shape which increases the surface area for exchange of gases by diffusion;
- Have haemoglobin which has high affinity for oxygen; (hence faster transportation of oxygen).
- Lacks nucleus to provide more room for packaging of haemoglobin.
- Have thin plasma membrane that allows faster / rapid diffusion of gases.
- Have carbonic anhydrase which accelerates loading and off-loading of carbon (IV) oxide for faster carbon (IV) oxide transport. (any three) (3 marks)
(b) - Carbamino haemoglobin;
- Carbonic acid; (1 mark)
5. (i) - Helps in formation of spindle fibres;
- Helps in formation of cilia and flagella; (any one) (1 mark)
(ii) Helps in formation of ribosomes. (1 mark)
6. (a) X – Guard cell;
W – Stoma; rej. Stomata
(b) - Have chloroplast that help in the process of photosynthesis;
- Have thin outer wall and thick inner wall to enhance bulging during opening of stomata;
7. (a) Epigeal germination is that type of germination where the cotyledons emerge above the ground: while hypogea germination the cotyledons remain underground;
(b) - Presence of germination inhibitors; Acc. Abscisic acid Immature embryo;
- Absence of enzymes that facilitate germination; - very low concentration of hormones e.g. Gibberelins;
8. (a) Presence of more than two sets of chromosomes in a cell; (1mk)
(b) Albinism;
a. Haemophilia;
b. Colourblindness
c. Sickle cell anaemia
9. (a) Homologous structures are structures that have a common embryonic origin but have been modified to perform different functions; while analogous structures have different embryonic origin but have evolved to perform similar functions.
(b) The breaking up, drifting and separation; of the big land mass to form the present day different continents;
10. (a) A – Sori rej. sorus
B – Rhizome
(b) - Pteridophyta
- Produce spores
11. (a) - Collenchyma;
- Scherenchyma;
- Xylem;
- Tracheids; (any three) (3 marks)
(b) Smooth muscles;
12. (a) Resolving power is the ability to distinguish two close parts as separate entities; (1mk)
(b) Diameter field of view = 3mm
No. of cells – 20 cells
 $1\text{mm} = 1000\mu\text{m}$
 $3\text{mm} = 3000\mu\text{m}$
Size of 1 cell = $\frac{3000}{20} = 150\mu\text{m}$
13. (a) Transpiration is the loss of water in form of water vapour; while guttation is loss of water in form of water droplets;
(b) - Loss / removal of excess water;
- Enhances absorption of water; (2 marks)
14. (a) - Have thin film of moisture to dissolve gases for efficient diffusion;
a. Have a thin epithelium for faster diffusion of gases;
b. Have a large surface area for maximum gaseous exchange;
c. Have a network of blood capillaries for transportation of differing gases; (any three) (3mks)
(b) Red blood cell; (1 mark)
15. (a) Respiratory quotient is a relationship between oxygen consumed and carbon (IV) oxide produced; which oxygen debt is the amount of oxygen required to break down lactic acid produced during anaerobic respiration. (2mks)

-
- (b) Cytoplasm; (1mk)
 16. (a) Intermittent growth curve; (1mk)
 (b) Moulting; (1mk)
 (c) Allows growth to take place; (1mk)
 (d) Arthropoda; rej. Wrong spelling.
17. (a) Process whereby nature selects those organisms that are well adapted to the prevailing environmental conditions enabling them to survive to reproductive maturity; and rejects those poorly suited. (1mk)
 (b) - Fossil records;
 - Comparative embryology;
 - Comparative serology;
 - Comparative cell Biology;
 - Comparative anatomy; (any three) (3mks)
18. (i) Have high concentration of cones for visual acuity; (1mk)
 (ii) Have tough corrective tissues which helps to support and protect other parts of eyeball; (1mk)
 (iii) Have ciliary muscles whose contraction and relaxation alters the tension exerted on suspensory ligaments; thus the curvature of lens. (1mk)
19. Lignin; (1mk)
20. (a) Gases exchanger is passage of respiratory gases across the respiratory surface; while ventilation is the process of bringing in air rich in oxygen and removing out air rich in carbon (IV) oxide; (2mks)
 (b) (i) Gill filaments; rej. Gills.
 (ii) Tracheoles'
21. (a) - Arteriosclerosis;
 - Coronary thrombosis;
 - Heart failure;
 - Hypertension;
 - Atherosclerosis; (any 2) (2mks)
 (b) The heart muscles is myogenic; capable of undergoing contraction and relaxation without nervous stimulation; (2mks)
22. - Botany; (2mks)
 - Zoology
23. (i) Attracts organisms using food as a bait; and traps them. (1mk)
 (ii) Sucks small organisms from bark of a tree; (1mk)
24. - Presence of valves to prevent back flow of blood;
 - Thin walled which are less muscular and have few elastic fibres and wide lumen for blood to flow under low pressure; (2mks)
25. Ultra filtration; (1mk)
 26. Serum is blood whose plasma proteins have been removed. (1mk)

NANDI NORTH SUB-COUNTY JOINT PRE-MOCK 2015
231/2 – BIOLOGY PAPER 2 - MARKING SCHEME

1. (a) (i) Type of response
 - Thigmotropism; / Haptotropism;
 - (ii) How the response named in (a) (i) above takes place.
 - Contact with tree cause auxins to migrate to the part away from contact causing faster growth / on that side away from contact hence the plant tines around the stem.
- (b) (i) Observations made after 20 minutes
 - Most of the termites will have moved towards the end with moist cotton wool(1mk)
 - (ii)Type of response exhibited by the termites.
 - Negative chemotaxis / positive hydrotaxis.
 - (iii)Survival value of the above response.
 - Enable them escape from harmful stimulus / enable them find water;
 - (iv) Photonasty is Non-directional movement of parts of plants in response to changes in light intensity;
2. (a) Multiple allelism is a condition in which a heritable characteristic is determined by more than two variant forms of the same single gene. (1 x 1 = 1mk)
 - (b) (i) The appearance of black coat colour in the offspring.
 - Gene for black coat colour (completely) dominant over gene for brown coat colour / brown colour gene recessive over gene for black colour.
- (ii) Parental phenotype
 Parental genotype
 Parental Gametes
 Fusion / Fertilization

F2 generation
 Genotype ratio => 1BB : 1Bb

- (iii) Two disorders in human beings that are as a result of chromosomal mutation.
 - Down's syndrome
 - Klinefelter's syndrome
 - Turner's syndrome
3. (a) (i) Biological control is using a living organism to regulate / control / the population of another organism.
 (ii) Examples: Beetles introduced to feed on water hyacinth; fish introduced to feed on mosquito larvae.
- (b) (i) Eutrophication is enrichment of water bodies; with nitrate / phosphates / ammonium sulphate / nutrients due to discharge of sewage / run off water containing fertilizers, leading to rapid growth of surface phytoplankton;
 (ii) Effects of eutrophication:
 - Block light from reaching plants underneath which will not photosynthesize. The plants die and decompose leading to lack / depletion of oxygen animals suffocate and die.
4. (a) Root (Dicotyledonous root)
 (b) Two reasons for your answer in (a) above.
 - Presence of root hairs.
 - Star-shaped xylem at the centre.
 - Presence of endodermis.
- (c) Parts labeled:
 - J: Epidermis / Piliferons layer
 - K: Phloem
 - L: Xylem
5. (a) (i)

N1:	Sensory neurone
N2:	Motor neurone

 (ii) Two reasons for your identity of the neuron in diagram N1.
 - It is unipolar;
 - Cell body located off the axon;
- (b) X – Synaptic knobs
 Y – Receptor dendrites or dendrite alone.
- (c) Receptor / Effector
- (d) Q - Neurotransmitter substance.
6. (a) Graph

- (i) $10.42\text{a.m.} \pm 0.06$ and $5.0\text{m} \pm 0.06$
(ii) $29 \pm 1\text{g/h}$; units must be stated.
- (b) Potometer / transpirometer
(c) - The leaf shoot should be cut under water.
- The system should be air tight.
(d) - Because of low rate of water loss.
(e) - Sunken stomata
- Hair stomata
- Small stomatal opening / pore.
7. How the mammalian male reproductive system is adapted to perform its functions;
Penis
- Highly vascularised / spongy ; sensitive glands.
 - Long to allow entry into the vagina;
 - Becomes erect when blood flows to the blood spaces;
 - Testis contains numerous seminiferous tubules;
 - Containing primordial germ cells for spermatogenesis takes place;
 - The process is favored by slightly lower temperature than that of the body;
 - Contain sterol cells which nourish sperms until they are mature;
 - Long coiled Epididymis; for storage of sperms;
 - A muscular Vas deferens; that upon contraction pushes sperms out and allows ejaculation; to increase chances of fertilization,
 - sperms have a tail and a head with a large number of mitochondria; to provide energy for swimming to reach the egg / ovum
 - Seminal vesicle / cowpers glands / prostate gland; produce seminal fluid to provide a medium for sperms to swim;
 - Urethra; conducts urine and sperms out of the body. (20mks)
8. Structure and functions of various organelles in a mature animal cell.
- Mitochondria:
Has a double membrane surrounding it and inner membrane folded to form cristae which increases the surface area for attachment of respiratory golgi body apparatus, are stack of membrane bound like sac / is a system of membranes sacs / hollow spaces; that transports glycoproteins / carbohydrates and proteins; They package glycoproteins; secrete mucus enzymes / synthesized proteins.
 - Lysosomes
Are spherical in shape and enclosed by a single membrane: contain hydrolytic enzyme which destroy worn out organelles, micro-organism / ingest food / breakdown large molecules.
 - Endoplasmic reticulum
Are membrane bound cavities in cytoplasm; smooth endoplasmic reticulum site for lipid / transport.
Rough endoplasmic reticulum has ribosome on its surface; and transport proteins.
 - Centrioles
Rod shaped; located outside the nuclear membrane, for formation of fibs and cilia.
 - Cytoplasm
It is a fluid medium; where chemical reaction occurs, contains organelles and inclusions (e.g. glycogen granules, fat droplets and dissolved substances).
 - Cell membrane
Encloses all cell organelles; has phospholipid layer between two protein layers / it's a lipoprotein layer has pores that selectively allows substances to pass in and out of the cell / its semi permeable.
 - Nucleus
Has a double membrane / nuclear membrane around it, which has pores to allow substances in and out of the nucleus; Has nucleoplasm, which contain nucleolus / chromatin, nucleus controls all cell activities. Nucleolus manufactures ribosomes and centrioles.
 - Ribosomes
Are spherical in shape and suspended in cytoplasm and attached on endoplasmic reticulum: synthesis proteins.

NANDI NORTH SUB-COUNTY JOINT EVALUATION 2015**231/3 – BIOLOGY PAPER 3 - MARKING SCHEME**

1.

FOOD SUBSTANCE	PROCEDURE	OBSERVATION	CONCLUSION
Proteins	<ul style="list-style-type: none"> Put 2cm³ of food sample D into a test tube. Add sodium hydroxide solution Add copper sulphate solution and shake; 	No colour change / blue colour of copper sulphate persists / retains / maintains;	Proteins / absent / Absence of proteins;
Non-reducing Sugar	<ul style="list-style-type: none"> Put 2cm³ of food sample D into a test tube. Add dil. Hydrochloric acid, boil and cool; Add sodium hydrogen carbonate until the fizzing stops; Add Benedict's solution and boil; 	Colour changes from Blue to green / yellow orange and brown. Acc Redbrown / if only one colour is mentioned.	Non-reducing sugar(s) present; Rej. Reducing sugar(s); present after hydrolysis.
Starch	<ul style="list-style-type: none"> Put 2cm³ of food sample D into a test tube. Add iodine solution and shake 	Coour changes to blue black / blue-black / blue / black;	Starch present

2. (i) (a) Dichotyledonae;

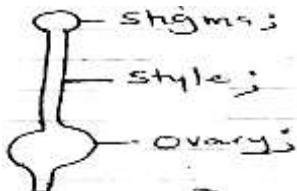
(ii) - Network venation / net veined leaves;

- Presence of leaf petiole / leaf stalk;
- Broad leaf;

(iii) Insect;

- (iv) - Brightly coloured petals to attract insects;
- Large and conspicuous;
 - Scented;
 - Has landing platform for insects;
 - Anthers are firmly attached to the filament;

(v)



3. (a)

K	M
<ul style="list-style-type: none"> - Has 3 pairs of legs - Has 3 body parts - Has wings - Has antennae 	<ul style="list-style-type: none"> - Has 4 pairs of legs; - Has 2 body parts; - Lack wings; - Lack antennae;

(b) (i) Phylum - Arthropoda;

- Reasons: - Jointed appendages;
- Segmented body;
 - Presence of exoskeleton;
 - Bilaterally symmetrical;

(ii) Class - Arachnida

- Reasons: - has 4 pairs of legs;
- body divided into two parts;
 - lack antennae;

(c) exoskeleton;

(d) (i) Pisces;

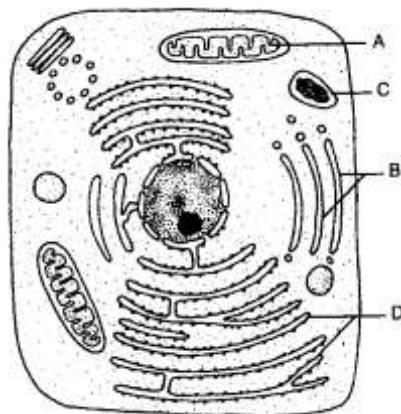
- (ii) - Presence of fins;
- Presence of scales;
 - Presence of lateral line;

MOKASA JOINT EXAMINATION 2015

(Kenya Certificate of Secondary Education)

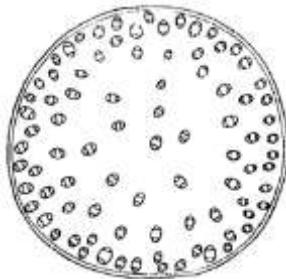
BIOLOGY THEORY**231/1****BIOLOGY THEORY****MARCH/APRIL 2015**

1. State **two** characteristics of living organisms that are specific to plants. (2marks)
2. State **one** use for each of the following apparatus in the study of living organisms.
 - a) Pooter. (1mark)
 - b) Bait trap. (1mark)
3. a) Name **two** tissues in plants which are thickened with lignin. (2marks)
 - b) How is support attained in herbaceous plants? (1mark)
4. The diagram below represents a cell as seen under an electron microscope.



- a) Identify the parts labeled **A** and **D**. (2marks)
- b) State the function of the structures found on the part labeled **D**. (1marks)
5. a) Using a microscope, a student counted 55 cells across a field of view whose diameter was $6000\mu\text{m}$. Calculate the average length of the cells. **Show your working.** (2marks)
- b) State the function of the following parts of a light microscope
 - i) Fine adjustment knob. (1mark)
 - ii) Condenser. (1mark)
6. (a) Name the fluid that is produced by sebaceous glands. (1mark)
 - (b) What is the role of sweat on the human skin? (2marks)
7. What is the importance of the following in an ecosystem? (2marks)
 - a) Decomposers
 - b) Predation
8. (a) State **two** functions of bile juice in the digestion of food. (2marks)
 - (b) How does substrate concentration affect the rate of enzyme action? (1mark)
9. Name the features that increase the surface area of small intestines. (2marks)
10. Describe what happens during the light stage of photosynthesis. (3marks)
11. (a) Define the following terms.
 - i. Population
 - ii. Community
 (b) Name a method that could be used to estimate the population size of the following organisms.
 - i. Fish in a pond. (1mark)
 - ii. Black jack in a garden. (1mark)
12. (a) What is meant by the term allele? (1mark)
 - (b) Explain how the following occur during gene mutation.
 - (i) Deletion. (1mark)
 - (ii) Inversion. (1mark)
 - (c) What is a test-cross? (1mark)
13. Explain what happens when there is oxygen debt in human muscles. (2marks)

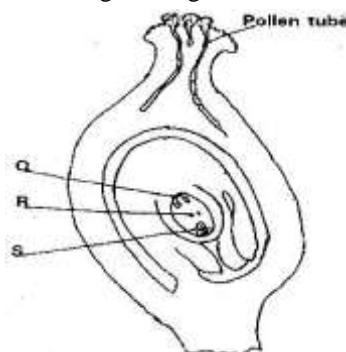
14. The diagram below shows a transverse section of a plant organ.



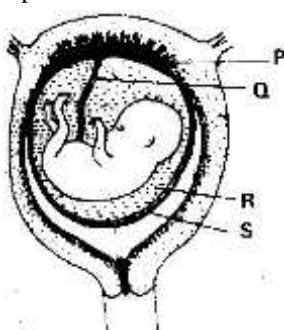
- a) Name the class to which the plant organ was obtained. (1mark)
 b) Give a reason for your answer in (a) above. (1mark)
15. Giving a reason in each case, name the class to which each of the following organisms belong: (4marks)
- Pea plant
 Reason
- Bat
 Reason
16. (a) Name the causative agents of the following diseases in humans. (2marks)
- Typhoid
 Amoebic dysentery
- (b) Name the disease in humans caused by *Plasmodium falciparum*. (1mark)
17. State **three** differences between Chilopoda and Diplopoda. (3marks)
18. What are the limitations of fossil records as evidence of organic evolution? (1mark)
19. The diagram below represents a member of the kingdom Animalia.



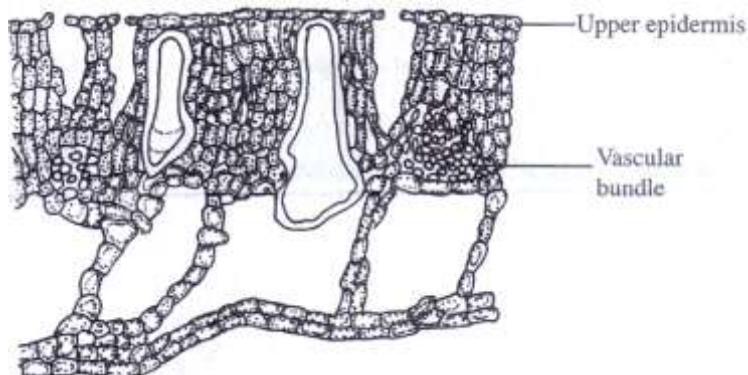
- i) Name the phylum to which the organism belongs. (1mark)
 ii) Using observable features in the diagram, give three reasons for the answer in (i) above. (3marks)
20. The diagram below shows a stage during fertilization in plants.



- a) Name the parts labeled Q and R. (2marks)
 b) State the function of the pollen tube. (1mark)
 c) On the diagram, label the micropyle. (1mark)
21. The diagram below represents a human foetus in a uterus.



- a) Name the types of blood vessels found in the structure labeled **Q**. (2marks)
 b) Name **two** features that enable the structure labeled **P** carry out its function. (2marks)
22. Name the type of skeleton that makes up each of the following animals. (3marks)
- Cockroach
 - Bird
 - Earthworm
23. (a) Highlight **two** survival values of tropic response. (2marks)
 (b) What is a klinostat? (1mark)
24. Name:-
- The pressure sensitive swellings at the base of some leaves and petals which through loss or gain of turgidity bring about nastic movements. (1mark)
 - The structure in cockroach used for detecting stimuli. (1mark)
 - The growth movement of part of plants in response to a unidirectional external stimulus. (1mark)
25. The diagram below shows a transverse section of a leaf. Study it carefully then answer the questions that follow.



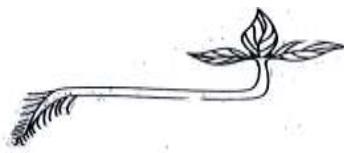
- a) Name the habitat of the plant from which the leaf was obtained. (1mark)
 b) Give **two** reasons for your answer in (a) above. (2marks)
26. a) Name the gaseous exchange surface in insects. (1mark)
 b) How is the surface named in (a) above suited to its function. (2marks)
27. Most carbon (IV) oxide is transported from tissues to the lungs within the red blood cells and not in the blood plasma. Give two advantages of this mode of transport. (2marks)

MOKASA JOINT EVALUATION EXAMINATION*Kenya Certificate of Secondary Education***231/2****BIOLOGY****Paper 2****(Theory)****March/April 2015****2 Hours****SECTION A:**

1. a) Define the following terms
 (i) Stimulus (1 mark)
 (ii) Taxis (1 mark)
- b) A student uprooted a seedling of Bryophyllum and left it to lie on the ground. After a few days the seedling has assumed a growth curvature shown in the diagram below.



At the start of the experiment



At the end of the experiment

Account for the growth curvature observed in parts (4 marks)

A and B

Part A

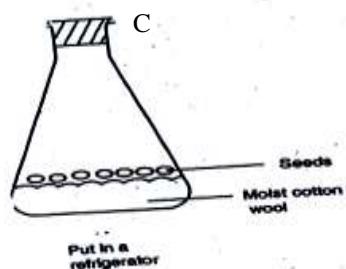
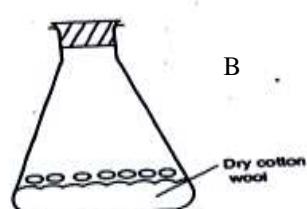
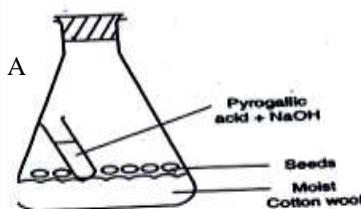
Part B

- c) State **two** survival values of taxis to organisms (2 marks)

2. A cross between a black bull and a white cow produces a calf with black and white spots.

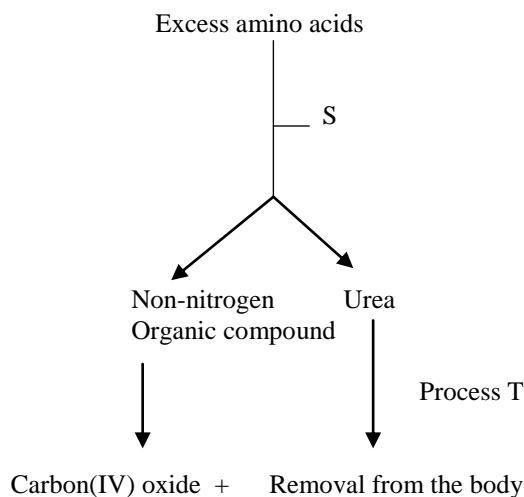
- a) Work out the possible genotypes of a calf resulting from a cross between a black bull and a white cow. (4 marks)
- b) State the reason why the calf had black and white spots (1 mark)
- c) What is meant by the term allele? (1 mark)
- d) State **two** characteristics of an individual with Down's syndrome (2 marks)

3. An experiment was set up as shown below by a biology class.



- a) What is the role of pyrogallic acid in sodium hydroxide in flask A? (1 mark)
- b) What conditions were being investigated in flasks A, B and C? (3 marks)
- c) Suppose the dry cotton wool in flask B was replaced with a moist cotton and set-up left for five days, give and account for the observation made (2 marks)
- d) State the inhibitory roles of gibberellic acid in plants (2 marks)
4. a) Distinguish the following terms as used in animal nutrition
 (i) Dentition and dental formula (1 mark)
 (ii) Homodont and heterodont dentition (1 mark)
- b) State **two** functions of the ileum (2 marks)
- c) Explain how the chloroplast is adapted to its function (4 marks)

5. Proteins are present in a balanced diet. They are broken down into amino acids and excess cannot be stored in the body. Its metabolism is as shown below.



- a) Describe how urea is transported to the site of removal from the body (2 marks)
 b) Name the process S and T, stating the organ in which each occurs (4 marks)

Process	Name	Organ
S		
T		

- c) Give **four** uses of amino acids in the body (2 marks)

SECTION B

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

6. In an experiment, Tradescantia plants with purple leaves were kept in the dark for about 1 hour, strips of leaves approximately 5mm by 12mm from this plants were then cut and floated with lower epidermis on experimental solution in petri dishes. The dishes were then placed in light and temperature kept at 20°C. After 5 minutes a leaf strip was removed from each experimental solution, quickly blotted dry and the percentage number of open stomata was found after counting under the microscope. The procedure was repeated with other strips from the same experimental solutions at intervals of 10 minutes. The results are as shown in the table below.

Time in minute, floating on solution	5	15	25	35	45	55
% open stomata in KCl solution (150mm)	0	0	20	76	82	86
% open stomata in NaCl solution (150mm)	0	0	6	22	42	45

- a) Plot graphs using the same axis and suitable scale for the percentage of open stomata against time for treatment in each of the solutions, potassium chloride and sodium chloride. (7 marks)
 b) Why was it necessary to keep the plant in the dark for a period of time before the experiment? (1 mark)
 c) Using the graphs you have plotted give possible explanations for the behaviour of the guard cells during this experiment (6 marks)
 d) What would happen if the experiment was carried out in the dark (1 mark)
 e) With respect to leaf structure only, state **five** ways in which plants living in arid areas minimize excessive water loss. (5 marks)
7. a) State **four** precautions to be observed when collecting specimens. (4 marks)
 b) Explain how the various activities of man have caused soil pollution (16 marks)
8. a) State the various ways in which energy is utilized in living organisms (6 marks)
 b) Describe the process of fertilization and implantation of the zygote in mammals (14 mks)

MOKASA JOINT EXAMINATION*Kenya Certificate of Secondary Education*

23I/3

BIOLOGY**Paper 3****(Practical)****March/April 2015****CONFIDENTIAL FOR EXAM REQUIREMENT**

The teacher in-charge of Biology to provide the following specimens and apparatus to each candidate.

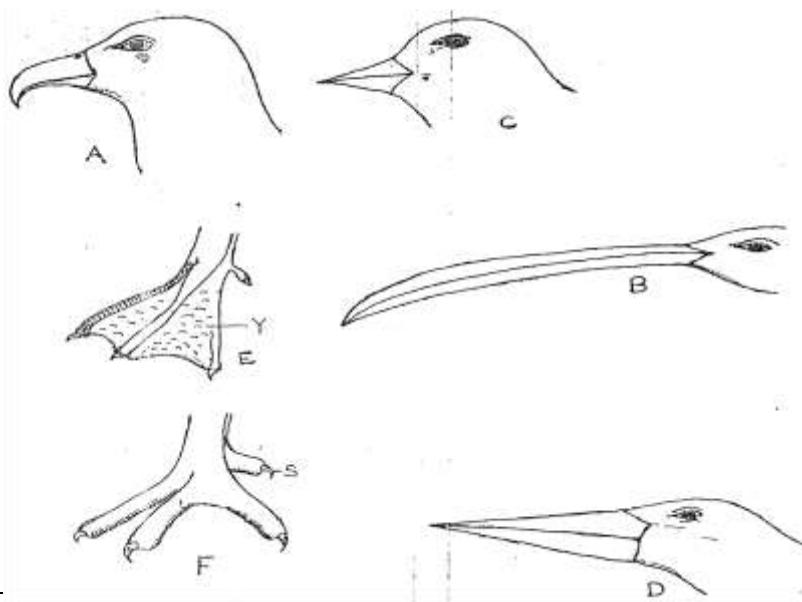
1. A piece of Lung (about 20 cm³) obtained from a mammal like a cow or goat labeled specimen T.
Provide specimen T on a Petri-dish or on a flat surface.
2. A gill obtained from a bony fish like Tilapia labeled specimen R.
3. Partially unripe pawpaw (small size) labeled specimen K.
4. Means of cutting e.g. sharp Knife/sharp scalpel/surgical blade.
5. Tap water labeled solution X. (Provide 100 ml for each candidate)
6. Concentrated salt solution labeled solution Y. (Provide 100ml per candidate)
7. A transparent ruler.
8. A pair of forceps.

MOKASA JOINT EXAMINATION*Kenya Certificate of Secondary Education*

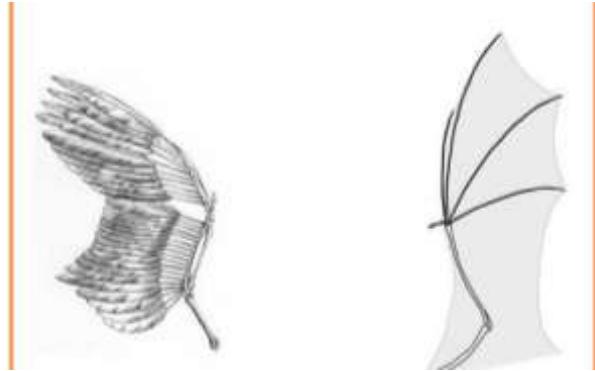
23I/3

BIOLOGY**Paper 3****(Practical)****March/April 2015****1 3/4 Hours**

1. You are provided with two specimens labeled T and R. Study each of the specimens carefully and use them to give accurate responses to the questions and procedures below.
 - (a) Take the whole of specimen T. Softly press it downwards on the petri-dish using your first finger, and then remove your finger. Observe and record what happens to the specimen.
 - (i) Observation (2 marks)
 - (ii) Explain the observation recorded in (a) (i) above. (2 marks)
 - (b) (i) Specimens T and R perform some functions in the organisms from which they were removed from. State one function which is common to both specimen T and R. (1 mark)
 - (ii) Using observable features only on specimen R, describe how it is adapted to the function named in (b) (i) above. (3 marks)
 - (c) Explain the main features that adapt specimen T to the function named in (b) (i) above. (4 marks)
 - (d) Identify the group of organisms that use specimen R. (1 mark)
2. The picture below shows series of beaks in birds.



- (a) State the type of evolution that may have led to the emergence of the different beaks shown on the pictures above.(1 mark)
 (b) Name the type of evolution structure represented by the beaks shown on the pictures above. (1 mark)
 (c) Observe the pictures carefully. From your observations, what features are responsible for the different types of beaks? (3 marks)
 (d) Suggest the type of food likely eaten by birds whose beaks are shown in pictures A, B, C and D. (4 marks)
 (e) Briefly state how beak shown in picture A is adapted to feeding. (1 mark)
 (f) Below are pictures from two different organisms.



- (i) What is the specific function of the two structures shown in the pictures? (1 mark)
 (ii) What type of structures is represented by the two structures shown on the pictures? (1 mark)
3. You are provided with a specimen labeled K.
- (a) (i) With a reason, identify the part of the plant represented by the specimen. (2 marks)
 (ii) Cut the specimen into two halves transversely. Observe the arrangement of seeds inside the specimen. Suggest its placentation. (1 mark)
- (b) (i) Suggest the mode of dispersal for specimen K. (1 mark)
 (ii) Give one reason for your answer in (b) (i) above. (1 mark)
- (c) (i) Specimen K in its raw state has an excretory substance in its skin. Name the excretory substances. (1 mark)
 (ii) How is the excretory substance named in (c) (i) importance to human? (2 mark)
- (d) From the remaining parts of specimen K, cut out thin strips measuring 1cm wide and 5cm long. Place two of the stripes in tap water (solution X) and the other 2 in concentrated salt solution (solution Y). Allow the set ups to stand for 30 minutes.
 (i) After the 30 minutes, remove the stripes from the two solutions. Observe and record the shape of the strips from each solution. (2 marks)
 Solution X
 Solution Y
 (ii) Using your fingers, feel the texture of the strips from the two solutions. (2 marks)
 Texture
 Solution X
 Solution Y
- (e) Explain the observations made in (d) (i) and (ii) for stripes in solution X. (3 marks)

MOKASA 2015**BIOLOGY P1****MARKING SCHEME**

1. Autotrophic nutrition; Limited movement,
Limited excretory products/unspecialized excretory structures;
Growth takes place in specific region; Alternation of generation;
2. a) Pooter. (1mark)
Sucking small organisms from rock and bark surfaces;
- b) Pitfall trap. (1mark)
Trapping crawling organisms;
3. (a) Sclerenchyma; Xylem vessels/Tracheids;
(b) Cells take in water and become turgid; owtte
4. a)
 i) **A** Mitochondrion; rej plural
 ii) **D** Rough endoplasmic reticular; rej singular
 b) Site for protein synthesis;
5. a) Length of a cell= diameter of field of view
 Number of cells ;

$$\frac{6000}{55} ;$$

$$\underline{109};$$
 b) i) Magnification (of images); owtte
 ii) Regulation of a mount of light (falling on the object/specimen on microscope);
6. (a) Sebum;
 (b) Kills micro-organisms; cools the body; getting rid of wastes/excretion;
7. (a) Recycling off nutrients; owtte
 (b) Regulation of numbers/population; owtte
8. (a) Emulsification of fats/breaking into small droplets; increase surface area for digestion; neutralizing acidity of chime/ provide alkaline medium (for enzyme action);
 (b) How does substrate concentration affect the rate of enzyme action? (1mark)
9. Name the features that increase the surface area of small intestines. (2marks)
 Presence of villi;
 Long length;
10. Light (energy) is observed by chlorophyll; the light splits/photolysis water molecule; to form hydrogen ions/atoms and oxygen gas; (Light is converted to) and also forms Adenosine triphosphate (ATP);
11. (a) Define the following terms. (2marks)
 - i. The number of organisms of a species occupying a given habitat;
 - ii. (populations) of different species of plant and animals in a given area and are interacting with each other;
 (b) i) Capture – recapture (method);
 ii) Line transect/ Belt transect/ Quadrat;
12. (a) (A gene is an) Alternative form of a gene;
 (b) (i) Some bases/nucleotides of a gene are removed;
 (ii) The order of some bases/nucleotides is reversed;
- (c) A cross made between a homozygous recessive individual/parent and a parent/individual of unknown genotype (to determine whether the unknown genotype is homozygous or heterozygous for dominant gene);
13. Muscles are subjected to respire anaerobically; resulting in accumulation of lactic acid in the tissues; causing fatigue/and muscle cramps;
14. a) Monocotyledonae;
 b) Vascular bundles scattered/not arranged in a ring; absence of pith; absence of vascular cambium;
15. Bean plant
 Dicotyledonae;
 Reason
 Leaves are net veined; have leave petiole/tap root system/cross-section of vascular bundles are arranged (around pith) star shaped xylem in roots/phloem in between arms of xylem/ floral parts are in 4s or 5s or multiples of 4a/5s/ two cotyledons;
Any one.
- Bat
 Mammalian;
 Reason
 Presence of fur/hair/mammary glands/sweat glands/ presence of two pina/heterodont dentition/ear oscicles; **Any one.**
16. (a) Typhoid
 Salmonella typhi
 Amoebic dysentery

Entamoeba histolytica;

(b) Malaria;

17. Chilopoda

A pair of (walking) legs per segment;

Body flattened dorsoventrally;

Body divided into head and trunk/two parts;

Has poisonous claws;

Posterior genital aperture;

Diplopoda

two pairs of walking legs per segment;

Body cylindrical

Body divided into head, thorax, trunk / three parts;

lacks poisonous claws;

posterior

18. Several missing fossils records (missing links); these have occurred due to complete decomposition of whole organism/scavenged upon/lack of conditions for fossilization/discovery of few fossils;

Distortion of parts of fossil during sedimentation which gives wrong impression of the structures;

Distortion of fossils by geological activities e.g. earthquakes, faulting, uplifting and mass movement.

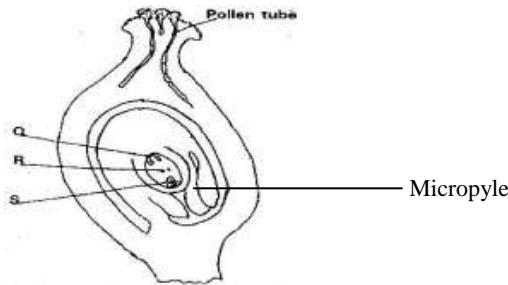
19. i) Arthropoda;

ii) Segmented body;

Jointed appendages;

Presence of exoskeleton;

20.



a) Q Antipodal cell(s);

R Polar nucleus/nuclei:

b) Secretes enzymes that digest the stigma/style/ovary tissue; Offer passage for male nuclei to ovum and polar nucleus/embryo sac;

c) On the diagram, label the micropyle.

(1mark)

21. a) Arteries; V eins;

b) Highly vascularised; has (villi) that provide a large surface area; presence of secretory cells (glandular) that produce progesterone;

22. a) Exoskeleton;

b) Endoskeleton;

c) Hydrostatic;

23. a) Phototropisms expose the leaves in position to maximize light absorption thereby enhancing photosynthesis

Hydrotropism enables the roots of the plant to seek water important in biochemical processes in plants.

Haptotropism enables the plants obtain mechanical support, especially in those plants lacking woody stems.

Geotropism enables plants roots to grow deep into the soil thus offering firm anchorage;

Chemotropism enables the pollen tubes too grow towards the embryo sac thereby facilitating fertilization; (first two)

(b) A device/instrument which slowly rotates a plant to nullify the effect of unidirectional stimulus;

(c) Cytoplasmic streaming;

24. Name:-

a) Pulvini;

b) Cerci/circus;

c) Tropic (response);

25. a) Aquatic/fresh water;

b) Large air spaces/aerenchyma tissues;

Sclereids;

Stomata on upper epidermis/surface//absence of stomata on lower epidermis;

Absence of cuticle;

Poorly developed vascular bundles;

26. (a) Tracheoles;

(b) Moist for gases to dissolve in solution; Branched/many/numerous to increase surface area; thin for fast diffusion;

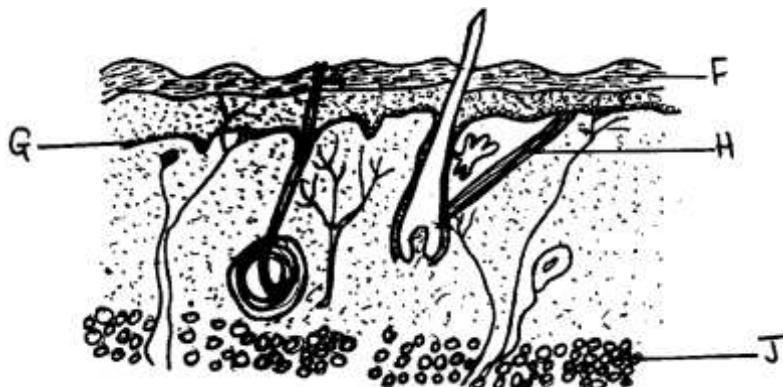
27. PH of blood plasma is not altered/homeostasis is maintained; within the red blood cells, there is enzymes (carbonic anhydrase) which help in fast loading/combination and offloading/dissociation of carbon (IV) oxide.

MOKASA JOINT EXAMINATION
Kenya Certificate of Secondary Education
23I/3
BIOLOGY Paper 3 (Practical)
March/April 2015

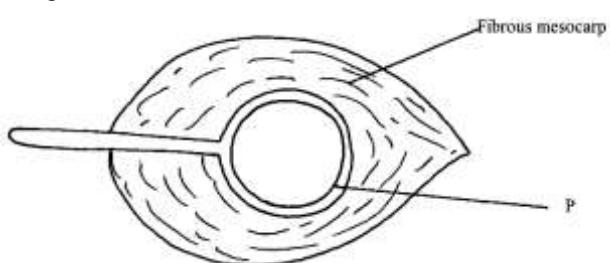
1. (a) (i) Spongy/loose/ soft; Specimen/ T bounces/ resumes its shape;
 (ii) Has air sacs/ alveoli; which makes specimen/T spongy
- (b) (i) Gaseous exchange
 (ii) - Has horny gill bars to support the other part of the gill/ specimen;
 - Has curved/pointed rakers to prevent solids from reaching/damaging the delicate filaments/parts of the specimen;
 - Filaments are numerous to increase surface area over which gaseous exchange occur;
 (c) - Has numerous air spaces/alveoli to increase area over which gaseous exchange occur;
 - Supplied with a lot of blood/served by numerous capillaries/highly vascularised for transportation of blood to and from the structure in order to maintain a steep concentration gradient;
 - Has thin walls/epithelia reduce distance of diffusion of gases.
 - Its walls are lined with a film of moisture to dissolve the gases before diffusion into the blood;
- (d) - Fish
2. (a) - Divergent/Adaptive radiation
- (b) - Homologous
- (c) - Length; shape; size;
- (d) A - Flesh;
 B - Nectar;
 C - Seeds;
 D - Insects;
- (e) - Hooked for eating flesh;
- (f) (i) - Flight;
 (ii) - Analogous structures
3. (a) (i) Part - Fruit
 Reason - Has two scars;
- (ii) - Parietal
- (b) (i) - Animal dispersal
 (ii) - Fleshy/succulent
 - Sweat tasting
- (c) (i) - Papain
 (ii) - Contains a proteolytic enzyme; used as meat tenderizer
- (d) (i) - Strips in solution X: Curved towards the epidermis
 (ii) - Strips in solution Y: Curved towards the inner surface
 - Stripes in solution X: Hard/firm/rigid
 - Stripes in solution Y: Soft/flappy/flexible
- (e) - Stripes in solution X were hypertonic to tap water; water molecules moved into the cells of the stripes by osmosis; causing them to bend/curve and become firm/rigid/hard;
 - Stripes in solution Y were hypotonic to the salt solution; water molecules moved out of their cells by osmosis; causing them to become soft/flexible/flappy and to bend towards the inner surface;

**SUNSHINE
PRE-MOCK 1 2015
BIOLOGY
PAPER 1
(THEORY)
TIME: 2 HOURS**

1. (a) Define the term 'parthenocarpy'. (1mk)
- (b) Name **two** plant growth hormones that promote parthenocarpy. (2mks)
2. Name the organelle that performs each of the following functions in a cell
 - (i) Protein synthesis. (1mk)
 - (ii) Transport of cell secretions. (1mk)
3. The diagram below shows a longitudinal section of mammalian skin.

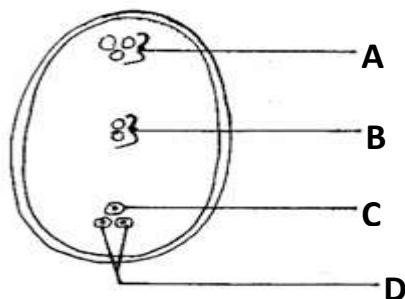


- a) Name the parts labelled **F** and **G**. (2mrks)
- b) State **one** function of each of the parts labelled **H** and **J** (2mrks)
4. Other than carbon (IV) oxide, name other products of anaerobic respiration in plants (2mks)
5. (a) Name the fluid that is produced by sebaceous glands. (1mk)
- (b) State **two** functions of sweat on the human body. (2mks)
6. (a) State **two** characteristics that are used to divide the phylum arthropoda into classes. (2mks)
- (b) Name the class with the largest number of individuals in the phylum Arthropoda. (1mk)
7. Why are people with blood group O referred to as universal donors? (1mk)
8. The diagram below represents a longitudinal section of a fruit



- (a) Name structures labeled P (1mk)
- (b) Describe two adaptations of the fruit for its mode of dispersal
 - (i) Mode of dispersal (3mks)
 - (ii) Adaptation
9. (a) What causes the following diseases?
 - (i) Diabetes mellitus. (1mk)
 - (ii) Diabetes insipidus. (1mk)
- b) An individual shows the symptoms for diabetes mellitus, how would you determine in the school laboratory whether they are positive for the condition? (3mks)
10. In an attempt to estimate the number of weaver birds in a small woodland 435 were captured, marked and released. Three days later, 620 were captured 75 of which were marked.
 - a) What is the name of the sampling method described above? (1mk)
 - b) Calculate the approximate size of the weaver bird population in the woodland. (2mks)
 - c) Give one disadvantage of this method. (1mk)
11. Identify the nucleic acid whose base sequence is shown below.
G-A-C-U-A-G-A-C-G
 - i) Identify the type of nucleic shown above (1mk)
 - ii) Give reason for your answer in (i) above. (1mk)
 - iii) Write the base sequence of a DNA strand for the nucleic acid shown above (1mk)

12. The diagram below shows a mature embryo sac of a flowering plant.



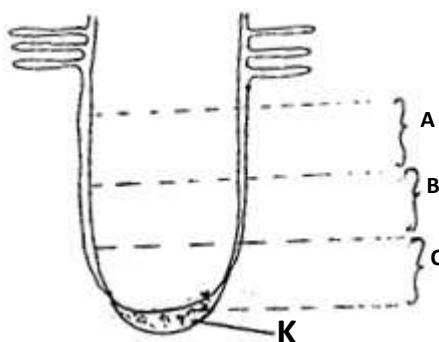
(a) Name the parts labeled A and B (2mks)

(b) What is the function of the structure labeled B? (1mk)

13. (a) Name the tissues that transport water in plants. (1mk)

(b) State why the tissue above is said to be dead. (1mk)

14. The diagram below shows regions of growth in a root. Study it and answer the questions that follow.



(a) Name the zone labeled B (1mk)

(b) State the function of part K (1mk)

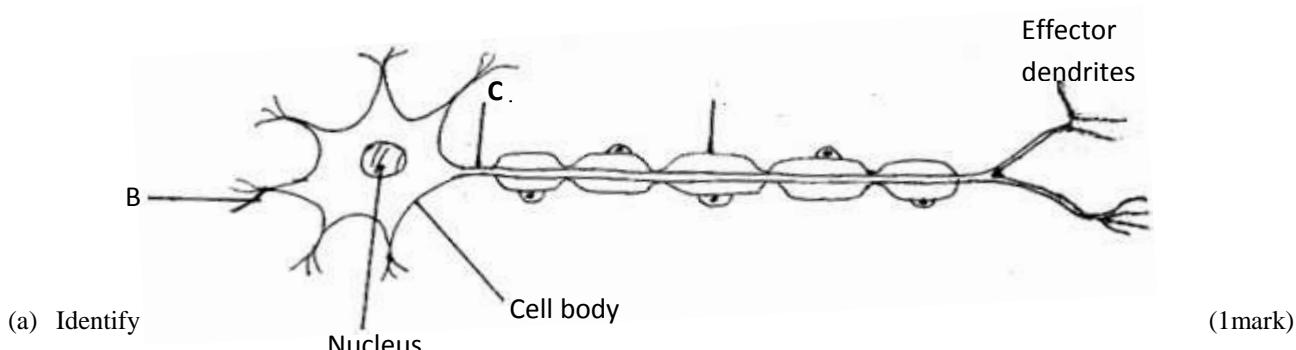
(c) State three characteristics of the cells found in zone C (3 mks)

15. The enzymes pepsin and trypsin are secreted in their inactive forms. Explain why they are secreted in these inactive forms. (1mk)

16. (a) Give two examples of natural selection in action. (2mk)

(b) List three features that make man the most dominant species on earth. (3mks)

17. Study the diagram below of a neurone in human being.



(a) Identify (1mark)

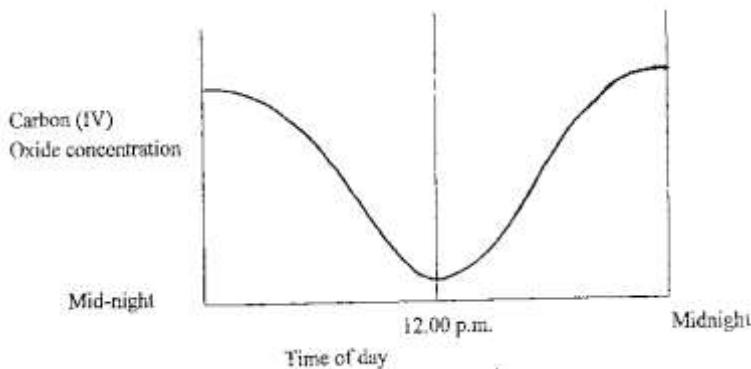
(b) Name the parts labeled A and B (2marks)

(c) Using an arrow indicate the direction of movement of a nerve impulse along the neuron (1mark)

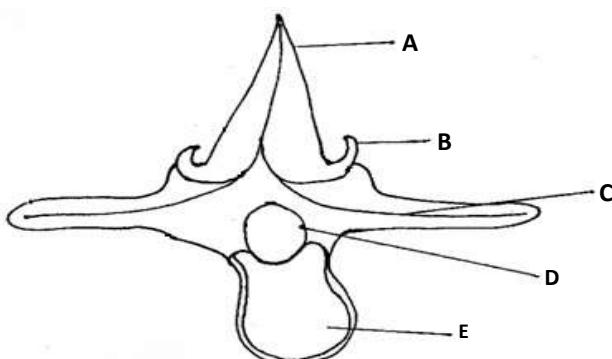
18. Study the diagram of the mammalian tooth below and answer the questions that follow.



- (a) Identify the tooth. (1mk)
 (b) Give a reason for your answer in (a) above. (1mk)
 (c) State **one** adaptation of the tooth to its function. (1mk)
19. a) Name the part of the brain that regulates breathing (1mk)
 b) Give two ways through which the body responds to increased concentration of carbon (IV) oxide in the blood (2mks)
 c) Name the structures in pneumatophores through which gaseous exchange occurs. (1mk)
20. The concentration of carbon (IV) oxide in a tropical forest was measured during the course of 24 hours period from mid-night to mid-night.

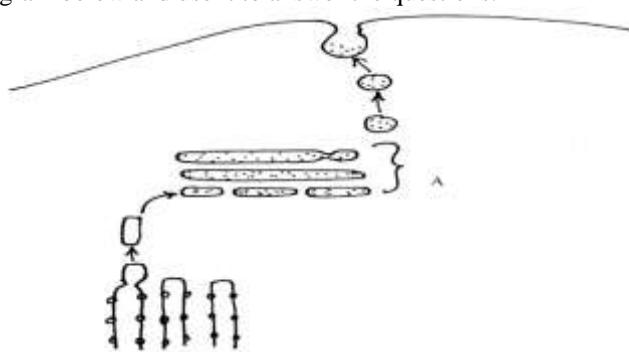


- Account for the results obtained at mid day. (2mks)
21. The diagram **below** represents the anterior view of a certain vertebra.



- (a) With a reason, identify the type of vertebra shown **above**. (2mks)
 (b) Name the parts labeled.
 (i) A (1mk)
 (ii) D (1mk)
 (c) State the function of part E. (1mk)
22. (a) State one similarity between diffusion and osmosis (1mk)
 (b) State two factors that can reduce the rate of active transport (2mks)

23. Study the diagram below and use it to answer the questions.



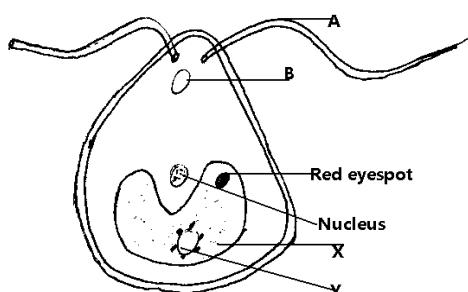
- a) Identify the organelle marked A. (1mk)
 b) Give three functions of the organelle named in (a) above (3mks)
24. It was found that during germination of pea seeds 9.3cm^3 of carbon (iv) oxide was produced while 9.1cm^3 of oxygen was used up.
 a) Calculate the respiratory quotient (RQ) of the reaction taking place. (2mks)

- b) Identify the type of food substance being metabolized. (1mk)
 25. What is the biological importance of the larval stage during metamorphosis (2mks)

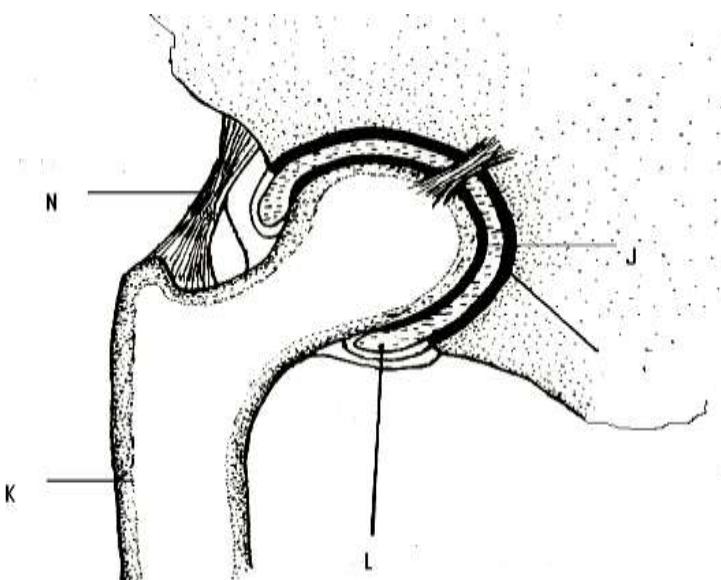
SUNSHINE**231/2****BIOLOGY PAPER 2****(THEORY)****TIME: 2 HOURS**

1. In human beings, a **downward pointed frontal hairline** ("windows peak") is a heritable trait. A person with windows peak always has at least one parent who has this trait; whereas persons with **frontal hairline** may occur in families in which one or even both parents have windows peak. Using W and w to symbolize genes for this trait
 (a) Determine the F₁ generation if a homozygous windows peak male parent is married to a homozygous frontal hairlined female parent (4mks)
 (b) State two causes of variations (1mk)
 (c) Name two sex linked genetic disorders affecting human females and males (2mks)
 (d) What is genome

2. The diagram below shows an organism obtained from an aquatic ecosystem



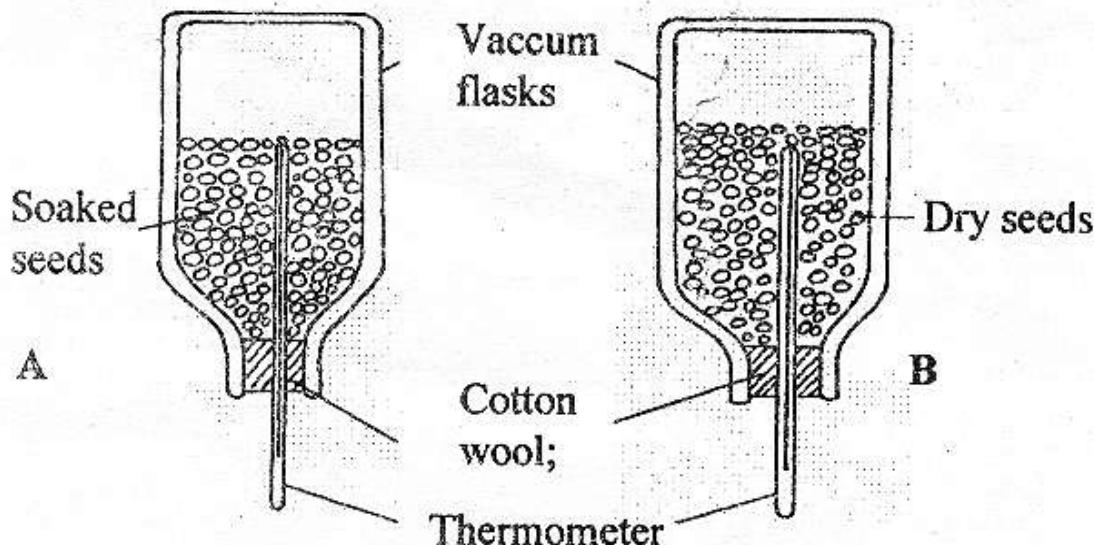
- (a) **State** the kingdom in which the organism belongs. (1mk)
 (b) **Name** the parts labeled B and Y (1mk)
 (c) **State** the functions of the following parts A, X and Z (3 mk)
 (d) Explain briefly why the organism is described as eukaryotic (2mk)
3. a) The diagram below shows some of the features of a synovial joint. Study the diagram carefully and answer the questions that follow.



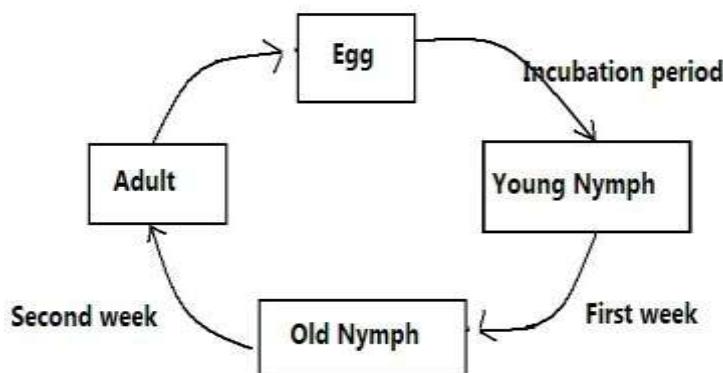
- (a) Name the type of synovial joint. (1 mark)
 (b) Name the parts labeled J, and L (2 marks)
 (c) State **two** roles of the part labeled L. (2 marks)
 (d) Suggest **one** advantage of this type of joint. (1 mark)
 (e) State how the following tissues are adapted to provide mechanical support in plants (2mks)

- i) Parenchyma
- ii) Collenchyma

4. A student set up an experiment using soaked and dry seeds as shown below



- a) State the objective of this experiment (1mk)
 - b) State the observations made in each of the flask after 24 hours (2mks)
 - c) Account for the observation made in (b) above (2mks)
 - d) Suggest why vacuum flasks were used in this experiment (1mk)
 - e) What alteration would you make in the set-up to make the results more reliable (1mk)
 - f) Why should the seeds be washed with antiseptic/10% formalin? (1mk)
5. a) Explain how the following meristematic tissues contribute to growth of higher plants (2mks)
- i) Vascular cambium (2mks)
 - ii) Cork Cambium (2mks)
- b) The diagram below shows a life cycle of a cockroach



- a) Name the hormone that would be at high concentration during. (1mk)
- (i) First week (1mk)
- (ii) Second week (1mk)
- b) Name the structure that produces hormone in a (ii) above (1mk)
- c) Name the series of stages through which the nymph undergoes to reach adult stage (1mks)

SECTION B (40 Marks)**Answer question 6 (Compulsory) and either question 7 or 8 in the spaces provided.**

6. The menstrual cycle is a sequence of events repeated monthly in the female production system. The table below shows the concentration of oestrogen and progesterone hormones and body temperatures of female against time.

Time in days	Oestrogen mg/100cm ³ of blood	Progesterone mg/100cm ³ of blood	Temperature in 0°C
1	20	0	36.4
2	20.5	0	36.6
3	25	0	36.7
4	27.5	0	36.8
5	30	0	36.7
6	32.5	0	36.6
7	35	0	36.8
8	40	0	36.7
9	48	0	36.6
10	56	0	36.8
11	64	0	36.7
12	72	0	36.6
13	80	0	36.4
14	170	20	36.3
15	140	50	36.6
16	80	80	37.0
17	70	130	37.2
18	65	170	37.0
19	60	160	37.1
20	65	150	37.15
21	130	130	37.2
22	140	110	37.1
23	130	90	37.0
24	100	70	37.1
25	80	50	37.2
26	60	20	37.0
27	20	0	36.4

- a) Using the same axis draw graphs of oestrogen and progesterone against time/days (8marks)
 b) State the possible event taking place in the uterus during the first week? (1 mark)
 c) State the events taking place in the ovary between day 1 and day 13. (2 marks)
 d) Account for the sudden increase in the progesterone concentration between day 14 and day 18. (2 marks)
 e) Account for the change in temperature between day 14 and 17. (1 mark)
 f) Account for the change of the curve of progesterone between day 19 and 27. (2marks)
 a) State the function of the following.
 (i) Ovary (1mark)
 (ii) Progesterone (1 mark)
 (iii) Oestrogen (1 mark)
 7 a) Describe how the following evidences support the theory of organic evolution: geographical distribution, fossil records and comparative anatomy (10mks)
 b) Explain tropic responses in plants and their survival values (10mks)
 8 a) Describe the structural adaptations of mammalian heart to its Functions (10mks)
 b) Explain the role of osmosis in organisms (10mks)

SUNSHINE**BIOLOGY CONFIDENTIAL****Each candidate will require the following:**

- 50ml distilled water labelled Q1.
- One ripe tomato labelled specimen J.
- 2 pieces of sewing machine cotton thread 9 15cm long each)
- Benedict's solution
- One mature pod from leguminous plant labelled specimen K.
- Iodine solution,
- One mature (dry) fruit of Bidens pilosa (Black jack)
- Labelled specimen L.
- 10cm long piece of visking tubing (wet) and preferably of 3cm width.
- 100 ml solution (made of 2% starch and 20% glucose) labelled Q2.
- Means of heating /Flame (candle or Bunsen burner)
- 100ml beaker
- A measuring cylinder – upto 10ml
- Distilled water.
- 6 test tubes
- Tap water / water in a wash bottle
- Test tube rank
- Test tube holder

A sharp razor blade / scalped

'Note'**Guide lines for the preparation of solution Q2**

To prepare 1 litre of solution Q2, dissolve 20g starch in about 500ml distilled water, dissolve 200g glucose in the solution. Make up the total volume of the mixture 1 litre by adding distilled water.

SUNSHINE**231/3****BIOLOGY****PAPER 3****(PRACTICAL)****March - 2015****TIME: 1³/₄ HOURS**

1. You are provided with liquids labelled **Q1** and **Q2**. Spare about 10ml of the liquids for part (a) of this question. Using a piece of thread, tie tightly one end of the visking (dialysis) tubing. Open the other end of the tubing and half fill it with liquid **Q1**. Tightly tie this end. **Ensure there is no leakage in both ends.** Immerse the tubing in a beaker containing liquid **Q2**. Leave the set up for at least 30 minutes.

- a) Using iodine and Benedict's solution provided; test for the food substance in liquids **Q1** and **Q2**. Record the procedure, observation and conclusion in the table below. (6mks)

LIQUID	PROCEDURE	OBSERVATION	CONCLUSION
A			
B			

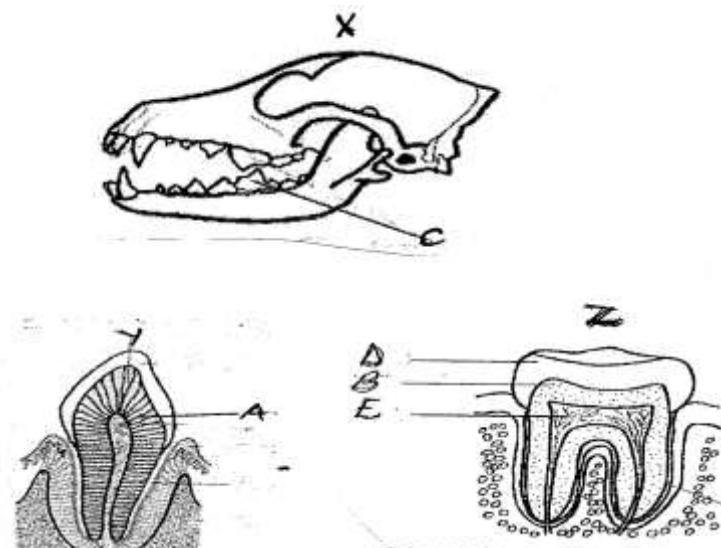
After at least 30 minutes remove the visking tubing from the beaker and wash the outside of the tubing thoroughly to remove traces of liquid **Q2**.

- b) Using the same reagents, test the food substance in liquid **Q1** in the visking tubing.

Record your observations and conclusion in the table below. (2mks)

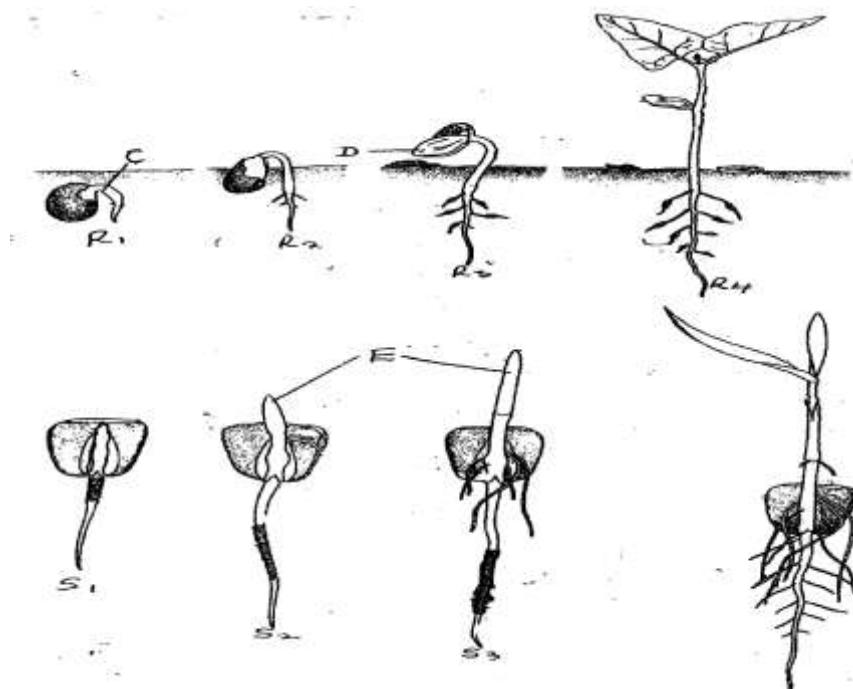
Liquid	Observation	Conclusion
Q1		

- c) i) Name the physiological process being demonstrated by this experiment. (1mk)
ii) Name two parts of the human body where the process named in (c) (i) above takes place. (2mks)
d) Account for the results obtained after carrying a second food test on liquid Q1. (2 mks)
2. You are provided with diagrams of specimens taken from a mammal. Study them carefully and answer the questions that follow.



- (a) Identify the diagrams labeled below. X , Y and Z (3 marks)
(b) State the diet of the animal from which diagram x was taken and give a reason for your answer. (1 marks)
(i) Diet
(ii) Reason (2 marks)
(c) Name the parts labeled A,B and D (3 marks)
(d) How are the following structures adapted to their functions (2 marks)

- (e) State the function of the parts labeled. (2 marks)
 (f) State **one** structural difference between Y and Z (1 mark)
3. Examine the seedling below and use them to answer the question that follow.
- a) Name the part labeled C,D, E and state their importance for the seedling.



- (b) The R series of seedlings on the roots later in its life:
- (i) What is the name of the swelling? (1mk)
 (ii) Name the organisms that would be found in the swellings (1mk)
 (iii) Explain the relationship that exists between the named organisms and the plant. (1mks)
- (c) (i) State the types of germination exhibited by R series of the seedlings. (1mk)
 (ii) Give a reason for your answer in (c) (i) above. (1mk)
- (d) State any two external factors necessary for germination. (2mks)

SUNSHINE SECONDARY SCHOOL**PRE-MOCK 1 2015****BIOLOGY PAPER 1****TIME: 2 HOURS**

1. (a) Fruit formation without fertilization having taken place; (2 mks)
 (b) Auxins;
 Gibberellins;
2. i) Ribosomes; (1 mk)
 ii) Golgi apparatus/ Golgi bodies; (1 mk)
3. a) F : Cornified layer;
 G: Malpighian layer;
 b) H: Contracts and relaxes to raise and lower hair;
 J: Storage of fats; and insulation against heat loss;
4. Ethanol; (2 mks)
 Energy;
5. a) sebum; (1 mk)
 b) Cools the body;
 Have antiseptic qualities hence kills micro-organisms; (2 mks)
6. a) Number of body parts; (2 mks)
 Number of legs;
 Presence and number of antennae;
- b) Insecta; (1 mk)
7. They lack antigens, hence can give blood to all blood groups; (1 mk)
8. a) (1 mk)
 b) i) Water (3 mks)
 ii) Has fibrous mesocarp which stores air; to enable it to float.
 Has a tough seed coat which is impermeable to water
9. a) i) Hypo secretion of Insulin (1 mk)
 ii) Hypo secretion of Antidiuretic Hormone (1 mk)
 b) Take urine sample from the patient. Put it in a test tube and add Benedict's solution; boil the mixture and note the colour changes; (3 mks)
10. a) Capture recapture/ capture, mark, release recapture; (1 mk)
 b) (2 mks)

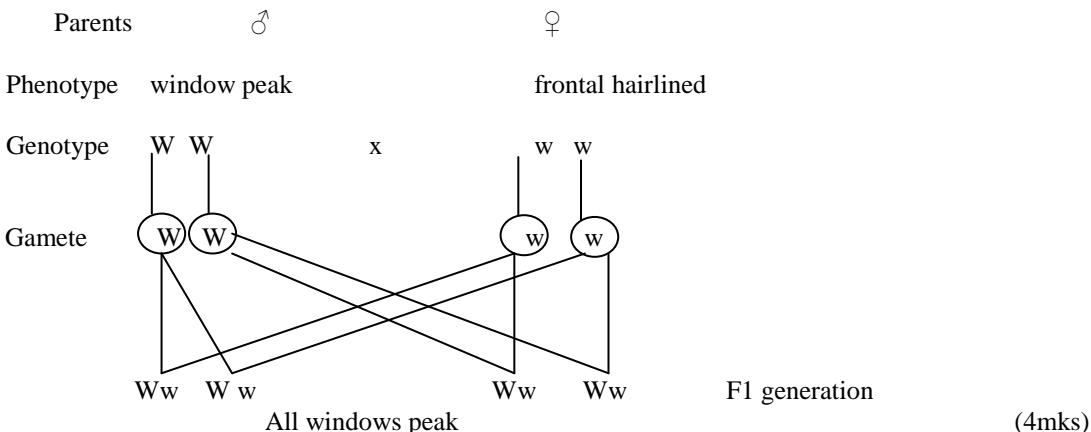
$$P = \frac{FM \times SC}{MR}$$
,

$$P = \frac{435 \times 620}{75}$$
;
- c) Is based on many assumptions which may not hold true; (1 mk)
11. i) RNA; (1 mk)
 ii) Has the base Uracil; (1 mk)
 iii) C-T-G-A-T-C-T-G-C ; (1 mk)
12. a) A: Antipodal cells;
 B: Polar nuclei;
 b) Fuses with one male gamete nucleus to form triploid primary endosperm; (1 mk)
13. a) Xylem; (1 mk)
 b) Lacks cytoplasms and organelles; (1 mk)
14. a) Zone of cell elongation; (1 mk)
 b) -protect the delicate apical meristem;
 -lack vacuoles;
 -Have thin cell walls;
 -Are small;
 -Are actively dividing;
15. To protect digestion of cells that secrete them; (1 mk)
16. a) Resistance of insects and bacteria to Insecticides and antibiotics; (2 mks)
 Industrial melanism;
 b) -Ability to communicate through speech;
 -upright posture;
 -A modified forelimb to form hand with an opposable thumb;
17. a) Motor; (1 mk)
 b) A: Myelin sheath; (1 mk)
 B: Dendrite; (1 mk)
18. a) Pre-molar; (1 mk)

-
- b) -Has two roots;
-Has cusps;
c) Has a wide top surface to increase surface area for grinding/ chewing food;
Has cusps to increase surface area for chewing;
19. a) Medulla oblongata; (1 mk)
b) Increased rate of breathing;
Increased rate of heart beat;
c) Lenticels; (1 mk)
20. Carbon (IV) Oxide concentration is lowest; due to high light intensities; hence high rate of photosynthesis which reduces carbon (IV)Oxide concentration (2 mks)
21. a) Lumbar;
Reason
- Has large/ broad transverse processes;
- Has large neural spine;
- Broad Centrum;
- Has metapophyses;
- b)
i) A: Neural spine; (1 mk)
ii) D: Neural canal; (1 mk)
c) Supports the trunk;
22. a) Molecules move passively from region of high concentration to region of low concentration; (1 mk)
b) -Presence of metabolic poisons;
-Low oxygen concentrations in the cell
-Low glucose concentration in the cell
23. a)
$$\frac{\text{Carbon(IV)Oxide concentrartion produced}}{\text{Oxygen consumed}} = \frac{9.3}{9.1} = 1.02$$
 (2 mks)
- b) Carbohydrates; (1 mk)
24. -Feeding and growth;
-Reduces competition within the species;

SUNSHINE SECONDARY SCHOOL**PRE-MOCK 2 2015****BIOLOGY PAPER 2****TIME: 2 HOURS**

- 1 (a) Gene for windows peak is dominant over the gene for frontal hairlined



- (b) Mutations

- Gene formation/independent assortment of homologous chromosomes and crossing over;
 - Fertilization; (1mk)

- (c) Haemophilia

Colour blindness (2mks)

- (d) It is the entire genotype of a cell individual; (1mk)

- 2 (a) Kingdom prototista

(b) B – Vacuole (1mk)

Y – Pyrenoid (1 mk)

- (c) A – for movement (1mk)

X – for photosynthesis (1mk)

Z – protection (1mk)

- (d) Because the nucleus is surrounded by a nuclear membrane (2mk)

- 3 (a) Ball and socket joint;

(b) J – Cartilage; (2mk)

L – Synovial fluid; (2mks)

(c) Absorption of mechanical shock;
 Reduce friction / lubricate the joint; (1mks)

- (d) Allows movement (rotate upto 360°) in all direction / planes; (1mk)

- 4 (a) To show that soaked seeds produce heat when they respire; (1mk)

(b) In flask A there was increase in thermometer reading; in flask B there was no noticeable increase in thermometer reading/ thermometer reading remained constant;

(c) In flask (A) soaked seeds respire aerobically to produce heat energy which raised the temperature in the flask; in flask B no respiration; no heat was produced hence no increase in temperature /thermometer reading;

(d) Vacuum flasks do not allow heat to enter or leave;

(e) Flasks should be filled with seeds to ensure that the bulb is covered;

(f) To kill bacteria/micro-organisms which would otherwise respire, giving wrong results

- 5 (a) i) Vascular cambium ;

Found between the xylem and phloem of woody plants; cells decide to give rise to secondary xylem and phloem; resulting to increase in birth / Diametre ; secondary parenchyma ; is formed between adjacent vascular bundles resulting to secondary growth ;

ii) Cork Cambium ;

Located beneath the Epidermis; Divides to form secondary cortex ; and corky cells ; (to the inside and outside respectively Preventing rapturing of the stem and root when vascular cambium increase in birth

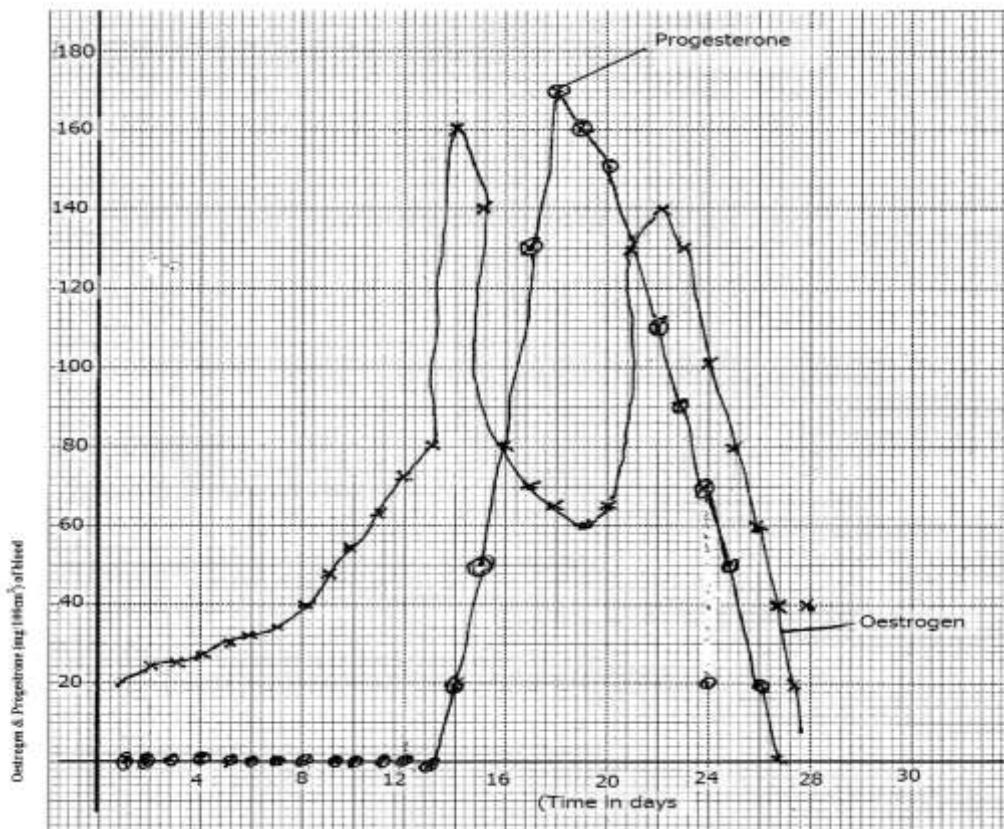
- a) i) Juvenile hormone (1mk)

ii) Ecdysone / moulting hormone (1mk)

b) Prothoracic gland (1mk)

c) Instar (1mk)

6. a)



- (a) Graph (NB) Reject if plotting is not visible.
 Plotting the 2 curves = 2 marks(p)
 Labelling curves = 2 marks(c)
 Labelled axes with units = 2 marks(l)
 Two linear scales = 2 marks
- b) Menstruation days 1 – 5
 c) Healing and repair of the uterus
 d) Causes/ stimulates thickening and increased blood supply to the endometrium in preparation of implantation of blastocyst in the uterus;
 e) Ovulation taking place; Due to hormonal imbalance There is rise in temperature;
 f) The corpus luteum disintegrates hence progesterone is produced;
 g) i) Ovary - Produces ova;
 - Produces female sex hormones;
 ii) Progesterone - Stimulates thickening of the endometrium
 - Stimulates increased blood supply to endometrium
 iii) Oestrogen - Healing and repair of the endometrium
 - Stimulates pituitary gland to produce LH

7. a) Evidence of Evolution

Fossil records//Palaeontology:

These are remains of organisms preserved in some naturally occurring materials e.g. sedimentary rocks for many years; They give direct evidence of the type of organisms that existed at a certain geological time//show a gradual increase in complexity/morphological changes of organisms over a long period of time e.g. skull of man

Geographical distribution:

present continents are thought to have been a large land mass joined together; continental drift led to isolation that lead to different patterns of evolution; e.g. camels of Africa resemble the llamas of S. America// tiger of Asia resemble jaguars of S. America // unique Marsupials of Australia;

(accept any valid example)

Comparative anatomy/taxonomy:

- Members of a phylum show similarities indicating common ancestry; These organisms have similar functions e.g. presence of digestive, urinary, nervous systems e.t.c;

- Homologous structures like pentadactyl limbs in different animals like monkey and rats have similar borne arrangement hence same origin but modified to perform different functions// adaptive radiation//divergent evolution; vestigial organs//coccyx Appendix;
- Analogous structures like wings of birds and wings of insects with different embryonic origin but perform same function//convergent evolution;
(maximum 10mks)

N/B- Mention of each evidence 1mk each

b) Phototropism

This is a growth curvature in response to direction and intensity of light Shoots are positively phototropic while roots are negatively phototropic

Chemotropism

This is a growth curvature in response to a gradient of chemical concentration; developing pollen tubes grow towards chemicals secreted by the embryo sac;

Geotropism

This is a growth curvature in response to gravity; Shoots are negative geotropic while roots are positively geotropic;

Hydrotropism

This is a growth curvature in response to water/moisture; Roots are positively hydrotropic;

Thigmotropism

This is a growth curvature in response to contact with solid objects; shown by tendrils/climbing stems which twine around objects;

Survival values of tropic responses

- Phototropism exposes the leaves in position to maximum light absorption thereby enhancing photosynthesis;
- Chemotropism enables pollen tubes to grow towards the embryo sac to facilitates fertilization;
- Geotropism enables plant roots to grow deep into the soil thus offering firm anchorage to the plant;
- Hydrotropism enables the roots of the plant to seek water;
- Thigmotropism enables the plants to obtain mechanical support, especially plants lacking woody stems;

8 a)

- It is muscular//Has cardiac muscles which are myogenic;//capable of contracting and relaxing without nervous stimulation to ensure the heart beat without stopping;
- Supplied by vagus and sympathetic nerves; which control the rate of heart beat depending on body's physiological requirement;
- Has tricuspid and bicuspid valves//arteria ventricular valves; to prevent back flow of blood into wrong directions;
- Has semi lunar valves at the base of pulmonary artery and aorta; to prevent back flow of blood into right and left ventricles respectively;
- Presence of valve tendons attached to the walls //arteria ventricular walls; prevent arteria ventricular valves // tricuspid and bicuspid valves from turning inside out;
- Supplied by coronary artery; to supply food and oxygen to the cardiac muscles for their pumping action;
- Coronary vein; draws away metabolic wastes;
- Heart is enclosed by pericardial membrane; which secrete fluids which lubricates//reduces friction on the walls as it pumps;
- Pericardial membrane is lined with a layer of fat to act as shock absorber; hold the heart in position; checks over dilation of the heart;
- The heart is divided into two by (artria ventricular) septum; which prevents mixing of oxygenated and deoxygenated blood;
- The sino-artria node// pace maker; initiates a wave of excitation leading to contraction and relaxation of cardiac muscles;
- The artria–ventricular node; in the heart spread out waves of excitation through out the heart

The structure tied to function wrong function cancel the mark of the structure. Correct structure minus function do not qualify for a mark

b) Role of osmosis in organisms

Absorption of water from the soil;

Root hair cells of plants absorb water from the soil by osmosis; it also helps in water distribution from cell to cell in the body.

Support;

Water taken into the cells increase cell turgor hence cells become firm /rigid/turgid; and therefore turgidity in the cells provide support to plant organs;

Opening and closing of stomata;

Guard cells become turgid; when they take in water by osmosis; Turgid guard cells cause the stomata to open; when the guard cells lose water by osmosis they become flaccid leading to the closure of the stomata;

Feeding of insectivorous plants;

The plants trap insects using special structures that suddenly change there turgor pressures when disturbed; the change in turgor pressure enables the special structures/ leaves to close trapping the insect which are then digested to provide amino acids;

Osmoregulation;

In kidney tubules of animals; water is withdrawn from the tubules through the tubular walls through osmosis; the water then enter the surrounding blood capillaries, this helps the animal to regulate its body osmotic pressure;

SUNSHINE SECONDARY SCHOOL
MARKING SCHEME
P3 PREMOCK
BIOLOGY PAPER 3

1.

LIQUID	PROCEDURE	OBSERVATION	CONCLUSION
Q1	Add iodine solution to solution Q1;	No colour changes/iodine colour remained /brown colour is retained;	No starch / starch absent;
	Add equal amount of benedict's Solution to Q1 and then heat.;	No colour change / benedict's solution remained unchanged /Blue colour of benedict's solution remains;	No reducing sugar/reducing sugar absent.;
Q2.	Add iodine solution to Q2;	Black/blue/black/ Blakishblue/bluish/black colour forms;	Starch present;
	Add equal amounts of Benedict's solution to Q2 then heat;	Green → yellow → orange colours observed;	Reducing sugars present;

 $\frac{1}{2}$ mk each Total 6mks (b)

LIQUID	OBSERVATION	CONCLUSION
Q1	Iodine colour retained /brown colour of iodine retained / No colour change;	No starch/starch absent;
	Green → yellow → orange; (correct sequence)	Reducing sugar present;

 $\frac{1}{2}$ mk each

Total: 2 mk

- (c) i) Diffusion;
- ii) Ileum / small intestine; placenta /lungs/ proximal convoluted tubule;
- (d) The visking tubing is semi-permeable and has small pores; reducing sugar molecules are small and hence move from region of high concentration to region of low concentration into visking tubing; starch molecules are large and did not diffuse through the small pores of the visking tube;

2. (a) C -Hypocotyl

Importance—protects the plumule /shoot tip/first foliage leaves /opens path through the soil for the cotyledon to pass/pulls the cotyledon out of the soil.

D Cotyledons/seed leaves

Importance: Photosynthesis

Food storage /food reserves

Provide food for germinating seedlings /young plants.

E Coleoptile/plumule sheath Rej: cover/coat

Importance-protects the delicate tip/first leaves/foliage leaves

- (b) i) nodules/root nodules
- ii) Rhizobium/Rhizobia/Rhizobium bacteria rej. Bacteria alone.
- iii) Symbiotic relationship in which bacteria gets protection and nutrients while the plant gets nitrogen in form of nitrates fixed by bacteria.
- (c) i) Epigeal
- ii) Cotyledons are brought out of the ground.
- (d) Water

Oxygen;

Optimum temperature

3. i) 4.5 cm, 1 mk

ii) Magnified size=4.5 cm

$$\text{mg} = x 6$$

$$\text{real size} = \frac{4.5}{6};$$

$$= 0.75 \text{ cm}$$

2 mks

i) Dentine; 1 mk

ii) Has cusps/ ridges; to enable it grind/chew food; (into smaller pieces)

iii) Blood vessels;✓ 2 mks

Nerve fibres; ✓ 1 mk

MWINGI CENTRAL SUB-COUNTRY EXAMINATION**Kenya Certificate of Secondary Education (KCSE)**

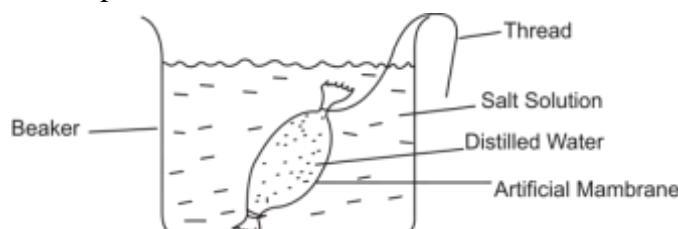
231/1

BIOLOGY (THEORY)**PAPER 1**

JULY/AUGUST 2015

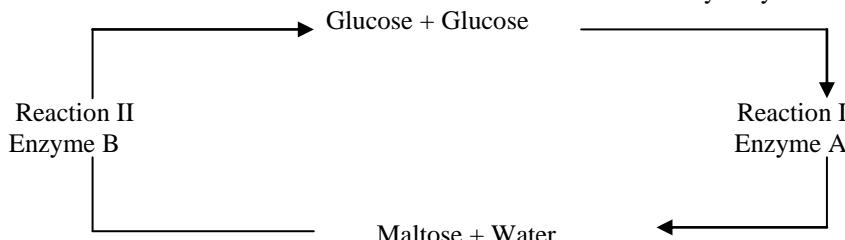
TIME: 2 HOURS

1. Give the name to the study of:
 - (a) The cell (1mark)
 - (b) Micro-organism (1mark)
2. State one function of each of the following cell organelles (2marks)
 - (i) Lysosomes
 - (ii) Ribosomes
3. A student drew a 3cm long diagram of a plant flower. If the actual length of the flower was 6cm, calculate the magnification of drawing made by the student. Show your working. (2marks)
4. An experiment was set up as shown below



The set up was left for 30 mins.

- (a) What was the aim of the experiment (1mk)
- (b) State and explain what would be observed after 30 minutes. (3mks)
5. (i) Explain why insectivorous plants trap and digest insect (2mks)
- (ii) Name the type of response in 5(i) above (1mk)
6. The diagram below shows chemical reactions I and II which are controlled by enzymes.



- (i) Into which class of carbohydrates is maltose (1mk)
- (ii) Name reaction I and enzyme A (2mks)
- Reaction I
Enzyme A
7. (i) Identify the mode of feeding of the animal whose dental formula is shown below (1mk)

I	Q	C	Q	PM	3	M	3
3		O		3		3	
- (ii) Give reasons for your answer in 7(i) above (2mks)
8. Explain each of the following:
 - (a) A mature plant cell does not lose its shape even after losing water (1mk)
 - (b) Xylem vessels do not collapse even when they are not conducting water (1mk)
9. Burning charcoal stove in a poorly ventilated room is likely to cause death of the inhabitants. Explain. (3mks)
10. Name two structures for gaseous exchange in aquatic plants (2mks)
11. Why should respiratory surfaces be:
 - (i) Moist (1mk)
 - (ii) Highly vascularised (1mk)
12. A process that occurs in plants is represented by the equation below.

$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{ } \longrightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 + \text{Energy}$$

(Glucose) (Ethanol) (Carbon VI oxide)

 - (a) Name the process (1mk)
 - (b) State the economic importance of the process named in (a) above (2mks)
13. Give two reasons why animals have specialized organs for excretion as compared to plants. (2mks)
14. Explain why the body temperature of a healthy human being must rise up to 39°C on a humid day. (2mks)
15. A student in form 3 caught an organism which had the following characteristics.
 - (i) Body divided into two parts

(ii) Simple eyes	
(iii) Eight legs	
Classify the organism up to the class level	(3mks)
16. State the importance of decomposers in an ecosystem	(2mks)
17. State the role of the following hormones	
(a) Prolactin	(1mk)
(b) Oxytocin	(2mks)
18. (i) How do the following mechanisms hinder self-pollination	
(a) Protandry	(1mk)
(b) Protogyny	
(ii) Which plant growth hormone induces parthenocarpy	(1mk)
19. (i) State two importances of metamorphosis to the life of insects	(2mks)
(ii) Name the hormone that is responsible for apical dominance	(1mk)
20. (i) Name an importance of non-dissolution in agriculture	(1mk)
(ii) State two disorders caused by gene mutation	(2mks)
21. (i) Give a reason why it is only mutation in genes of gametes that can influence mutation	(1mk)
(ii) Differentiate between convergent and divergent evolution	(2mks)
22. (i) State the importance of thigmotropism	(2mks)
(ii) Chloroplasts in a palisade cell move away from extreme light intensity. Name the type of response by the chloroplast	
	(1mk)
23. (i) State the components of peripheral nervous system	(2mks)
(ii) Give a reason for the presence of white matter in the central nervous system	(1mk)
24. Name the type of joint found between:	
(a) Humerous and ulna	(1mk)
(b) Femur and Pelvic Girdle	(1mk)
25. Give the importance of support in plants	(3mks)
26. Name the two hormones that prepares a person for emergency	(2mks)
27. (i) Explain why trypsin is secreted in inactive form	(1mk)
(ii) State the inactive form of the above mentioned enzyme in 27 (i)	(1mk)
28. (i) State why green plants are termed as primary producers	(1mk)
(ii) State one adaptation of aquatic plants to photosynthesis	(1mk)
29. State three ways in which support is brought about in a leaf of a terrestrial plant	(3mks)
30. Briefly explain how double fertilization occurs in the embryo sac of a flowering plant	(3mks)
31. State the homeostatic functions of the following hormone.	
(i) Insulin	(1mk)
(ii) Glucagon	(1mk)

MWINGI CENTRAL SUB COUNTRY EXAMINATION**Kenya Certificate of Secondary Education (KCSE)**

231/2

BIOLOGY (THEORY)**PAPER 2**

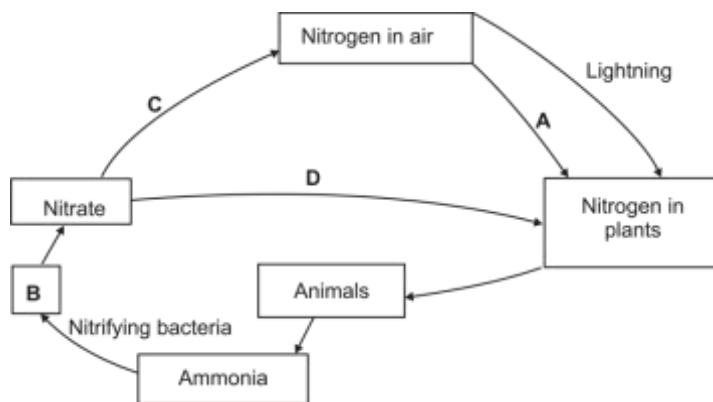
JULY/AUGUST 2015

TIME: 2 HOURS

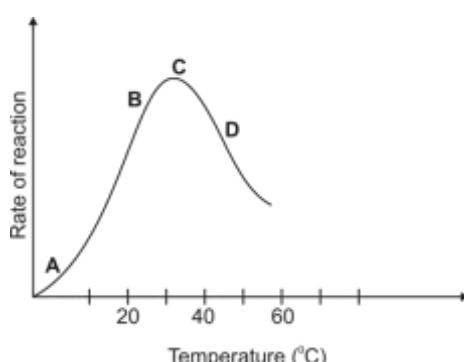
SECTION A (40MARKS)

Answer ALL questions in this section in the spaces provided.

1. Below is a diagram of nitrogen cycle. Study it and answer the questions that follows.



- (a) Name the processes represented by: A and B (2marks)
 (b) Name the compound represented by B (1mk)
 (c) Name the group of organisms represented by C (1mk)
 (d) (i) Identify the class of the plants to which the above cycle takes place (1mk)
 (ii) Name the part of the plant where process A takes place (1mk)
 (e) How would use of excessive pesticides affect process A (2mks)
2. A pure breeding black guinea pig was crossed with a pure breeding white guinea pig, the offspring had a coat with black and white patches
 (a) (i) Draw a genetic cross to show the F₂ of this cross (use letter G to represent gene for black coat and H for white colour) (4mks)
 (ii) From the cross, work out the genotypic ratio of F₂ (1mk)
 (b) State the phenotypic ratio of the F₂ above (1mk)
 (c) (i) Name the genetic expression of the colour observed in F₁ (1mk)
 (ii) Give an example of a trait in man where the condition named in c(i) above is expressed (1mk)
3. The graph below shows the rate of an enzyme controlled reaction against temperature (OC)



Explain the shape of the curve:

- (i) Between A and B (2mks)
 (ii) At Point C (2mks)
 (iii) Between C and D (2mks)
 (iv) Other than temperature, state two factors that affect the above reaction (2mks)
4. (a) Explain the fate of excess amino acids in the liver (4mks)
 (b) Name the parts of the human nephron that are only found in the cortex (2mks)

- (c) What would happen if a person secreted less antidiuretic hormone into the blood circulation (2mks)
5. The question below represents a chemical equation that takes place in green plants under certain conditions
 Carbon (IV) Oxide + water \longrightarrow Glucose + X
- (a) Name substance X (1mk)
 (b) Other than the conditions stated in the equation, state two other conditions necessary for the reaction (2mks)
 (c) Name two types of cells in which this process occurs (2mks)
 (d) Name the process represented by the equation given above (1mk)
 (e) State the importance of the process named in 5(d) above (2mks)

SECTION B (40 MARKS)**Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.**

6. A certain experiment was performed to demonstrate the effect of sweating on human body temperature. Boiling tubes A and B were filled each with water their initial temperatures recorded. This was repeated after every 5 minutes. The surface of Tube A was continuously wiped with a piece of cotton wool which had been soaked in methylated spirit. The results are as shown below.

Time (Min)	Temperature $^{\circ}\text{C}$ in tubes	
	A	B
0	80	80
5	54	67
10	40	59
15	29	52
20	21	47
25	18	46

- (a) On the same axis, plot graphs of water temperature against time (min) (8mks)
 (b) Find the rate of cooling in test tube A (1mk)
 (c) Why was tube B included in the set up? (1mk)
 (d) Name two ways through which heat is lost in tube B (2mks)
 (e) State the expected results if tube A was insulated (1mk)
 (f) Name the structures in the following organisms that would insulate heat loss
 (i) Birds (1mk)
 (ii) Mammals (1mk)
 (g) Name any two receptor cells on the skin of man (2mks)
 (h) Describe the response of hair on the skin during cold weather (3mks)
7. (a) What is meant by the term natural selection (2mks)
 (b) Describe how natural selection results to speciation (8mks)
8. (a) State four characteristics of gaseous exchange surfaces (4mks)
 (b) Describe the mechanism of gaseous exchange in a named mammal (16mks)

MWINGI CENTRAL SUB-COUNTY JOINT EXAM

JULY/AUGUST 2015

231/3**BIOLOGY PAPER 3****CONFIDENTIAL**

In addition to general laboratory apparatus, the teacher in charge of Biology should avail the following for each student.

1. Bougainvillea flower
2. - Iodine solution labeled P
- Benedict's solution labeled Q
- DCPIP labeled R
- Sodium hydroxide labeled S
- Copper (II) Sulphate labeled T
- Solution K

NB: Solution K is prepared by mixing 10g of maize flour, 5ml of pineapple juice in 100ml of distilled water for 10 students. For more than 10 students, use the ratios to prepare solution for your students.

- 4 clean test tubes in a test tube rack
- Dropper
- Source of heat

MWINGI CENTRAL SUB-COUNTY JOINT EXAMS**Kenya Certificate of Secondary Education****JULY / AUGUST 2015****231/3****BIOLOGY****PAPER 3****PRACTICAL****TIME: 1 ¾ Hours**

1. You are provided with specimen labeled X, use it to answer questions that follow.

- (a) (i) State the agent of pollination (1mk)
- (ii) Give reasons for your answer in a(i) above (2mks)
- (b) Describe the floral parts of specimen X

Floral	Description

(8mks)

- (c) (i) State the class to which the specimen X belongs (1mk)
- (ii) Give reason(s) for your answer in c(i) above (2mks)

2. (a) You are provided with reagents P – Iodine, Q – Benedict's solution, R-DCPIF, S-Sodium hydroxide and T-Copper (II sulphate)

Use the reagents to identify the food substance(s) in solution K

Food	Procedure	Observation	Conclusion

(12mks)

- (b) Name the end product of digestion of food substance(s) present in solution K (1mk)

(2mks)

3. Study the photograph T provided and answer the questions that follow.

- (a) (i) Name the class to which the specimen belongs (1mk)
- (ii) Give reasons for your answer in a(i) above (2mks)

(1mk)

(2mks)

- (b) (i) Describe the shape of the specimen (1mk)
- (ii) What is the significant of your description 6(i) above (1mk)

(1mk)

(1mk)

(c) Measure in millimeters the depth of:

- (i) Specimen from the tip of the mouth to the tip of the tail (1mk)
Length _____ mm

(1mk)

- (ii) Tail from the anus to the tip of the tail (1mk)
Length _____ mm

(1mk)

- (iii) Using the measurement in c(i) and c(ii) above, calculate the tail power (percentage length of tail to the rest of the body) (2mks)

(2mks)

- (d) Name the parts labeled B and D (2mks)

(e) State one function of the part labeled E

MWINGI CENTRAL SUB-COUNTY JULY/AUGUST EXAMS**Kenya Certificate of Secondary Education (K.C.S.E)****231/1****BIOLOGY PAPER 1****JULY/AUGUST 2015****TIME: 2 ½ hrs**

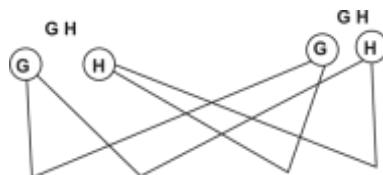
1. (a) Cytology; rej: cell biology
(b) Microbiology
2. (i) Site for protein synthesis – Ribosomes
(ii) Produce lytic enzymes which destroy worn out organelles or the entire cell – Lysosomes
3. $Mg = \frac{\text{Length of diagram}}{\text{Real length}} = \frac{3\text{cm}}{6\text{cm}} = X 0.5$
4. (a) Osmosis
(b) The artificial membrane decreases in size or loss tridity; salt solution is hypertonic and develops osmotic pressure which draws water osmotically; from inside the membrane across the membrane to the salt solution making the membrane to be less swollen.
5. (i) To obtain nitrogenous compounds/nitrates; since they grow in substrates deficient of nitrogenous compounds
(ii) Chemonasty/Chemonastic
6. (i) Disaccharides
(ii) Reaction I – condensation
Enzyme A – Maltase
7. (i) Herbivorous; rej herbivore
(ii) -Presence of horny pad/absence of upper incisors
-Presence of diastema
8. (a) Presence of cellulose cell walls
(b) Lignified to prevent collapsing; Acc strengthening
9. Haemoglobin combines with carbon (II) oxide to form carboxy haemoglobin which is not easily broken; this reduces the capacity of haemoglobin to transport oxygen (to the cells for respiration)
10. - Stomata
- Pneumatophores
- Thin cuticle (mark 1st two)
11. (i) To dissolve respiratory gases (to be transported)
(ii) To transport respiratory gases
12. (a) Fermentation/alcoholic fermentation/anaerobic respiration in plants
(b) - In brewing industries
- Bread making
- Production of biomass
- Production of milk products; (mark the 1st 2)
13. - Most of the metabolic waste products in plants are re-used unlike in animals
- Some of metabolic wastes in plants are deposited in leaves and barks
- Animals from metabolic waste products more rapidly than plants; (mark the 1st 2)
14. Heat is not easily lost to surrounding through sweating; this is because evaporation will be reduced as air is already saturated with moisture.
15. K – Animalia; rej: animal/ammalia
P – Arthropoda; rej: Antropoda/Athropoda/Arthropoda
C – Arachnida
16. - Delocalises nutrients in dead bodies
- Minimises pollution by the dead bodies
17. (a) Prolactin – Stimulates milk secretion by mammary glands
(b) Oxytocin - Causes contraction of uterus at birth
- Causes expulsion of milk from mammary glands
18. (i) (a) Protandry – The male parts matures before the female parts
(b) Protogyny – The female parts of a flower matures before the male parts
(ii) Auxins/ Gibberellins
19. (i) - Avoid adverse weather
- Different forms do not compete for the same food
- It enables change from one form to the next (Mark 1st 2)
(ii) Auxins
20. (i) Causes polyploidy
(ii) Albinism
Sick-cell anaemia
Chondroydystrophic durafisin; Acc. Achondroplasia (mark 1st 2)

21. (i) Its only genetic acquired characteristics which can be inherited
(ii) Convergent evolution - This is where different structures are modified to do same function; whereas divergent evolution is where one basic structural form is modified to give rise to different forms which will perform different functions.
22. (i) - Provide support to tendrils
- Enable weak plants to have leaves exposed to light energy for photosynthesis
- Have their flowers exposed to pollinating agents
- Have their seeds and fruits to dispersal agents
(ii) Phototaxis; acc. photo tactic
acc. phototaxis (Mark 1st 2)
23. (i) Sensory neurone; motor neurone
(ii) Axons of sensory and motor neurons are myelinated and found in the part hence white;
24. (a) Hinge joint
(b) Ball and socket
25. - Expose leaves to light for photosynthesis
- Expose flowers to pollinating agents
- Expose fruits and seeds to dispersal agents
- Mechanical support to avoid breakage (mark 1st 3)
26. - Adrenaline
- Nor-adrenaline
27. (i) To prevent the walls of digestive tract from being digested; by the enzyme
(ii) Trypsinogen
28. (i) They are autotrophic
(ii) - Presence of aerenchyma tissue to store CO_2 for photosynthesis
- Presence of chloroplasts which are very sensitive to low light intensity
- Leaves highly dissected to increase SA for light and CO_2 absorption
29. - Presence of turgid parenchyma cells in petiole
- Presence of collenchyma cells with thickened walls by cellulose
- Presence of sclerenchyma cells with lignin
- Lignified xylem vessels and tracheids; (mark 1st 3)
30. - One of the male nuclei fuses with the egg cell to form diploid zygote; the secured male nuclei fuses with the two polar nuclei to form a triploid nucleus; which becomes the endosperm
31. (i) Insulin – Induces conversion of high sugar level in blood to normal
(ii) Ghrelin – Induces conversion of glycogen to glucose to increase sugar level in blood to normal

MWINGI CENTRAL SUB-COUNTY JULY/AUGUST EXAMS**Kenya Certificate of Secondary Education (K.C.S.E)****231/2****BIOLOGY PAPER 2****JULY/AUGUST 2015****TIME: 2 ½ hrs**

1. (a) A – Nitrogen fixation (symbiotic nitrogen fixation)
D – Absorption
(b) Nitrates
(c) Denitrifying bacteria
(d) (i) Dicotyledonae
 (ii) Root nodules
(e) Chemical kills nitrogen fixing bacteria; hence less nitrogen fixation leading to weak plant

2. (i) (a)



If different symbols used award 1mk for fusion

- (ii) 1GG: 2GH: 1HH; or GG: GH: HH;
1 : 2 : 1
- (b) 1black: 2 black white: 1 white; or black: blackwhite: white
1 : 2 : 1
- (c) (i) Codominance
(ii) AB blood group
3. (i) Increase in temperature increases the rate of enzyme reaction; because increase in temperature increases kinetic energy causing substrate-enzyme collision
(ii) The rate of reaction is at maximum/best; because enzymes are working at their optimum temperature
(iii) The rate of reaction decreases with increase in temperature; because increase in temperature above optimum denatures the enzymes.
(iv) PH; substrate concentration; enzyme inhibitors; cofactors and coenzymes (mark 1st two)
4. (a) The amino acids are broken into amino group and carboxyl group; the amino group combines with hydrogen forming highly toxic ammonia; it then combines with carbon (IV) oxide forming urea that is less toxic; Carboxyl group is converted into carbohydrates and then oxidized or converted into neutral fats and stored in the mammalian body.
(b) Proximal convoluted tubule
Distal convoluted tubule
(c) Less water reabsorbed in the blood stream hence production of too much dilute urine
5. (a) Oxygen
(b) Chlorophyl
Temperature
Light intensity
(c) Guard cells
Palisade cells
(d) Photosynthesis
(e) Production of food for plants and animals
Air purification
Release of oxygen in the atmosphere
Basis of source of energy
(mark 1st two)
6. (a) On the grid paper
(b) $(80 - 18) \div 25 = 62 \div 25 = 2.48^{\circ}\text{C}$
(c) Control experiment
(d) Convection
Radiation
(e) Less heat loss
(f) (i) Feathers
 (ii) Fur and hair; (Tied)
(g) Skin thermo receptors
(mark 1st two)

Hypothalamus

- (h) Erector pili muscles contract; hair stands upright trapping air; air being a bad conductor of heat prevents heat loss
7. (a) This is where nature selects those individuals; who are sufficiently well adapted
- (b) Individuals of same species show certain variations; these variation differences are caused by genes; and they are passed from parents to offspring; through genetic inheritance; some of the characters of variation become more suited to prevailing environment; due to selection pressure most organisms generally produce more offspring; than environment can support; therefore organisms are always in struggle for existence; due to competition among individuals; those individuals possess characters; that enable them to have advantage to survive; and pass over the favourable characteristics to the offspring; those who are poorly adapted; fail to reach sexual maturity; and therefore do not pass their genes to the offspring; and thus the fittest survives; Allow valid examples
- Peppered moths
 - Hooves of horses
 - Sickle cell anaemia
 - Mosquito resistance to drugs
8. (a) Moist to dissolve gases before diffusing;
- Thin walled/epithelium which is one cell thick to reduce the distance of diffusing molecules
 - Highly folded to increase surface area for exchange of gases
 - Highly vascularised to maintain a steep concentration gradient hence maximum gaseous exchange
 - Well ventilated to allow circulation of respiratory gases (mark 1st 4)

(b) Breathing in/inhalation

External intercostal muscles contract; while internal intercostal muscles relax; this causes raising of ribcage upward and outwards; muscles of diaphragm contract hence flattens; the volume of thoracic cavity increases; and pressure decrease; than the atmospheric pressure; The higher air pressure in the atmosphere forces air into the lungs and the lungs inflate

Breathing out/exhalation

External intercostal muscles relax; while internal intercostal muscles contract; this causes ribcage to move downwards and inwards; the muscles of the diaphragm relax and diaphragm assume a dome shape; this makes the volume of thoracic cavity to decrease; while pressure increases; than atmospheric pressure; higher pressure in the thoracic cavity forces air out of the lungs and the lungs deflate;

MWINGI SUB-COUNTY JOINT EXAM

JULY/AUGUST 2015

231/3

1. (a) Insect/Insects; (1mk)
Rej: Specific insect e.g. bee

Insect pollination

- (ii) Briefly coloured bracts (2mks)
Tubular corolla

Landing state

(b)

Floral Parts	Description
Sepals	5 fused retals
Retals	5 fused Retals
Stamens	8 free stamens
Carpet	1 Carpet

(8mks)

- (c) (i) Dicotyledonae (1mk)
Rej: Dicotyledon and wrong spelling

- (ii) Network of veins/Net venation (2mks)
Floral parts in four or fives or multiples of four or fives

2.

a)

Food	Procedure	Observation	Conclusion
Starch	Put a little food substance into a test tube. Add a few drops of iodine/ P; Rej (2-3) arrange Acc. Specific no. of drops e.g. 2/8/4	The colour changes to blue/black/blue black	Starch present
Reducing sugar	Put a little food substance into a test tube. Add a few drops of Benedict's Solution. Warm/heat to boil Ref: burn	Colour changes from blue to green-yellow/orange to brown precipitate	Presence of reducing sugar
Proteins	Put a little food substance K into a test tube. Add a few drops of sodium hydroxide. Add a few drops of copper sulphate, shake	No observable colour change Rej: No change	Absence of proteins
Vitamin C/Ascorbic acid	Put a little few drops of DCIP into a test tube. Add a few drops of food substance K into the test tube. Shake	DCPIP is decolourise / the colour of DCPIP disappears	Presence of Vitamin C

Acc where candidate uses:

- Few drops
- Little substance
- Specific amounts e.g. 1cm³, 2 dorps, 3 ctn
- Rej: range e.g 3-4, 2-3 etc
In proteins test
Rej: if candidates write
Add copper sulphate, ten add sodium hydroxide

(b) Glucose

- (c) Glucose – energy production (cell respiration) (1mk)
Vitamin C – Healing of wounds / gums prevents scurvy

3.

(a) (i) Pieces

(ii) Presence of scales; fins; operculum; lateral line

NB: a(i) and all tied

- (b) (i) Streamline/Torpedo shape
(ii) Reduce friction in water

(c) (i) 77mm

(ii) 22mm

(iii) $\frac{22}{70} \times 100 = 25.97\%$

(d) B – Dorsal , D – Anal

(e) Steering

Control pitching
Changing direction
Braking

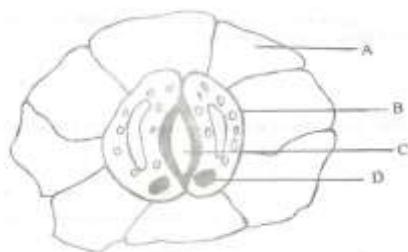
KASSU JOINT EXAMINATION TEST
Kenya Certificate of Secondary Education (K.C.S.E)

231/1
BIOLOGY
PAPER 1

JUNE 2015

TIME: 2 HOURS

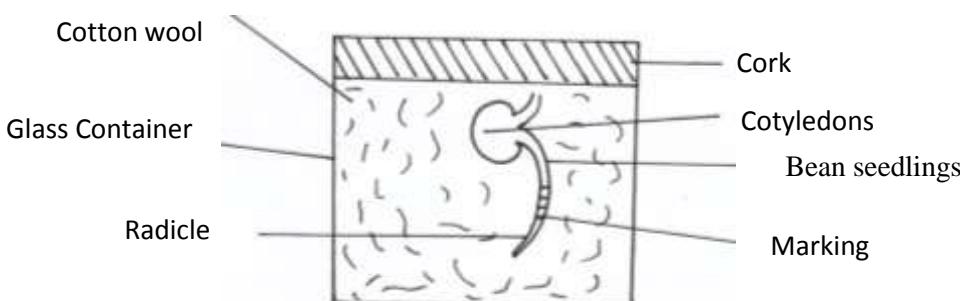
1. In what **two** ways does excretion differ between plants and animals? (2marks)
2. (a) Give **two** contributions made by Carolus Linneus to classification (2marks)
(b) Classify Human being based on the **Order** and **Family** it belongs to?
Order
Family (2marks)
3. (a) State **two** functions of the plasma membrane? (2marks)
(b) Give the synthesis role of smooth endoplasmic reticulum. (1mark)
4. (a) Distinguish between Plasmolysis and turgidity (2marks)
(b) Explain how the following factors affect active transport
Oxygen concentration
Metabolic poisons (4marks)
5. How is a palisade cell suited to carry out photosynthesis? (3marks)
6. (a) What is anaphylaxis (1mark)
(b) State the difference between active artificial acquired and active natural acquired immunity (2marks)
7. State how the following structural features affect transpiration (3marks)
Leaf fall
Sunken stomata
Thin cuticle
8. The diagram below represents a specialized plant structure



- (a) Name the cells labelled A and B (2marks)
- (b) Describe the mechanism of closing of aperture C (4marks)
9. Name the causative agent of whooping cough (1mark)
10. State the economic importance of the following excretory products in plants (2marks)
Nicotine
Quinine
11. Give **three** distinguishing features of class Aves (3marks)
12. State **two** differences in the roots of **Monocotyledonae** and **Dicotyledonae**? (2marks)

Monocotyledonae	Dicotyledonae

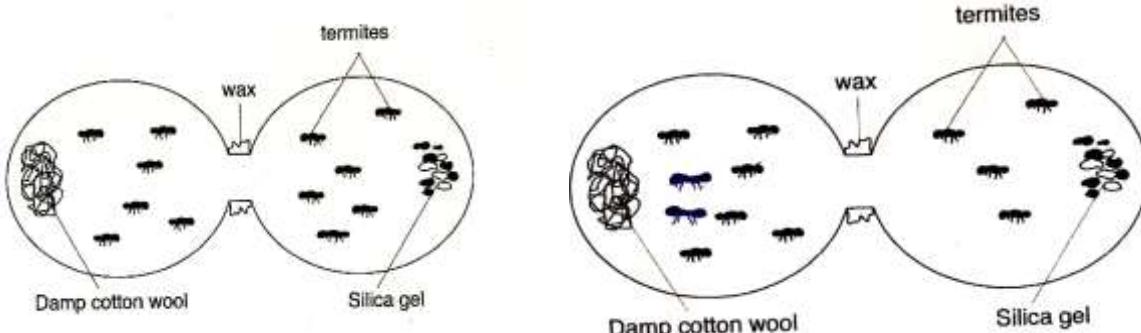
13. A student set up an experiment as shown in the diagram below.



- a) (i) What was being investigated in the experiment? (1mark)
(ii) Draw a diagram to indicate the expected results of the experiment after three days. (2mks)

- (iii) Why was it necessary to have wet cotton wool in the container (1mark)
 b) What is the role of the following in a germinating seed (2 marks)
 (i) Oxygen
 (ii) Cotyledons

14. The following set up was used in an experiment



At the start of experiment

- (a) State the function of the following in the set –up (3 marks)
 i). damp cotton wool
 ii) Silica gel.
 iii) Wax
 b) Deduce the condition that must be present in a termite habitat (2 marks)

15. a) Give the importance of nitrogen cycle. (1mark)

b) What are the roles of the following organisms in an ecosystem? (2 marks)

Decomposers

Detrivores

16. Define the term:

Greenhouse effect (1mark)

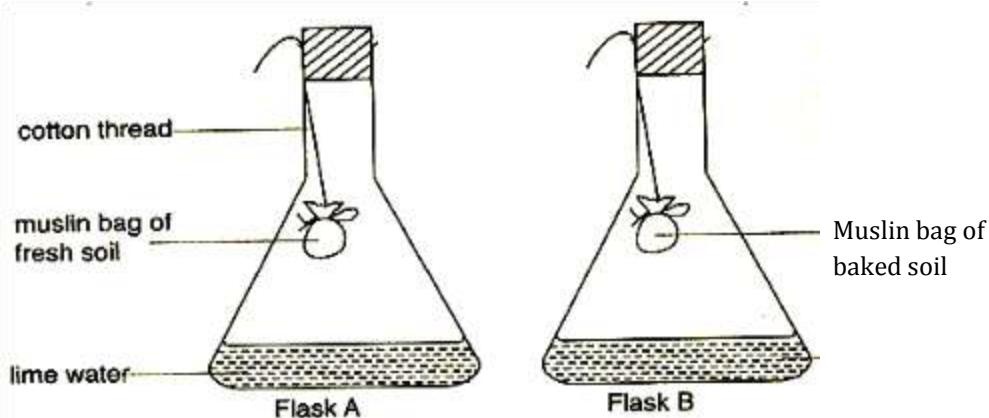
Global warming (1mark)

17. (a) What is organic evolution? (1mark)

(b) Briefly explain how the peppered moth (*Biston betularia*) shows natural selection (3marks)

(c) Distinguish between convergent and divergent evolution (2 marks)

18. Study the diagram and answer the questions that follow

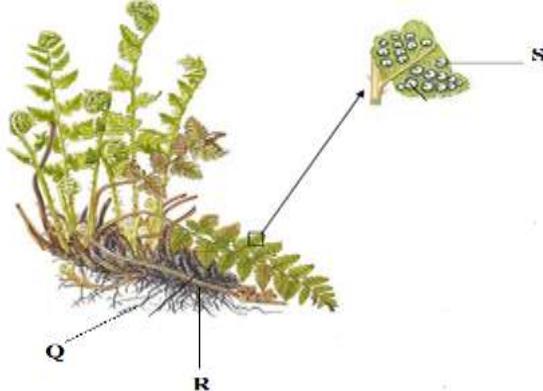


- (a) In which set-up did the lime water become turbid? (1 mark)
 (b) Explain your answer in (a) above (2 marks)
19. State the three structural adaptations of the lungs in mammals (3marks)
20. What are the roles of each of the following on transmission of impulses: (2 marks)
 i) Nodes of Ranvier
 ii) Myelin Sheath
21. (a) Give three effects of over secretion of adrenaline? (3 marks)
 (b) Define non disjunction? (1 mark)
22. (a) Name two genetic disorders of the blood. (2marks)
23. State how herbaceous plants obtain their support? (3marks)

KASSU JOINT EXAMINATION
Kenya Certificate of Secondary Education
231/2
BIOLOGY
JUNE, 2015
2 HOURS
SECTION A

Answer all questions in this section

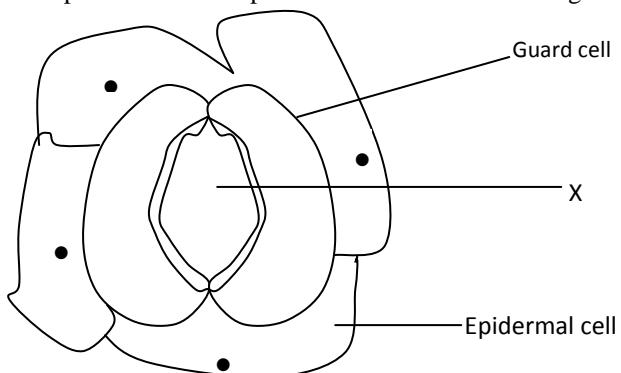
1. The diagram below indicates an organism that grows under shaded places with damp conditions. Study it and answer the questions that follow.



- (a) Name the division to which the specimen belongs. (1 mark)
 (b) Name and state the functions of the parts labelled Q, R and S. (6 marks)
 (c) Name the two body forms of the organism in its alternation of generation. (2 marks)
2. In cattle the gene for red colour is represented by letter R and that of white colour as W. A Red bull and a white cow were crossed and all the offspring were Roan.
 (a) Give a reason for the appearance of roan cattle in F₁ generation. (1 mark)
 (b) Using a punnet square work out the F₂ generation. (4 marks)
 (c) State the genotypic and phenotypic ratio of the F₂ offspring above. (2 marks)
 (d) Name the molecule that carries genetic information in eukaryotic cells. (1 mark)
3. Study the diagram of the organism shown below then answer the questions that follow.



- (a) State the phylum to which the organism belongs. (1 mark)
 (b) With reasons state the class to which the organism belongs.
 Class _____ (1 mark)
 Reasons _____ (3 marks)
- (c) Name **two** human diseases of which the organism is a vector. (2 marks)
 (d) What type of metamorphosis does the organism show? (1 mark)
4. The epidermis of a leaf is adapted to have the specialized cells known as the guard cell such as shown below.



- (a) (i) Name the structure labelled **X** on the diagram. (1 mark)
(ii) State three adaptations of the guard cell to its function of opening and closing of stomata in plants. (3 marks)
- (b) The mammalian lung is known to have adapted the mammal to terrestrial habitat by having a pleural membrane.
(i) State **two** functions of a pleural membrane that gives the mammal advantage over other organisms. (2 marks)
(ii) Name **two** diseases of the respiratory system. (2 marks)
5. The human ear has the following structures; (i) Auditory meatus
(ii) ear drum (iii) eustachian tube (iv) ear ossicles and (v) cochlea.
(a) Name **two** functions of the mammalian ear. (2 marks)
(b) For each of the structures above, state its function. (5 marks)
(i) Auditory meatus
(ii) Eardrum
(iii) Eustachian tube
(iv) Ear ossicles
(v) Cochlea
(c) Name a defect caused by damage of the cochlea. (1 mark)

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

6. A physiologist working to determine the amount of glucose levels in the iliac artery and hepatic vein per hour after a heavy carbohydrate meal in mg/100ml of blood collected and recorded the following data in a 24 hour period. Study the data and use it to answer the questions that follow.

Amount of glucose in mg/100ml	Iliac artery	2	2	2	2	2	2	2	8	12	20	24	20	24	22	28	20
Hepatic vein	20	22	24	24	24	24	18	12	6	4	2	2	2	2	2	2	2
Time of day	00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.0	12.0	13.0	14.0	15.0	16.00

- (a) On the same axes plot a line graph to show amount of glucose in mg/100ml of blood against time of the day in a 24hour day up to 4.00 p.m. (8 marks)
(b) At what time of day was the amount of glucose the same in the iliac artery and iliac vein? (1 mark)
(c) Account for the rise in glucose levels in the iliac artery peaks at: (3 marks)
(i) 11.00 hrs a.m.
(ii) 14:00 hrs p.m.
(d) Which organ and hormone is responsible for raising the sugar levels in Hepatic vein between 00.00 hrs – 2.00 hrs a.m. (2 marks)

- | Organ | Hormone |
|-------|---|
| | |
| (e) | Name the hormone responsible for the fall of glucose and the complex polysaccharide that forms between 14:00 hrs p.m. and 6.00 hrs p.m. (2 marks) |
| | Hormone - |
| | Complex polysaccharide - |
| (f) | Name a disease that would have resulted if the hormone in (e) above failed to be produced. (2 marks) |
| 7. | (a) Explain the role of the following factors in germination (2marks) |
| | (i) Oxygen (3 marks) |
| | (ii) Water (1 mark) |
| | (iii) Gibberellic acid |
| (b) | (i) Describe the various modes of adaptation for the flat worm of the blood <i>Schistosoma mansoni</i> (8 marks) |
| | (ii) State the effects of <i>Schistosoma mansoni</i> on its primary host, the human (12 marks) |
| 8. | (a) Describe how the digestion of a protein is achieved in the following portions of the alimentary canal. (4 marks) |
| | (i) Stomach (4 marks) |
| | (ii) Duodenum (8 marks) |
| | (b) (i) Describe the process of absorption at the root hair to the xylem of the root. (4 marks) |
| | (ii) Describe how temperature and light intensity affect the rate of transpiration. |

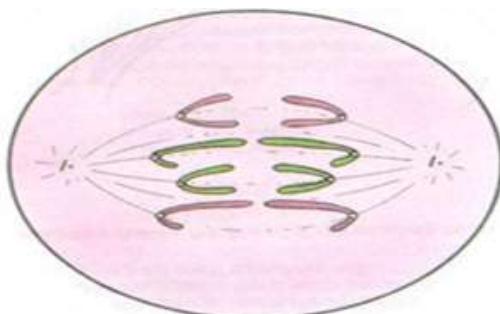
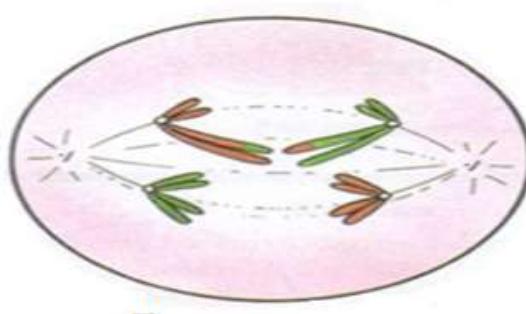
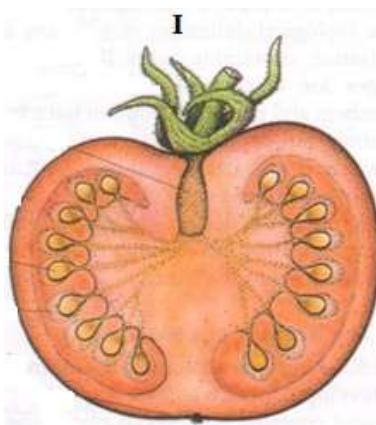
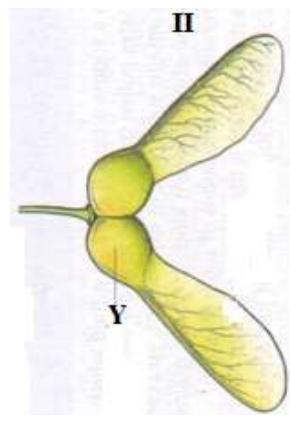
KASSU JET EXAMINATION – JUNE 2015**231/3****BIOLOGY PRACTICAL****PAPER 3****JUNE 2015****CONFIDENTIAL INSTRUCTIONS TO SCHOOLS**

Each candidate will require:

- Specimen **S** (A sukuma wiki - Kale) leaf.
- Coloured photographs on page 3 of the question paper.
- Specimen **L** (Thoracic vertebra).
- Specimen **M** (Lumbar vertebra).

KASSU JET EXAMINATION 2015*(Kenya Certificate of Secondary Education)***231/3****BIOLOGY PRACTICAL****PAPER 3****JUNE 2015****Time: 1 ¾ Hours**

1. You are provided with specimen **S**. Study the specimen carefully then answer questions that follow.
 - a) Make a drawing of specimen **S** and label midrib, leaf lamina, leaf margin, and leaf petiole. (3mark)
 - b) Name the class to which the specimen belongs. (1mark)
 - c) Identify two features of the specimen **S** that may have been used to place it in the class named in (b) above. (2mark)
 - d) Using observable features only, explain how the specimen **S** is adapted to its photosynthetic function. (6mark)
2. Use the photographs provided to answer the questions that follow:

**A****B****I****Y****III**

- a) (i) Identify the type of cell division represented in the photographs **A** and **B**. (2mark)
 (ii) With a reason, name the stage of cell division represented in each case. (4mark)
 (iii) Name the parts of human body where the process **B** represented above occur. (2mark)
- b) (i) What type of fruit is represented by photograph **I**? Give two reasons. (3mark)
 (ii) Name the agent of dispersal for fruits **II** and **III**. (2mark)
 (iii) How are the fruits adapted for the mode of dispersal stated in (b) (ii) above? (2mark)

-
- (iv) Identify the type of placentation shown by photograph **I**. (1mark)
3. You are provided with specimens labeled **L** and **M**. Study them then answer questions that follow:
- a) Identify the specimens. **L** and **M** (2mark)
 - b) Name the part of the body where each is found. (2mark)
 - c) With which bone does the vertebra **L** articulate, other than those of the vertebral column? (1mark)
 - d) Using observable features only, state two adaptations of the specimen **M** to its functions. (2mark)
 - e) Observe the specimen **L** from the anterior view. Name the parts of the vertebra that are most pronounced. (3mark)
 - f) Name the cartilaginous pad found between two adjacent vertebrae and state its function. (2mark)
- Name _____
- Function _____

KASSU JOINT EXAMINATION TEST**231/1****BIOLOGY****PAPER 1****JUNE 2015****Time: 2 Hours**

1. In what two ways does excretion differ between plants and animals? (2marks)

PLANTS	ANIMAL
Waste products are fewer	Waste products are more
Less complex excretory structure	Have complex excretory structure
Waste products are stored as harmless products	Waste products are more toxic

2. (a) Invented a natural system of classifying organism

Introduced /pioneer binomial nomenclature

- (b) Order:Primate

Family Hominidae

3. (a) Selective passage of substances in and out of the cell

Encloses cell contents

- (b) Synthesis of lipids

4. (a) Distinguish between Plasmolysis and turgidity (2marks)

Plasmolysis	turgidity
Plant cell loses water by osmosis	Plant cell gain water by osmosis

- (b) Oxygen concentration

Increase in oxygen concentration increases respiration to produce more energy for higher rate of active transport

Metabolic poisons

Inhibit respiratory enzymes hence reduce energy production thus reduce active transport which require energy

5. Has chloroplast which contain chlorophyll that traps light for photosynthesis

Located on the upper epidermis in position for maximum absorption of light

Vertically arranged and closely packed to increase surface area for photosynthesis

6. (a) An extreme allergic reaction that cause death

- (b) Artificial- acquired after vaccination

Natural-acquired after exposure to a disease

- (c) Leaf fall

Reduces surface area for transpiration to occur

Sunken stomata

Water vapour accumulate in sunken pits reducing saturation deficit for transpiration to take place

Thin cuticle

Reduces distance for diffusion of water vapour from epidermal cells, increasing the rate of transpiration

7. (a) A epidermal cells

- B. guard cell

(b) At night,no photosynthesis occur,no glucose is produced is produced,the osmotic pressure of the guard reduces,water from the guard cells is lost to surrounding cells by osmosis.the cells become flaccid and stoma closes

8. Bordetalla pertusis

9. Nicotine

Mild stimulant

Quinine

Treatment of malaria

- 10.

1. Mouth modified to a beak

2. Forelimbs modified to wings

3. Covered with feathers

- 11.

Monocotyledonae	Dicotyledonae
Vascular bundles alternate	Xylem is star shaped surrounded by a phloem
Fibrous	Taproot
Has a pith	Lack a pith

- 12.

- (a) (i) Investigate region of growth in the root

(ii) Draw a diagram to indicate the expected results of the experiment after three days.

(iii) Why was it necessary to have wet cotton wool in the container

Provide moisture

(1mark)

- (b) (i) Oxygen

For oxidation food substances to generate energy for growth

- (ii) Cotyledons
Contains food reserve for germination
13. The following set up was used in an experiment
- (a) i). To create moisture
 - ii). To absorb water and create a dry environment
 - iii) To make the apparatus airtight
- (b) moisture, since majority congregate where cotton wool is wet.
14. (a) It avails nitrogen to organism in an ecosystem
- (b) Decomposers
Breakdown organic matter and release nutrients to the ecosystem thus recycling nutrients
 - Detrivores
Breakdown plant and animal remains to simpler materials to allow easier decomposition
15. Greenhouse effect
The thick layer of carbon (IV) oxide that surrounds the upper part of earth's atmosphere trapping heat preventing excessive cooling of the earth
Global warming
Increase in global earth's temperatures due to an increase in greenhouse effect which traps more heat around earth's atmosphere.
- 16.
- (a) A
 - (b) Fresh soil has micro-organism while the baked soil the micro-organism are killed. The micro-organism respire releasing carbon (IV) oxide which reacts with water
17. (a) Gradual change in organism from simple to complex life form over long period of time.
- (b) Industrial areas have dark sooty tree trunks, in rural areas the trunks are covered with lichens. The dark melanin forms camouflage on the dark tree trunk. The white were predated upon the dark survive to reproductive maturity and produced more moths
 - (c) Convergent-the organism has different embryonic origin yet modified to exploit the same habitat. While divergent evolution organism claim the same embryonic origin yet modified to exploit different ecological niche
18. Moist to dissolve respiratory gases
Vascularized for uptake of respiratory gases
Thin epithelium of the alveoli to reduced distance for diffusion
Numerous alveoli to increase surface area for gaseous exchange
19. i) Nodes of Ranvier
Propagates and speed up impulse transmission
- ii) Myelin Sheath
Insulates the axon
20. Migraines
Hypertension
Sweating
Heart attack
Frequent hunger
Faintness
21. (a) Failure of homologous chromosome to separate, during meiosis leading to a loss or gain of a chromosome
- (b) Sickle cell anaemia
Haemophilia
22. (a) Stigma is large and feathery to trap pollen
Stigma hangs outside to trap pollen easily
Long style to expose the stigma to pollen
23. (i) Turgidity or firmness obtained through absorption of water by osmosis
- (ii) Twining stems-stems coil around hard object
 - (iii) Tendrils -modified leaves which curl around other plants

KASSU JOINT EXAMINATION
Kenya Certificate of Secondary Education
231/2
BIOLOGY
JUNE, 2015
2 HOURS

1. (a) Pteridophyta

(b) Q

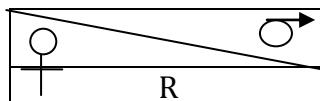
Name	-	Adventitious root; (reject roots)
Function	-	Anchorage/absorption of water
R		
Name	-	Rhizome (underground stem)
Function	-	For storage of food and water
S		
Name	-	Sorus
Function	-	Contains (Sporangium with a sexually reproductive)spores

(c) Name the two body forms of the organism in its alternation of generation. (2 marks)

- Gametophyte
- Sporophyte

2. (a) Incomplete/co-dominance

(b)

	R	W;
R	RR;	RW;
W	RW	WW;

*Gametes
All off springs
Correct crossing*

(c) Phenotypic ratio ; 1 Red : 2 Roan : 1 white

Genotypic ratio ; 1RR : 2RW : 1WW

(d) Deoxyribon nucleic acid

3. (a) Arthropoda

(b) Class Insecta

Reasons : Three body parts/Head, thorax and abdomen

Three pairs of legs/six legs

A pair of antennae

(c) - Cholera

- Typhoid

- Amoebic dysentery

(d) Complete metamorphosis

4. (a) (i) Stoma Reject Stomata

(ii)

- The wall of the guard cell is differentially thickened with the inner membrane to open the stoma when turgid.
- The cell is rich in mitochondria for photosynthesis which creates sugar for high osmotic gradient of the cell which draws in water from adjacent cells.
- Bean and sauge shaped to create a pore/aperture/stomata for gaseous exchange.

(iii) During day time. The guard cell traps light for photosynthesis; which results into sugar that is a osmotically active; the sugars draw in water by osmosis; from epidermal cells making it turgid and opening stomata/converse is correct.

(b) i)

- Secretes pleural fluids;
- Holds the lungs in pleural cavity
- Protection of lungs

(ii)

- Lung cancer
- Asthma
- Bronchitis

5. a)

- Hearing
- Body balance and posture

(b)

i) Transmission of sound waves into the eardrum

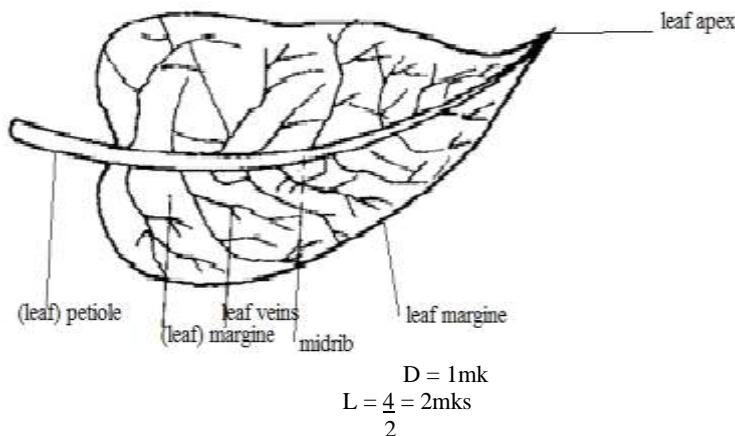
- ii) Vibrates and amplify soundwaves
 iii) Balancing the pressure
 iv) Regulates the position of the head and body posture
 vi) Contains perilymph which moves on detecting vibration transmitting stimulus to the receptor cells.
 (c) Permanent deafness
6. (a) On the same axes plot a line graph to show amount of glucose in mg/100ml of blood against time of the day in a 24hour day up to 4.00 p.m.
 (b) 8.00 a.m
 (c) (i) 11.00 hrs a.m.
 The peak is achieved at 11.00 hrs due breakfast involving carbohydrate intake; digestion; absorbed directly into the blood stream;
 (ii) 14:00 hrs p.m.
 The peak at 14.00 hrs is accounted for by intake of a heavy carbohydrate meal at lunch time taken at 12.00 hrs p.m; and the peak after complete digestion; and absorption; at 14.00 hrs.
- (d) Organ - Liver
 Hormone - Glucagon
 (e) Hormone - Insulin
 Complex polysaccharide - glycogen
 (f) Diabetes mellitus
7. (a) i) Oxygen
 Required for aerobic respiration that releases energy/ATP; for germination
 ii) Water
 Mobilises and dissolves stored food; stimulates the (germinating) enzymes; Provides medium for transport of dissolved food; provides a medium for reaction of enzymes.
 iii) Stimulates germination;
- (b) (i) Has two hosts to improve chances of survival; the secondary host the snail and human as the primary host; The adult worms have suckers for taking in digested food; The larvae occurs as either cercariae; redia or miracidia; The worm produces chemical substances against the hosts antibodies the female lays numerous eggs to improve chances of survival.
 (ii) Deprives it of its food making weak bores and tears the intestine leading to bleeding; the anaemia; Causes abdominal pains; causes ulceration of the alimentary canal; cercariae causes itching or boning the skin;
8. (a) i) Stomach
 Pepsin; acts on proteins to polypeptides; Rennin; Acts on milk protein caseinogens to casein; this occurs in acidic medium.
 ii) Trypsin; in pancreatic juice; hydrolyses polypeptides to peptides molecules; in alkaline conditions provided by \ bile juice.
- (b) (i) The root hair cell sap is hypertonic to the soil water; water from the soil moves into the root hair cell sap by osmosis; this makes the cell sap hypotonic/dilute; compared to hypertonic adjacent cortex cells; water moves into the cortex cells by osmosis; till it reaches the casparyan layer; which pumps water into the xylem of the root; this is called the root pressure;
 (ii) Increase in temperature causes evaporation of water into the intercellular airspace of the leaf; this makes water vapour from adjacent cells to move into the stoma; creating diffusion gradient deficit between the atmosphere and intercellular space increased transpiration;
 Increase in light intensity; increases rate of photosynthesis; leading to opening of stomata which leads to increased transpiration.

KASSU JOINT EXAMINATION*Kenya Certificate of Secondary Education*

231/3

BIOLOGY PRACTICAL**PAPER 3****JUNE 2015****Time: 1 ¾ Hours**

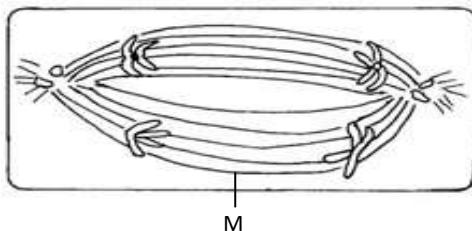
1. a)



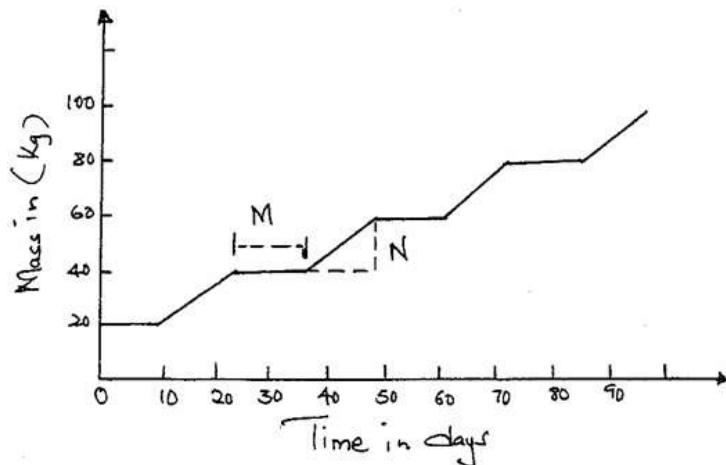
- b) Dicotyledonae;
 - c) Broad lamina; Network/reticulate venation; Presence of a petiole;
 - d)
 - Numerous leaf veins; to transport water and mineral salts to the photosynthetic cells / remove products of photosynthesis;
 - Green in colour due to the presence of chlorophyll; to absorb light energy for photolysis / splitting water molecule into hydrogen atom/ion and oxygen atom;
 - Broad lamina; to provide large surface area for absorption of light energy and carbon IV oxide;
 - Thin leaf to reduce distance for light and gases to/from photosynthetic cells;
2. a) (i) A: Mitosis;
 B: Meiosis;
 (ii) A: Anaphase;
 Reason: (Sister) chromatids have separated and are moving/migrating towards the opposite poles; formed V-shaped appearance;
 B: Anaphase I;
 Reason: Homologous chromosomes separate and move towards the opposite poles;
 (iii) Ovaries/Ovary; Testes/Testis;
- b) (i) Type: Berry;
 Reasons: Has fleshy (mesocarp and endocarp); Has numerous/many seeds;
 (ii) II: Wind;
 III: Animal(s);
 (iii) II: It has extended pericarp to form wing/wing-like structure that increase the surface area for buoyancy; owtte
 III: It has hooks/hook-like structures on the pericarp which stick to amnimal fur/skin;
 (iv) Central/Axile;
3. a) L: Thoracic vertebra;
 M: Lumbar vertebra;
 b) L: Thoracic region/upper part of the back;
 M: Lumber/abdominal region;
 c) Ribs;
 d)
 - Thick centrum to support the weight of the upper part of the body;
 - Broad neural spine/transverse processes to provide large surface area for attachment of abdominal muscles;
 - Metapophyses and anapophyses to increase the surface area for attachment of abdominal muscles;
 e) Neural spine; Neural canal; Centrum;
 f) Name: Intervertebral disc;
 Function: Absorbs shock/reduces friction (between two vertebrae); allow flexibility of the vertebral column;

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/1****BIOLOGY****PAPER 1****(THEORY)****JULY/AUGUST, 2015****TIME: 2 HOURS**

1. Name the organelles that are abundant in:
 - (a) Goblet cells (1 mark)
 - (b) Liver cells (1 mark)
2. Give a reason why it is difficult to calculate Respiratory Quotient (RQ) in plants. (2 marks)
3. List **three** advantages of asexual reproduction in plants. (3 marks)
4. The diagram below represents a stage during cell division.

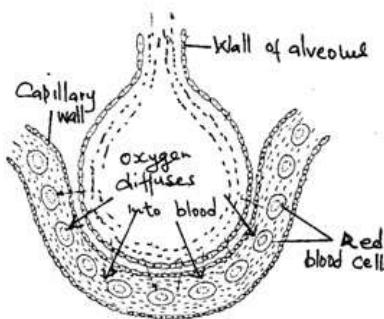


- (a) (i) Identify the stage of cell division. (1 mark)
 (ii) Give a reason for your answer. (1 mark)
- (b) Name the structures labelled **M**. (1 mark)
5. Explain why there is increased heart beat during vigorous exercise in man. (2 marks)
6. (a) State **two** characteristic features of members of division pteridophyta. (2 marks)
 (b) Give **one** way in which pteridophyta differ from spermatophyta. (1 mark)
7. (a) Explain the role of antidiuretic hormone when there is excess water in the human body. (3 marks)
 (b) State the kidney disorder characterized by production of large volume dilute urine. (1 mark)
8. (a) State **one** role of each following hormones in the menstrual cycle.
 - (i) Follicle stimulating hormone. (1 mark)
 - (ii) Luteinising hormone. (1 mark)
 (b) Explain why hormone testosterone still exerts its influence even when vas deferens have been cut. (2 marks)
9. The graph below represents growth pattern in a certain group of animals. Study it and answer the questions that follow.



- (a) Name the type of growth curve. (1 mark)
 (b) Name the animal phylum that shows this type of growth pattern. (1 mark)
 (c) Name the process that occurs in part **M**. (1 mark)
10. (a) Name the bacteria found in ceacum of herbivores. (1 mark)
 (b) State the association of the bacteria named in (a) above with herbivores. (1 mark)
11. During germination and early growth, the dry weight of endosperm decreases while that of the embryo increases. Explain. (2 marks)

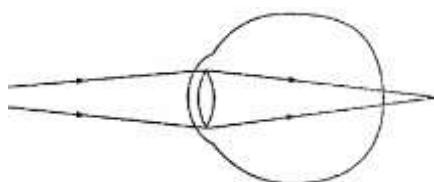
12. The figure below shows an alveolus in which gaseous exchange take place.



- (a) (i) Define the term diffusion. (1 mark)
(ii) What causes oxygen to diffuse into the blood from the alveoli? (1 mark)
(iii) List **two** features of gaseous exchange surfaces in animals, such as humans that are evident in the diagram above. (2 marks)
13. State **two** characteristics that researchers use/select in breeding programmes. (2 marks)
14. (a) Which component of the blood gives the body immunity? (1 mark)
(b) Distinguish between natural and acquired immunity. (2 marks)
15. (a) Define 'osmosis'. (2 marks)
(b) State the importance of osmosis in plants. (2 marks)
16. (a) Give **two** evidences that support the theory of organic evolution. (2 marks)
(b) Why is Lamarcks theory of evolution not accepted by biologists today. (2 marks)
17. The number and distribution of stomata on three different leaves are shown in the table below.

Leaf	Number of stomata	
	Upper epidermis	Lower epidermis
A	300	0
B	150	200
C	2	13

- (a) Suggest the possible habitat of the plant from which the leaves were obtained. (3 marks)
(b) State **one** modification found in the stomata of leaf (C). (1 mark)
18. (a) State **one** way through which herbaceous plants achieve support. (1 mark)
(b) Name **three** supporting tissues in plants. (3 marks)
19. (a) One of circulatory systems in animals is open circulatory system. Give the name of the other type of circulatory system found in animals. (1 mark)
(b) State **two** advantages of the circulatory system you have named in (a) above. (2 marks)
20. State **two** advantages of metamorphosis to the life of insects. (2 marks)
21. There are at least 205 known sex-linked recessive disorders.
(a) What is meant by term sex-linkage? (2 marks)
(b) Name **two** sex-linked traits in humans. (2 marks)
22. The diagram below shows the position of an image formed in a defective eye.

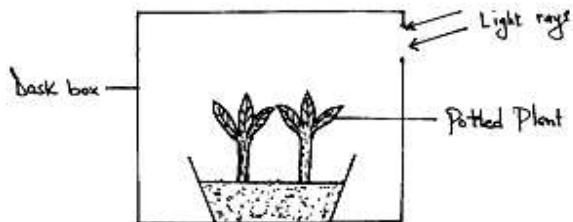


- (a) Name the defect. (1 mark)
(b) Explain how the defect named in (c) above can be corrected. (2 marks)
23. (a) State the importance of the following processes that take place in the nephron of a human kidney.
(i) Ultrafiltration. (1 mark)
(ii) Selective reabsorption. (1 mark)
(b) In which part of the nephron does ultra filtration take place? (1 mark)
24. A biological washing detergent contains enzymes which remove stains like mucus and oils from clothes which are soaked in water with the detergent.
(a) Name the two groups of enzymes that are present in the detergent. (2 marks)
Why would the stains be removed faster with the detergent in water at 35°C rather than at 15°C? (2 marks)

25. Explain why it is important to go for Voluntary Counseling and Testing (VCT) on HIV/AIDS.

(2 marks)

26. In an experiment young potted seedlings were placed in a dark box with unilateral light source as shown below.



(a) What was the aim of the experiment?

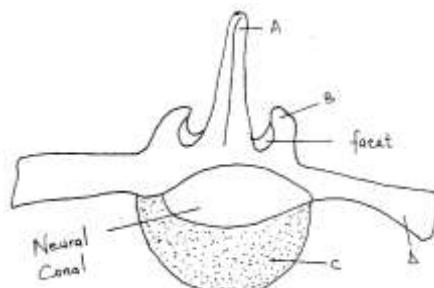
(1 mark)

(b) State the observation made of on the seedling after 3 days.

(2 marks)

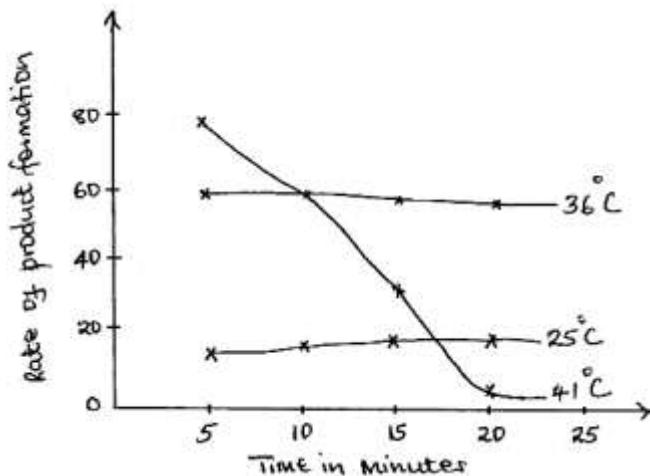
KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/2****BIOLOGY****PAPER 2****(THEORY)****JULY/AUGUST, 2015****TIME: 2 HOURS****SECTION A: (40 MARKS)****Answer all the questions in this section in the spaces provided:**

1. Study the diagram shown below of the anterior view of a lumbar vertebra of a mammal.



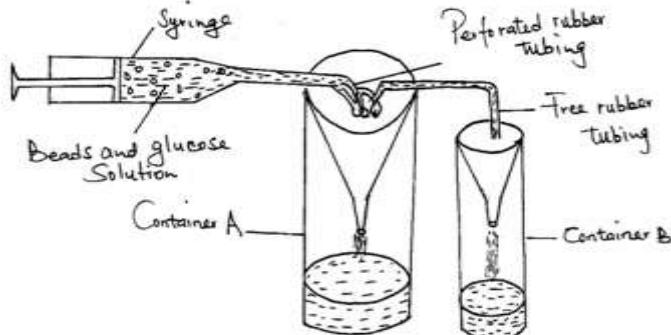
- (a) Name the parts labelled: A,B,C (3 marks)
 (b) State the function of the part labelled D. (1 mark)
 (c) State three roles of skeletons in organisms. (3 marks)
 (d) State how the part labelled D is adapted for the function stated in (b) above. (1 mark)

2. The graph below shows rates of photosynthesis in a plant at different temperatures.



- (a) Account for the decrease in the rate of product formation at 41°C from 5 to 20 minutes. (2 marks)
 (b) Explain the results obtained at
 (i) 25°C. (2 marks)
 (ii) 36°C. (2 marks)
 (c) (i) Other than temperature, state one external factor that affect the rate of photosynthesis. (1 mark)
 (ii) Suggest the product which could have been used in the experiment. (1 mark)

3. The diagram below shows a model of the nephron of a mammalian kidney.

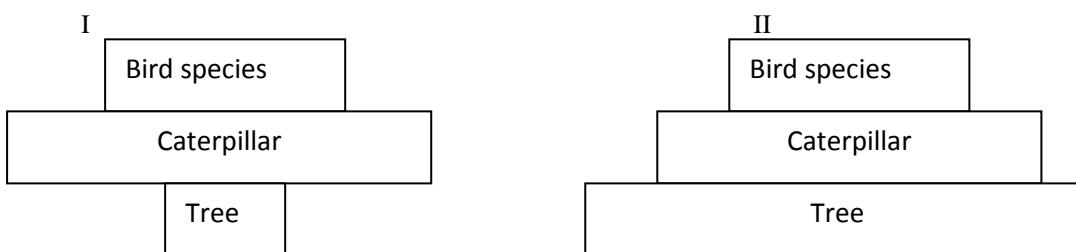


- (a) Which parts of the nephron are represented by the:

- (i) Syringe? (1 mark)
(ii) Perforated rubber tubing? (1 mark)
(iii) Free rubber tubing? (1 mark)
(b) Name the type of filtration taking place within the perforated rubber tubing. (1 mark)
(c) What would happen to the contents of the syringe if its handle was slowly pushed forward? Explain. (4 marks)
4. The table below shows the number of Leopards and Impala in a grassland park over a period of six years.

Time in years	1	2	3	4	5	6
Number of Impala	360	498	546	216	120	72
Number of Leopard	11	17	25	7	3	2

- (a) (i) What is the average number of Impala in the park during the six years. (2 marks)
(ii) Account for the decrease in the number of leopards between the 4th and 6th year? (3 marks)
- (b) Identify the trophic level occupied by
(i) Leopards (1 mark)
(ii) Tick feeding on the leopard. (1 mark)
- (c) The two pyramids shown were obtained in the park.



- (i) Identify each type of pyramid. (2 marks)
5. A pea plant with smooth seeds was crossed with one with wrinkled seeds. The gene for smooth seeds is dominant over that for wrinkled seeds. Use letter R to represent the dominant.
(a) State the genotype of the parents if the plant with smooth seeds was heterozygous. (2 marks)
(b) State the gametes produced by the smooth seeds and wrinkled seeds parents. (2 marks)
(c) State the genotype and phenotype of F1 generation. Show your working. (4 marks)

SECTION B:(40 MARKS)

Answer question 6 (Compulsory) and EITHER question 7 or 8 in the spaces provided after question 8.

6. An experiment was carried out in which red blood cells were put in salt solutions of different concentrations. The table below shows the percentage of cells which were destroyed by haemolysis in different salt concentration.

Salt concentration (g/dm ³)	% of RBC destroyed By haemolysis
0	100
1	100
2	100
2.5	100
3.0	100
3.5	96
3.7	80
4.0	60
4.5	16
4.7	0
5.0	0
6.0	0

- (a) Draw a graph of percentage of red blood cells haemolysed against salt concentration. (6 marks)
(b) Explain haemolysis of red blood cells. (3 marks)
(c) From the graph, state:
(i) the salt concentration at which 50% red blood cells were haemolysed. (1 mark)
(ii) the highest salt concentration when the largest number of red blood cells were haemolysed. (1 mark)
- (d) (i) Suggest the normal salt concentration in the blood of the mammal from which the red blood cells were obtained. (2 marks)
(ii) Give a reason for your answer in (d) (i) above. (1 mark)
(iii) What term is used to describe the solution with equal solute concentration as that of the cells? (1 mark)
- (e) Name the process in the human body that ensures that haemolysis of red blood cells is prevented. (1 mark)
(f) State the role of osmosis in organisms. (4 marks)
7. How are respiratory gases, oxygen and carbon (IV) oxide transported to and from tissues in mammals? (20 marks)
8. State and explain how the mammalian small intestines are adapted to perform their function.

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015
231/3
BIOLOGY
PAPER 3
(PRACTICAL)

CONFIDENTIAL

Requirement for school:

Question 1

Each candidate should be provided with:

1. A piece of small intestine of about 3cm from a freshly killed cow
(with intestinal contents intact)
2. A 50ml beaker.
3. 4 test tubes in a test tube rack.
4. Means of heating.
5. Benedict's solution.
6. Iodine solution.
7. 10% sodium hydroxide solution.
8. 1% copper sulphate solution.
9. Test tube holder.

NB: The small intestine can be bought a day before the exams and preserved.

Question 3

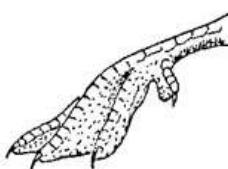
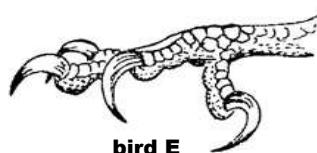
Specimen R – A bony fish e.g. Tilapia (one may be shared between two students).

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/3****BIOLOGY****PAPER 3****(PRACTICAL)****JULY/AUGUST, 2015****TIME: 1½ HOURS**

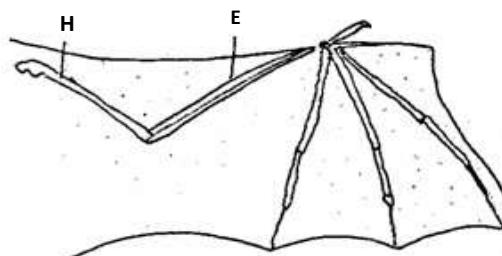
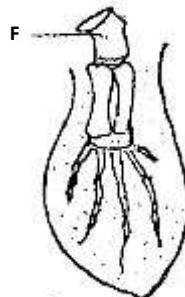
1. You are provided with a specimen labelled H which is a piece of a mammalian intestine. Squeeze the contents in the lumen into a test tube. Add 3ml of water and shake the contents. Reserve the piece of intestine for question (b).
- (a) (i) Use the reagents provided to test for the presence of starch, proteins and reducing sugars in the contents. Record the procedures, observations and conclusions in the table below.

Food substance	Procedure	Observations	Conclusions
Starch			
Proteins			
Reducing sugars			

- (ii) Account for the results obtained in (a)(i) above. (9 marks)
 (3 marks)
- (b) Cut specimen H along its length to expose the inner surface.
 (i) Feel the inner and outer surfaces of the specimen. Record your observations. (2 marks)
 (ii) Account for our observations of the inner surface. (3 marks)
2. (a) The figure below shows feet of various birds. Study the diagram and answer the questions that follow.

**bird A****bird B****bird C****bird D****bird E**

- (i) Name the type of evolution represented by the diagrams. (1 mark)
 (ii) Using Darwin's theory of evolution, explain how the feet of **bird E** would have evolved. (3 marks)
 (iii) Explain how Larmack could have explained the evolution of feet of bird C. (3 marks)
- (b) Figure 1 represents a bat wing, Figure 2 a whale paddle and Figure 3 an insect wing. Study the diagrams and answer the questions that follow.

Figure 1**Figure 2****Figure 3**

- (i) Name parts labelled **E** and **F**. (2 marks)
(ii) State **one** difference between the wings in Figure **1** and **3**. (1 mark)
(iii) Name the type of joint found at proximal end of bone marked **H**. (1 mark)
3. (a) You are provided with a specimen labelled R. Using observable features only, identify the class to which the specimen belongs.
Class _____ (1 mark)
List the observable features used to identify the class which the specimen belongs. (3 marks)
- (b) Stroke the specimen on the lateral side from the head end to the tail end. Repeat the stroking from the tail end to the head end.
(i) Record your observation. (2 marks)
(ii) Observe the arrangement of the scales. Record your observations. (1 mark)
(iii) State the significance of the arrangement of the scales. (1 mark)
- (c) Name the observable features that adapt the specimen to:
(i) forward movement. (1 mark)
(ii) Balancing. (1 mark)
(iii) Staying upright. (1 mark)
(iv) Fast movement. (1 mark)

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/1****BIOLOGY****PAPER 1****MARKING SCHEME**

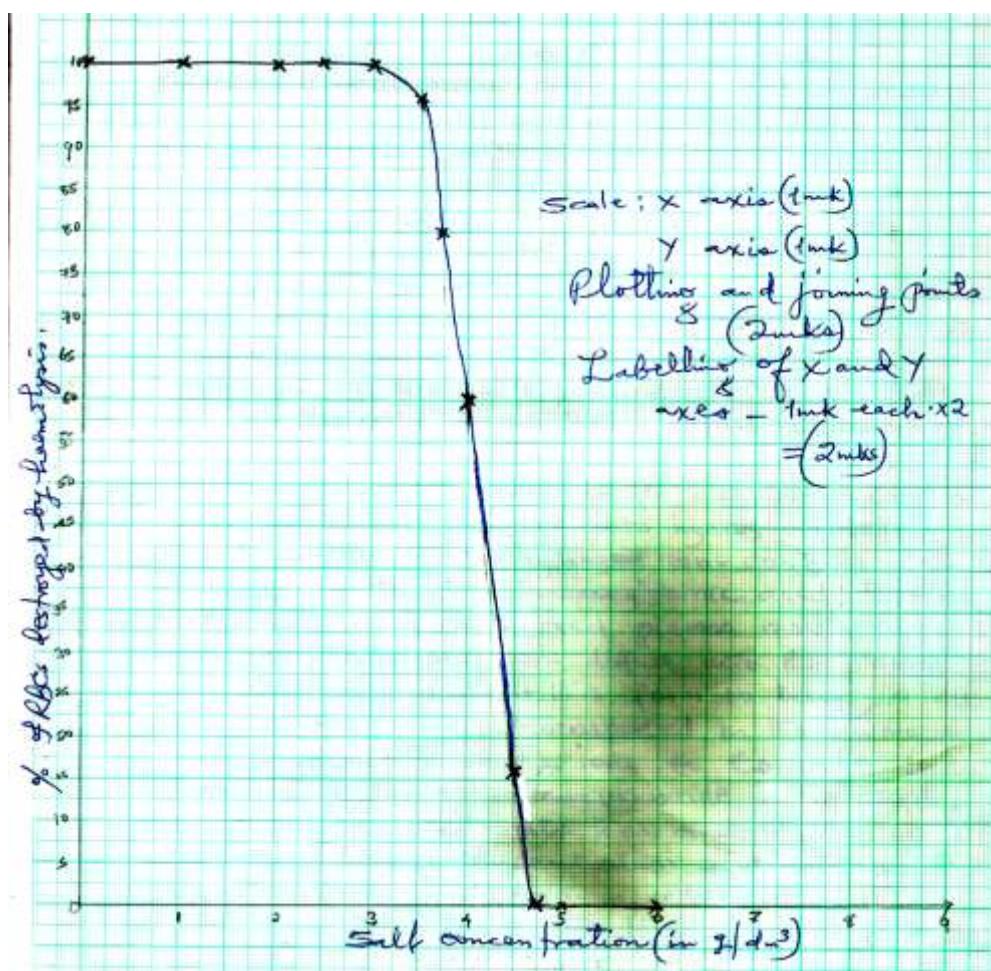
- 1.(a) Golgi bodies / Golgi apparatus
 (b) Mitochondria
2. Carbon (IV) oxide produced in respiration is utilized in photosynthesis; oxygen produced in photosynthesis is used in respiration ;
3. Favourable characteristics of parents retained.
 Exploit favourable conditions of parents /
 New offspring are nourished by parents/
 New plants produced in conditions already favourable to the parents/
 Shorter life cycles / Early maturity / Early maturity / faster colonisation / faster reproduction;
 Independent of two parents / fertilization / pollination;
 Large supply of stored food;
 (Rej. Asexual reproduction does not require mating) (mark first 3 mks)
4. (a) (i) Anaphase I
 (ii) Homologous chromosomes separate at the equator; chromosomes start migrating to opposite poles;
 Sister chromatids attach at the centromere; (mark first one)
 (b) Spindle fibres.
5. This is to remove the poisonous lactic acid produced by anaerobic respiration in muscles;
 and increase oxygen supply to the tissues; (Rej; Poisonous alone or removal alone)
6. (a) They show alternation of generation;
 Have spore bearing structures called sporangia;
 Show clearly defined sexual reproduction which are independent of water;
 Possess chlorophyll and they are photosynthetic;
 Have clearly defined vascular system;
 Have true roots, stems and leaves and no flowers. (mark first two)
 (b) Spermatophyta are seed bearing plants while pterophyta produce spores;
 Spermatophyta have flowers or cones while pterophyta have sporangia;
- 7.(a) Less anti-diuretic hormone secreted (by pituitary gland) ; causing less reabsorption of water in the kidney tubules; thus resulting to dilute urine / copious urine;
 (b) Diabetes insipidus / Diuresis;
- 8.(a)(i) Cause Graffian Follicle to develop (in the ovary)
 Stimulates tissues of the ovary / wall of Graffian Follicle to secrete oestrogen; (mark first one)
 (ii) Causes ovulation;
 Causes Graffian Follicle to change to corpus luteum;
 Stimulates corpus luteum to secrete progesterone;
 (b) Because testosterone is transported through the blood but not through the vas deferens;
9. (a) Intermittent growth curve;
 (b) Arthropoda (Rej. Wrong spelling)
 (c) Ecdysis / moulting / shedding of old skeleton;
- 10.(a) Cellulose digesting bacteria;
 (b) Symbiosis / mutualism;
11. Endosperm material was being converted / oxidized; into new cytoplasm / use for growth.
 (Acc: endosperm oxidised) (Rej. Endosperm food broken down)
12. (a)(i) Process by which particles move from a region of high concentration to a region of low concentration;
 (ii) High concentration of oxygen in the alveoli.
 (iii) Thin epithelium;
 Rich network of blood capillaries;
 Moist surface
13. Heterosis / High yielding / Hybrid vigor;
 Resistance of diseases;
 - Resistance of drought / salinity;
 Early maturity. (mark first two).
14. (a) White blood cells ;
 (b) Natural immunity is inherited / transmitted from parents to off springs;
 Acquired immunity is acquired after suffering from a disease / through vaccination / vaccination through inoculation / through introducing antibodies. (Rej. Immunisation alone)
15. (a) Movement of water molecules from a region of high (water) concentration to a region of low (water) concentration through a semi-permeable membranes.
 (b) - Absorption of water (from the soil);

-
- Movement of water (molecules) from cell to cell;
 - Mechanical support due to frigidity;
 - For opening / closing of stomata;
 - Feeding in insectivorous plants; (mark first two)
16. (a) Fossil records / paleontology;
 Comparative anatomy;
 Comparative embryology;
 Geographical distribution;
 Cell biology;
 Comparative serology; (mark first 2)
- (b) Acquired characteristics cannot be inherited;
 Inherited characteristics are found in reproductive cells;
17. (a) A - Aquatic / fresh water (Rej. marine)
 B - Forest (Rej terrestrial)
 C - Arid / semi - arid / desert
- (b) Sunken / hairy / reversed rhythm / small / stomatal pores / adaptations; (mark first to appear)
18. (a) Use of turgor pressure / turgidity;
 Use of tendrils and climbing stems ;
 Use of xylem / thickened tracheids and vessels;
 Use of spines / thorns (mark first one)
- (b) Sclerenchyma;
 Collenchyma;
 Xylem;
 Parenchyma; (mark first three)
19. (a) Closed circulatory system.
 (b) - Blood flows under high pressure;
 - Blood flows at high speed;
 - Blood travels for long distances;
 - Animal remain active throughout;
 - Animals grow into big sizes (mark first two)
20. - The adult and larvae exploit different (food) niches; do not compete for food;
 - Pupa can survive adverse conditions / pupa is non-feeding stage for adverse conditions;
 - Dispersal phase prevents overcrowding; (mark first two)
21. (a) Genes are located on the sex chromosomes / on X and Y chromosomes; They are transmitted together with those determining sex.
- (b) Baldness; colourblindness; haemophilia;
 Hairy ears / pinna / nose; duchere
 Muscular dystrophy; (Rej: Bleeders diseases)
- 22.(a) Long sightedness / Hypermetropia (Acc. Long sight)
 (b) Convex lens / converging lens; to converge the rays so that the image focus on the retina.
- 23.(a) (i)To remove toxic / harmful substances / urea / nitrogenous wastes / toxic metabolic wastes;
 (ii) To return useful substances / glucose and amino acids (mineral salts back to the bloodstream).
- (b) Bowman's Capsules
24. (a) Protease; Lipase;
 (b) 35°C is the optimum temperature for the enzyme to act; at 15°C enzymes are inactivated since the temperature is low;
25. To know HIV status; so as to take appropriate measures; if positive start medication /negative avoid infection;
26. (a) Effect of unilateral / unidirectional light on shoots;
 (b) Seedlings / shoot grows / bends; towards light / growth curvature towards light;

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/2****BIOLOGY****PAPER 2****MARKING SCHEME**

- 1.(a) A - Neural spine; (1 mk)
 B - Metapophysis; (1 mk)
 C - Centrum; (1 mk)
- (b) - To offer a large surface area for attachment of abdominal muscles; (1 mk)
- (c) - Provides sites for attachment of muscles and organs;
 - To protect inner organs;
 - To maintain the body shape;
 - To enable movement;
 - To provide support; (max 3 mks)
- (d) - It is elongated to provide a large surface area for muscle attachment. (1 mk)
2. (a) Photosynthesis is controlled by enzymes ; the enzymes are denatured at high temperature; hence Decrease in product formation. (2 mks)
- (b)(i) The rate of product formation is low and constant; enzymes are inactive at low temperature;
 (ii) Rate of photosynthesis is high and constant;
 This is the optimum temperature for the enzyme activity; (4 mks)
- (c)(i) Light intensity / carbon (iv) oxide; (1 mk)
 (ii) Oxygen / glucose / starch; (1 mk)
- 3.(a)(i) Syringe - afferent vessel / arteriole ; (1 mk)
 (ii) Perforated rubber tubing - glomerular; (1 mk)
 (iii) Free rubber tubing - efferent vessel / arteriole; (1 mk)
- (b) Ultra filtration; (1 mk)
- (c) Pressure would force the glucose solution to be filtered into container A; as their molecules are smaller and passes through the perforations; while the beads will collect into container B; as they cannot pass through the perforations; (4 mks)
- 4.(a)(i) $360 + 498 + 546 + 216 + 120 + 72 = 1812/6; = 302$; (2 mks)
 (ii) Decrease in number of impala / prey hence starved to death; emigration / poaching / immigration leading to increased competition ; disease epidemic ; pollution / human activities; (3 mks)
- (b)(i) Secondary consumer;
 (ii) Tertiary consumer; (2 mks)
- (c)(i) Pyramid of numbers;
 (ii) Pyramid of biomass; (2 mks)
5. (a) - Smooth seed plant - Rr; (1 mk)
 - Wrinkled seed plant - rr; (1 mk)
- (b) Smooth seed plant - R and R/ \oplus and \oplus ; (1 mk)
 Wrinkled seed plant - r and r / \textcircled{r} and \textcircled{r} (1 mk)
- (c) Parental phenotypes; Smooth seeds Wrinkled seeds
 Parental genotypes; Rr X rr ✓
 Gametes; R R r ✓
 F1 generation; R r rr ✓ Smooth seeds $\checkmark \frac{1}{2}$ Wrinkled seeds $\checkmark \frac{1}{2}$

6. (a) On the graph.



- (b) Haemolysis of red blood cells occurs when they are placed in a hypotonic solution; they gain a lot of water; swell and then burst; (3 mks)
- (c)(i) $4.1 \text{ g}/\text{dm}^3; \pm 0.1$; (1 mks)
(ii) $3.0 \text{ g}/\text{dm}^3; \pm 1$; (1 mks)
- (d)(i) $4.7 \text{ g}/\text{dm}^3 \pm 0.1$; (1 mks)
(ii) At $4.7 \text{ g}/\text{dm}^3$ salt concentration; as there is no haemolysis / haemolysis was zero; (2 mks)
(iii) Isotonic solution; (1 mks)
- (e) Osmoregulation; Rej. homeostasis (1 mks)
- (f) - Osmosis enables movement of water from one cell to another;
- Osmosis helps in closing and opening of the stomata;
- Osmosis helps in support when cells become turgid in plants;
- Osmosis helps in absorption of water by the root hairs; (max 4)

7. Transport of oxygen gas.

The alveoli have a higher concentration of oxygen gas; than the blood in pulmonary capillaries; oxygen diffuses across alveoli wall, endothelium of capillaries; into red blood cells; where it combines with haemoglobin; to form oxyhaemoglobin; a compound that dissociates easily; it is then transported in this form to respiring tissues; in the capillaries of respiring tissues oxyhaemoglobin dissociates into oxygen and haemoglobin; Oxygen diffuse into tissue cells; along a concentration gradient.

Transport of carbon (IV) oxide.

High concentration of carbon (IV) oxide in the cells stimulates dissociation of oxyhaemoglobin in blood capillaries of the tissues; carbon (IV) oxide diffuses out of the cells tissue fluid, across the endothelium of tissue capillaries; into the red blood cells; where it combines with water to form a weak carbonic acid; which dissociates into hydrogen carbonate and hydrogen ions; hydrogen ions combine with haemoglobin to form haemoglobin acid; thus pH of the red blood cells and plasma remains constant; the hydrogencarbonate ions diffuse into the plasma and are transported in this form to lungs; a little of carbon (IV) oxide is transported in the plasma in form of hydrogencarbonate ions to the lungs; in the pulmonary capillaries, carbon (IV) oxide is released from the hydrogencarbonate ions and diffuses into the alveoli along a concentration gradient ; the enzyme carbonic anhydrase in red blood cells speed up loading and off-loading of carbon(IV) oxide;

(20 mks)

8. - It is relatively long; to increase the surface area for absorption of food and for digestion;
- Lumen has many villi per unit area to increase the surface area for absorption of food; villi have microvilli to increase the surface area for absorption of food.
- Its walls have glands which secrete enzymes that complete digestion; Acc names of enzymes.
- Walls have goblet cells; which secret mucus; for lubrication of food / walls; and to protect the walls from digestive enzymes ;
- Presence of circular and longitudinal muscles; that allow mixing of food by peristalsis;
- It is coiled / folded; to slow down movement of food / to give food enough time for digestion;
- Intestines are richly supplied with blood; to supply oxygen and carry away digested food;
- It has lacteals; for transport of fats / lipids.
- Their walls are thin / thin epithelium; for faster diffusion / absorption of food; (max 20 mks)

KIRINYAGA CENTRAL SUB-COUNTY JOINT EXAMINATION - 2015**231/3****BIOLOGY****PAPER 3****(PRACTICAL)****MARKING SCHEME**

1.(a)(i)	Food substances	Procedure	Observations	Conclusion.
	Starch	Add a drop of iodine - If heating reject but continue marking Acc heating and cooling	No colour change (Rej. No observable change Acc colour of iodine retained	Starch absent / No starch
	Proteins	Add dilute NaOH soln and Add CuSO ₄ (Stop marking if heating is there)	Violet or purple (rej. pink)	Protein present
	Reducing sugar	Add Benedict's Soln then heat / boil / warm	Colour changes from blue to green to yellow. Turn green	Reducing sugars present. Rej. Glucose Acc simple sugars present Traces of reducing sugars/little amounts of reducing sugars.

(ii) Starch - No starch because it has been digested / converted to / broken down / hydrolysed / changed to; Reducing sugars / mono saccharide simple sugars / maltose / glucose.

Proteins - Proteins present because their digestion is not complete / continues / is incomplete.

Reducing sugars - Reducing sugars present because they are the end products of carbohydrate/starch digestion; OR

Reducing sugars present because they have not been absorbed completely.

(b)(i) Inner surface - Slimy / slippery / wavy / undulating / has protrusions has projections / swellings / folds /lumps (rej. rough)
Outer surface - smooth.

(ii) - Is slimy due to presence of mucus ; secreted by walls of the intestine; to protect the wall of intestine from digestion / to lubricate the passage of food.

- Due to presence of villi / finger like projection; for absorption of digested food;

- Has folds to increase the surface area (for absorption)

2.(a)(i) Divergent evolution; (1 mk)

(ii) Small variations occurred in feet of birds within the population; competition for limited food occurred in the environment; predation as a mode of feeding favoured birds whose feed had long; sharp and curved claw / talons; to kill prey / tear flesh of prey; OWTTE (3 mks)

(iii) All birds had same length of feed; the (aquatic environment favoured long feet talons; leading to continuous natural use of the feet; which kept increasing in length; the longer trait was then passed on to offspring along the generations; OWTTE (3 mks)

(b)(i) E - Radius; (1 mk)

F - Humerus; (1 mk)

(ii) Figure 1

- Have pentadactyl limb structure
- Originate from endoskeleton

Figure 3

- Have no pentadactyl limb structure
 - Originate from exoskeleton.
- (Mark first one only) (1 mk)

(ii) Ball and socket joint; (1 mk)

Total marks for the question (11 mks)

3. (a) Pisces reject fish or fishes (1 mk)

- (i) Presence of fins
- (ii) Presence of (overlapping) scales
- (iii) Presence of gill / operculum
- (iv) Presence of lateral line. (3 mks)

(b) (i) Head → tail — smooth

(2 mks)

Tail → head — Rough

(ii) Scales overlap pointing backwards.

(iii) Minimizes / reduce friction (during motion)

- Prevent mechanical injury.

Rej. Protection for prevent

(c) (i) Tail / Tail fin / tail muscle / caudal fin;

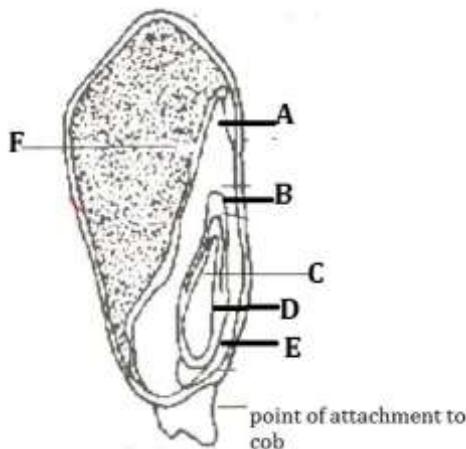
(ii) Pectoral fins; pelvic fins

(iii) Dorsal fin; anal fin (ventral fin)

(iv) Streamlined body / backward facing scale / slimy / mucoid surface

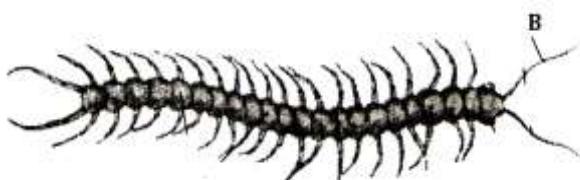
KAMDARA JET**23/1****JULY/AUGUST 2015****BIOLOGY (THEORY)****PAPER I****TIME: 2 HOURS**

1. Name the basic functional unit of a kidney. (1mark)
Name two support tissues in plants strengthened with lignin. (2marks)
 2. What is binomial nomenclature? (1mark)
State the importance of the following in a living organism
(a) Locomotion (2marks)
(b) Respiration (1mark)
 3. State the functions of the following in the heart. (2marks)
(a) Sino Atrio Node (SAN)
(b) Interventricular septum
 4. The table below shows percentage water gain in man and kangaroo rat.
- | Gains | Human beings | Kangaroo rat |
|-----------------|--------------|--------------|
| Drinking | 48% | 0% |
| Water in food | 40% | 10% |
| Metabolic water | 12% | 90% |
5. Explain why a Kangaroo rat gains a higher percentage of metabolic water than human beings. (2marks)
 6. State three functions of adrenaline released when a person is faced with an emergency situation. (3marks)
 7. Name a disadvantageous gene that is dominant (1mark)
 8. State the importance of metamorphosis in an insect. (2marks)
 8. Name the causative agent of the following diseases. (3marks)
(a) Whooping cough
(b) Typhoid
(c) Syphilis
 11. (a) Name two causes of water pollution (2marks)
(b) For each cause named in 11(a) above state a control measure. (2marks)
 12. Define the following terms in reference to fish locomotion (3marks)
(a) Pitching
(b) Rolling
(c) Yawing
 13. Name the type of reproduction in the following organisms. (3marks)
(a) Yeast
(b) Bacteria
(c) Rhizopus
 14. The diagram below shows the structure of a monocotyledonous seed



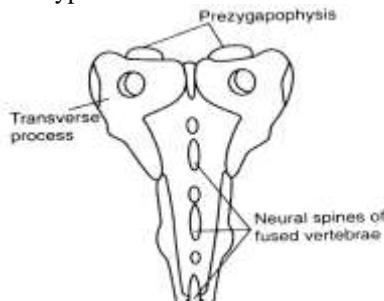
- (a) Name the parts B and D (2marks)
(b) Name the parts that would stain blue black with iodine solution. (2marks)
15. State the importance of

- (a) Aerenchyma tissue in hydrophytes (2marks)
 (b) Salts glands in halophytes (1mark)
16. (a) Explain why osmosis is a special type of diffusion. (1mark)
 (b.) What is the importance of carriers in active transport. (1mark)
17. Name the cell organelles which would be abundant in (2marks)
 (a) Sperm cell
 (b) Pancrease
18. (a) Name the respiratory surface of an insect (1mark)
 (b) State two adaptations of the respiratory surface named in (a) above.
19. State three properties of proteins. (3marks)
20. What is the role of light energy during photosynthesis (2marks)
21. Use the diagram below to answer the questions

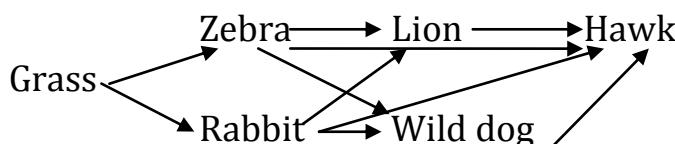


- (a) Identify the class which the organism belongs (1mark)
 (b) Give two observable characteristics to justify your answer in (a) above (2marks)
22. Name two main mineral ions required for transmission of a nerve impulse (2marks)
23. Name an old age disease associated with the following body organs (2marks)
 (a) Eye
 (b) Ear
24. Explain the following terms as used in evolution. (3marks)
 (a) Struggle for existence
 (b) Divergent evolution
 (c) Vestigial structure
25. State two adaptations of xylem tissues in plants. (2marks)
26. (a) Name a compound that stores energy in a cell (1mark)
 (b) Explain why cell membrane is semi-permeable. (1mark)

27. The diagram below shows type of vertebrae fused to form a rigid structure.



- (a) What is the name of the rigid structure? (1mark)
 (b) What is the importance of the rigid structure in human beings? (2marks)
28. Study the food web below and answer the questions below



- (a) Name the organism occupying the highest trophic level (1mark)
 (b) Construct two food chains with wild dog as secondary consumer. (2marks)
29. State three roles of Gibberellins in plant (3marks)
30. Cardiac muscles are myogenic while skeletal muscles are neurogenic.
 Explain (2marks)
31. (a) State two adaptations of the oviduct in female reproductive system. (2marks)
 (b) Name the hormone involved in
 (i) Milk production (1mark)
 (ii) Development of male secondary sexual characteristics. (1mark)

32. Explain why it is difficult for scientist to make a vaccine against plasmodium which causes malaria.

(2marks)

KAMDARA JOINT EVALUATION TEST

231/2

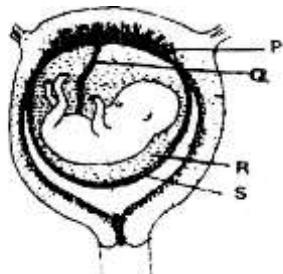
BIOLOGY PAPER 2

(THEORY)

TIME: 2 HRS

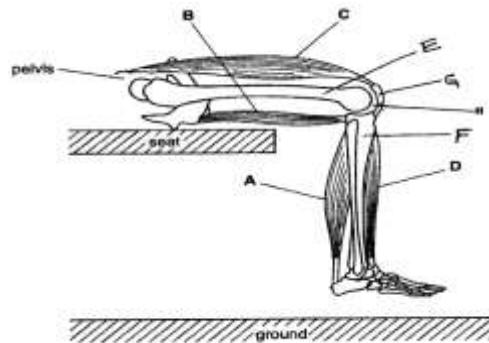
SECTION A: (40 MKS)

1. The diagram below represents a human foetus and a uterus.



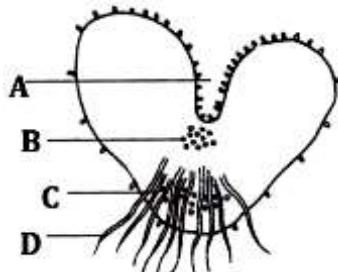
- (a) Name the part labeled S (1 mark)
 (i) Name the types of blood vessels found in the structure Q. (2 marks)
 (ii) State the difference in composition of blood in the vessels named in b (i) above. (2 marks)
- (b) State two structure adjustment in the circulatory system of the baby at birth. (2 marks)

2. The diagram below shows the bones and muscles of a human leg when seated.



- (a) Name the bones A and F (2 marks)
 (b) Muscles in the leg work antagonistically to muscle A
 (i) What is meant by antagonistic? (1 mark)
 (ii) State two structural difference between muscle A and muscle found in the esophagus. (2 marks)
- (c) (i) Name the type of joint formed by the articulation of bones E, F and G (1 mark)
 (ii) State one difference between the joint named in C (ii) and the one which bone E make at the proximal end. (1 mark)
- (d) State the function of the substance found in part labeled H. (1 mark)

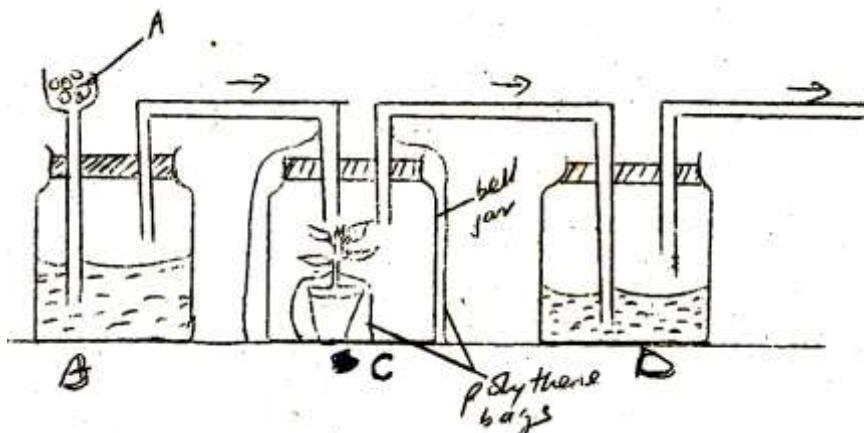
3. The diagram below shows the gametophyte of a fern



- (a) (i) Name the structure shown above (1 mark)
 (ii) Name the part labeled: B and C
 (b) (i) Define the term alternation of generation. (1 mark)

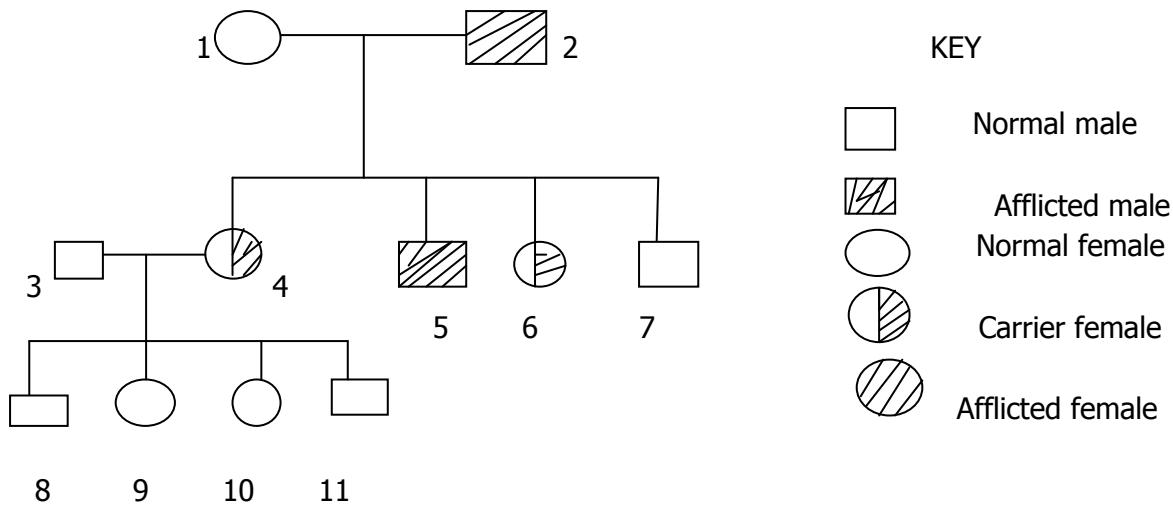
- (ii) Name two plant division that exhibit alternation of generation. (2 marks)
- (c) State three features in terms that make them advanced the moss plant. (3 marks)
- (d) State the importance of gametophyte to a sporophyte. (1 mark)

4. The diagram below illustrate an experiment to demonstrate some aspects of respiration in a potted plant.



- (a) Name and state the role of the chemical compound labeled A
Chemical compound _____ (2 marks)
Role played _____
- (b) What aspect of respiration is being demonstrated? (1 mark)
- (c) Name the reagents in set up B and D. (1 mark)
- (d) What would be the results in set up B and D after the experiment has run for some time.
Set up B _____
Set up D _____
- (e) State the importance of covering the bell jar in set up C with a black polythene bag. (1 mark)
- (f) Why was it necessary to enclose the pot with a polythene bag. (1 mark)

5. The pedigree chart below illustrates the inheritance of muscle dystrophy in 9 given family.



- (a) Suggest the possible genotypes of individual 2, 4, 7 and 9. Use the letter D to represent the gene for normal muscle formation.
- (b) Explain why there are no male carriers.
- (c) Work out the phenotypic ratio of off springs from individual number 4 and an afflicted male.

SECTION B (4 MARKS)***Answer question B compulsory and either 7 or 8 in the spaces after question 8.***

6. The following data results of making daily growth measurement on an organism over a period of 24 days during its development.

DAY	WIDTH OF HEAD (MM)	LENGTH OF HIND FEMUR 1MM
1	3.0	7.0
2	3.5	7.5
3	4.0	8.0
4	4.0	8.0
5	4.0	8.0
6	4.0	8.0
7	4.0	8.0
8	4.4	9.2
9	4.7	10.5
10	5.0	12.0
11	5.0	12.0
12	5.0	12.0
13	5.0	12.0
14	5.0	12.0
15	5.0	12.0
16	5.0	12.0
17	5.6	13.3
18	6.4	14.8
19	7.0	16.4
20	7.6	18.0
21	7.6	18.0
22	7.6	18.0
23	7.6	18.0
24	7.6	18.0

- (a) Using a suitable scale, draw graphs of width of head and length of femur against time. Draw the graphs on the same axis. (8 marks)
- (b) (i) Name the growth pattern represented by the graphs. (1 mark)
- (ii) With reference to your graph, identify the phylum to which the organism belongs. Give a reason for your answer. (2 marks)
- (c) (i) Account for the length of hind limb (femur) between day 3 and day 7. (3 marks)
- (ii) Day 7 and day 10. (2 marks)
- (d) State the hormones involved in the growth pattern represented by the graphs. (2 marks)
- (e) State two advantages for metamorphosis in organisms. (2 marks)
7. Describe that played by the liver in:
- (a) Protein metabolism (8 marks)
- (b) Regulation of blood sugar (12 marks)
8. Describe the movement of water from the soil upto the leaves and then into the atmosphere. (20 marks)

KAMDARA JET**231/3****CONFIDENTIAL
REQUIREMENTS**M – *solanum incanum* (sodom apple) flowers

N – Hibiscus flowers

- Blades
- Microscope slide
- Cover slips
- Microscopes
- Iodine solution
- L – diastase / invertase
- 0.1%, 1.4% sodium chloride solution
- Benedict's solution
- Thermometer
- Test tubes (3) per candidate
- Test tubes holder
- Water bath maintained at 37°C
- Hand lens

KAMDARA JOINT EVALUATION TEST**BIOLOGY PRACTICAL****PAPER 3****JULY/AUG. 2015****TIME: 1 ¾ HRS.**

1. You are provided with specimen M and N. Examine them.
 - (a) Describe the arrangement of the stamens in specimen N. (3 marks)
 - (b) Carefully remove one stamen from specimen M. Examine it using a hand lens. Draw and label it. (4 marks)
 - (c) Remove another stamen from specimen M, cut the anther transversely into two equal parts. Tap the pollen grains from the lower half onto a microscope slide. Add a drop of iodine. Place a cover slip and pass on the coverslip gently to spread out the pollen grains.
Observe the pollen grains under medium power.
Draw one pollen grain (1 mark)
 - (d) Remove an anther from N. Place it on a microscope slide. Add a drop of iodine solution. Cover with a cover slip. Press gently on the cover slip to spread out the pollen grains. Observe the pollen grains under medium power.
Draw one pollen grain. (1 mark)
 - (e) State one observable difference between pollen grains of specimen M and N. (1 mark)
 - (f) State four observable differences between the corolla of specimen M and N (4 marks)
 2. You are provided with a solution labeled L, starch solution and sodium chloride in two different concentrations, 0.1% and 1.4%.
- Place 3 ml of starch solution in test tubes labeled 1, 2 and 3. Add 3 drops of 0.1% sodium chloride to the test tube labeled 2 and 3 drops of 1.4% sodium chloride to the test tube labeled 3.
- Add 3 ml of solution L to each of the test tubes labeled 2 and 3.
- (a) Place a drop of the contents from each test tube 1, 2 and 3 on a white tile.
To each drop add iodine solution;
Record your results in the table below.

(6 marks)

- (b) Place the test tubes in a water bath maintained at 37°C . Allow to stand for 30 minutes. Place a drop of the contents from each test tube on a white tile. To each drop add iodine solution.

Record your observations in the table above;

- (c) Add equal amounts of Benedict's' solution to test tube labeled 2 and 3. Boil

Record your observations

(2 marks)

Test tube	Observation
Test tube 2	
Test tube 3	

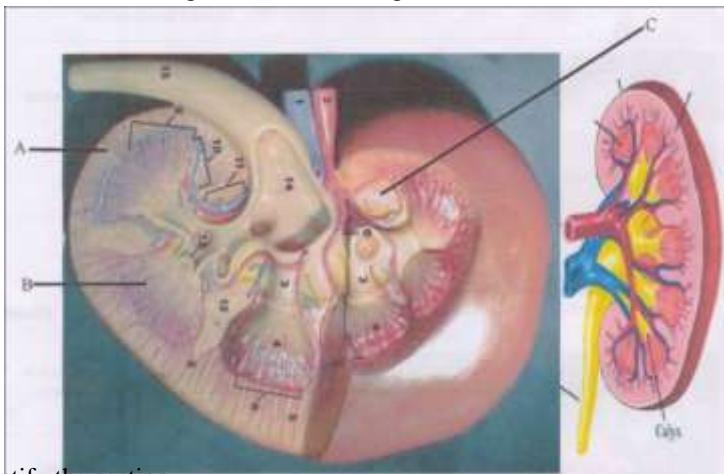
- (d) Account for the result in test tube 3 at the end of the experiment. (2 marks)

- (e) Suggest the identity of solution L. (1 mark)

- (f) Why was the test tube labeled 1 included in the experiment? (1 mark)

- (g) Why were the test tubes placed in a water bath maintained at 37°C . (1 mark)

3. Below is a section through a mammalian organ.



- (a) Identify the section. (1 mark)

- (b) Name the parts labeled A, B and C (3 marks)

- (c) State three functions of the photographed specimen. (3 marks)

- (d) Label on the photograph using G and L the region where the Glomerulus and Loop of Henle are located respectively. (2 marks)

- (e) Name a process that occurs in the Glomerulus and Loop of Henle. (2 marks)

- (i) Glomerulus

- (ii) Loop of Henle

- (f) Name two renal diseases (2 marks)

Test tube	Observation at start of experiment	Observation at the end of experiment
1		
2		
3		

KAMDARA JOINT EVALUATION TEST**BIOLOGY PAPER 1 (231/1)****MARKING SCHEME.**

1. Nephron –reject Nephrons (1mk)
 2. Xylem accept (tracheid and vessels); sclerenchyma; (2mks)
 3. A system of giving two scientific names to an organism (reject double naming system); (1mk)
 4. -a quire resources (food, water shelter);
 - Escape from predators;
 -to get mates;
 -To escape harmful stimuli;

Any two (2mks)
 To acquire energy for various activities; (1mk)

5. a.) Regulates the pace at which the heart beats; initiating and maintain contraction of the Heart; (1mk)
Any one (1mk)
 b) Prevents mixing of oxygenated and deoxygenated blood; (1mk)
 6.) To maintain osmotic pressure (and volume of its body fluid); Does not drink water; (2mks)

7. - Increase in the rate and force of contraction of heart muscle
 -release and break down of glucose;
 -Stimulates diversion of blood from alimentary canal and skin to selected muscles;
 -Increased rate and depth of breathing;
 -Dilation of the pupil.
 -stimulates conversion of fats to fatty acids;

Any three correct (3mks)

8. Gene for chondrodystrophic dwarfism / (Achondroplasia); (1mk)
 9. for growth and development;
 -reduces competition; -(pupal stage is non-feeding);
 -enables survival during unfavorable conditions; (pupal is encysted)

Any two (2mks)

- 10 a. Bordetella pertussis (1mk)
 b. Salmonella typhi (1mk)
 c. Treponema pallidum (1mk)

- I must follow binomial nomenclature rules
 -rej wrong spelling

- 11 a. -untreated sewage
 -Agrochemicals
 -industrial and domestic effluents
 -oil spillage
 -heavy metals
 -soil erosion

Any two correct (2mks)

- b. mark as per causes – mentioned in 11 (a) reject others.

Cause	Control
i.) Untreated sewage	- Treatment and proper disposal of sewage.
ii.) agrochemicals	- use right amount of fertilizes - use of organic manures - Use of biological control.
iii.) Industrial and domestics effluent	- Proper disposal
iv.) Oil spillage	- Use of pipeline to transport oil - Service of ships
v.) Soil erosion	- Control by terracing, crop rotation construction of gabions, planting cover crops trees

(2mks)

12. pitching – ploughing into water with headfirst; (1mk)
 Rolling- The rotation of the fish around its own axis

 rocking from side to side; (1mk)

 Yawning – lateral deflection of the body; (1mk)

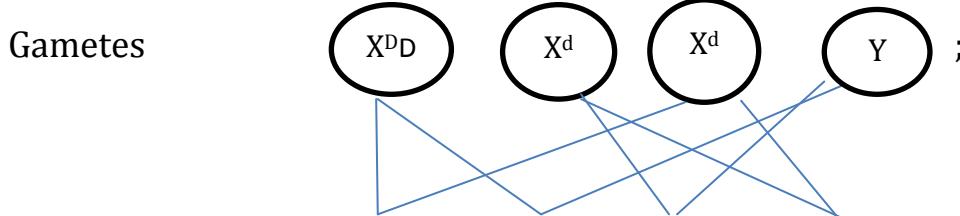
- 13 a) bubing nej budung; (1mk)
 b) Binary fission raj binary fusion; (1mk)
 c) spore formation /sporulation; (1mk)

- 14 a) B- coleoptile (1mk)
 D-Radicle (1mk)
 b) A and F (2mks)

- 15 a)- Contain air for gaseous exchange;-
 - Air reduce density giving buoyancy/floating; (2mks)
 b)- Excretion of excess salts; (1mk)
- 16 a) involve movement of water molecules from a region where they are highly concentrated (Hypertonic) to a region where they are lowly concentrated (hypertonic); (2mks)
 b) movement of substances from one part of cell membrane to another; (1mk)
- 17 a) mitochondria (1mk)
 b) corgi bodies (1mk)
- 18 a) tracheole; (1mk)
 b) - thin walls – reduce distance thus faster diffusion of gases;
 - Moist for oxygen to dissolve then diffuse; (2mks)
19. - form colloidal suspensions in water;
 - denatured by high temperatures (above 40⁰c);
 - are amphoteric (have both basic and acidic properties). (3mks)
20. To split water molecules; into oxygen and hydrogen atoms; (2mks)
- 21 a) chilopoda (1mk)
 b.) - two body parts (head and trunk);
 - A pair of legs per body segment;
 - dorsal ventrally flattened body;
 - A pair of antennal on the head; **Any two** (2mks)
22. Sodium; rej Na⁺
 Potassium; rej K⁺ (2mks)
23. (a) Presbyopia; (1mk)
 (b) Presbycusis (1mk)
- 24 a) competition for resources (1mk)
 b) structures from a common origin modified to perform different functions; (1mk)
 c.) structure which have ceased to be functional thus reduced in size; (1mk)
25. - Narrow to enhance capillarity;
 - Have lignin – for strengthening;
 - Have perforated walls to allow lateral movement of water;
Any two (2mks)
- 26 a.) Adenosine triphosphate rejects ATP (1mk)
 b.) Allows the passage of certain substances but prevents passage of others; (1 mk)
- 27 a.) sacrum; (1mk)
 b.) strong and firm to bear body weight; and spread it to the legs through the pelvic girdle; (2mks)
- 28 a.) Hawk: (1mk)
 b.) (i) Grass → zebra → wild dog; (1mk)
 (ii) Grass → rabbit → wild dog; (1mk)
29. - rapid cell division and elongation in dwarf varieties
 - stimulate development of ovaries to fruit;
 - induce parthenocarpy;
 - promote formation of side branches from lateral buds;
 - Inhibits sprouting of adventitious roots stem cuttings;
 - inhibits formation of abscission lawyerly reduce leaf fall;
 - breaks seed dormancy / activates germination enzymes; **Any three.** (3mks)
30. Contractions of heart muscles originate from heart themselves; while contractions of skeletal muscles are under nervous stimulation; (2mks)
- 31a.) - Have ciliva which waft the ovum towards uterus;
 - Has smooth muscles which also aid in movement of ovum; (2mks)
 - (i) prolactin; (1mk)
 - (ii) testosterone; (2mks)
32. Plasmodium rapidly changes its coat antigens; thus resisting drugs meant to kill them ;(2mks)

KAMDARA JOINT EVALUATION TEST**MARKING SCHEME****231/2****BIOLOGY PAPER 2**

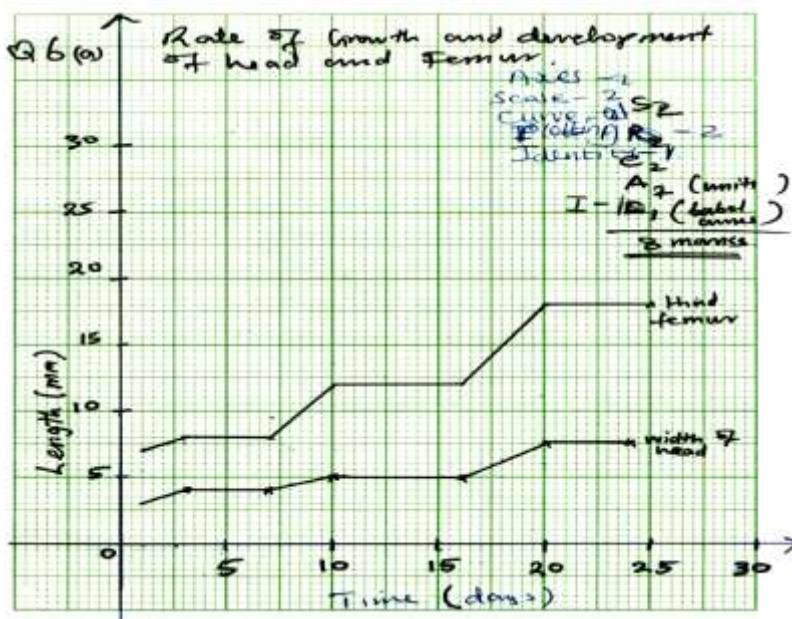
1. (a) Amnion;
 (b) Umbilical artery;
 Umbilical vein;
 (ii) U.veins U. artery
 Arteries nutrients; confein metabolic;
 And oxygen; wastes and carbon (IV) oxides
- (c) Shock absorber;
 (d) Closure of foramen ovale;
 Constriction of ductus arteriosu
- 2 (a) E – femur; F – Tibia
 (b) When one muscle contractise the other relaxes
 (ii) Muscle A Smooth muscle
 - Striated not striated
 - Multinucleated mononucleate cells
 - Voluntary involuntary
- (c) (i) Hinge joint
 (ii) Hinge joint Ball and
 -Max stretch is 180° allows movement in all planes
 one plane
- (d) Lubrication/ shock absorber;
- 3(a) (i) prothallus
 (ii) B Archegonium
 C –Antheridium
- (b)(i) The change/alternation between the gametophyte phase and the Sporophyte phase;
 (ii) Pteridophyta; Bryophyta;
 (c) Presence of cuticle;
 Vascular bundles; differentiated into roots, stems and leaves;
 (d) Produce male gametes that undergo fertilization to produce zygote which develops into the sporophyte phase;
- 4(a) potassium hydroxide;
 Absorbs carbon (IV) oxide (CO_2)
 (b) Production of CO_2 during respiration
 (C) Lime water
 (d) Clear;
 (e) To prevent the process of photosynthesis
 (f) To prevent CO_2 from micro-organisms in the soil;
- 5a) individual 2 - $X^D Y$
 Individual 4 - $X^D X^d$
 Individual 7 - $X^D Y$
 individual 9 - $X^D X^D$
- (b) Males have only one X – chromosome thus, no chance of heterozygous state since the gene is located on the non-homologous portions of the X – chromosome.
- (c) Parental phenotype Female x Male ;
 Parental genotypes $X^D X^d$ $X^d Y$;



$X^D Y^d$ $X^D Y$ $X^d Y$ $X^d Y^d$;

Phenotypic ratio: 1 normal: 1 normal: 1 afflicted: 1 afflicted male ;
 Male male female

6



- (b) (i) intermittent growth/discontinuous growth
 (ii) Phylum: Arthropoda: rej Anthropoda
 Reason: shows discontinuous growth
- (c) (i) length of the femur remains constant/ no change in length;
 Growth has not taken place due to presence of hard/rigid exoskeleton/cuticle; which limits expansions of tissue.
 (ii) Length of femur increase; because moulting/ecdysis/shedding of tissue.
- (d) Juvenile hormone;
 Moulting/Edyson hormone
- (e) To escape unfavourable environmental conditions;
 To reduce competition for resources nutrients;
- 7(a) Excess amino acids are deaminated in the liver. The products being amino group; and carboxyl group; carboxyl is channeled respiratory pathway to release energy; while amino groups combines to form ammonia; which then combines with carbon(iv) oxide to form urea in the ornithine cycle; urea is transported to the kidney for excretion.
- (b) The presence of excess glucose; stimulate the pancreas to secrete insulin; which on reaching the liver, stimulate the liver cells to:
 (1) Convert excess glucose to glycogen;
 (2) Convert excess glucose to lipids/fats;
- (3) Increase oxidation of glucose to produce energy; these reactions lower the level of glucose to the normal level; Low level glucose in the blood; stimulates the pancreas to produce glucagon; which on reaching the liver, glucagon stimulates liver cells to:
 1) Convert glycogen back to glucose;
 2) Lower the rate of oxidation of glucose;
 Glycogen raises the level of blood glucose to normal;
8. Water exist as film in the soil/ the soil particle; the concentrations of the cell sap of the root hair cells is greater than (hypertonic to) the surrounding solution in the soil; the osmotic pressure of the root hair cell sap overcomes the water retention capacity of the soil; causing roots hair cells to draw in water by osmosis; through cell wall and cell membrane;

Water drawn into the root hair cells dilutes the concentrations of the root hair cell sap; making root hair cell sap hypotonic/less concentrated than the adjacent cortical cells of the root; due to osmotic gradient water moves from the root hair cell into adjacent cortical cells by osmosis; water then moves within the cortex from cell to cell by osmosis; until the endodermis where it passes through by active transport; then into the root xylem; to the xylem of the stem; then to xylem of the leaves;

Water is pushed/rises up the stem by root pressure; in the xylem vessels water rises up by capillarity due to the narrower lumen of the xylem vessels; cohesive forces; and adhesive forces makes water molecules to move as a continuous uninterrupted column (transpiration stream) in the xylem vessels up to the leaves.

As water vapourises from the spongy mesophyll cells their cell sap becomes more concentrated // hypertonic than the adjacent leaf cells; this increases the osmotic pressure of the spongy mesophyll cells; as a result water flows into the spongy mesophyll cells from the surrounding cells; which in turn take in water from the xylem vessels in the leaf veins;

This creates a pull //suctions force// transpiration pull; that pulls the streams of water from the xylem vessels in the stem and roots. The transpirations pull maintains a continuous column of water from the roots to the leaves;

KAMDARA JET 2015
BIOLOGY MARKING SCHEME
231/3

Q1. (a) N – Hibiscus

The stamens are many/numerous; the filaments are partially fused; to form a staminate tube; they are below the stigma.

(b)

L – 2

D – 1

Mg – 1

4 mks)

Filament shorter than stamen

(c)



D – 1 rej. – shaded pollen grain

- no organelles seen
- double lines

Mg. x 100

(d)



D – 1 mk

Mg. x 100

(e)

M	N
- Smooth	Rough / spiked
- Small in size	Large / bigger

(f)

M	N
1. partially fused	petals are free
2. corolla is small	corolla is large/broad
3. petals have pointed tips	petals have rounded tips
4. inconspicuous nectar guides	conspicuous nectar guides

Q2. (a)

Test tube	Observation at start of experiment	Observation at the end of experiment
1	Blue black	Blue black
2	Blue black	Brown/retained colour of iodine
3	Blue black	Retained colour of iodine solution

(b)

Test tube 2	green / yellow
Test tube 3	orange / brown / red

- (d) There is a lot of reducing sugar; starch converted to simple sugar; by solution L; sodium chloride solution accelerated the action of solution L;
- (e) Enzyme / Diastase / Amylase;
- (f) Control experiment;
- (g) Optimum temperature / favourable temperature / hot temperature for enzyme action;

- Q3.
- (a) – kidney
 - (b) – A – cortex
B – medulla
C – pelvis
 - (c) - excretion
 - osmoregulation
 - ionic balance
 - regulation of Ph
 - (d) mark on the diagram
 - (e) (i) ultra-filtration
(ii) osmosis
 - (f) – nephritis
 - kidney stones
 - albuminuria / proteinuria
 - kidney failure

KAHURU /KIHARU DISTRICT JOINT EXAMINATION - 2015**231/1****BIOLOGY****PAPER 1****(THEORY)****JULY/AUGUST, 2015****TIME: 2 HOURS**

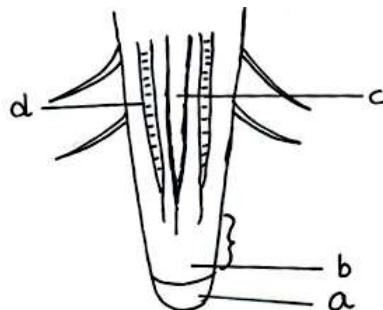
1. Name the branch of Biology that deals with the study of
 - (i) Microscopic organisms. (1 mark)
 - (ii) Fungi. (1 mark)
2. (a) Name the kingdom into which the prokaryotes are placed. (1 mark)

(b) State two characteristics used to classify arthropods in classes. (2 marks)

(c) A certain plant had the following characteristics:
 - Presence of roots, stem and leaves.
 - Found with sori on the under surface.
 - Life cycle in sporophyte and gametophyte generations.
 - Sporophyte generation being dominant.
 Name the division to which the plant belongs. (1 mark)
3. (a) Name **two** structures for gaseous exchange in aquatic plants. (2 marks)

(b) Explain why guard cells have thicker inner walls and thinner outer walls. (1 mark)
4. (a) Distinguish between homozygote and heterozygote. (2 marks)

(b) State **two** causes of variations. (2 marks)
5. State the functions of the following cell organelles.
 - (i) Nucleolus. (1 mark)
 - (ii) Centriole. (1 mark)
6. Name the causative agent of the following diseases.
 - (i) Cholera. (2 marks)
 - (ii) Candidiasis.
7. Define each of the following terms.
 - (a) Speciation. (1 mark)
 - (b) Natural selection. (2 marks)
 - (c) Divergent evolution. (1 mark)
8. (a) Study the diagram below and answer the questions that follow. (3 marks)



- (i) Label parts: a,b and c (1 mark)

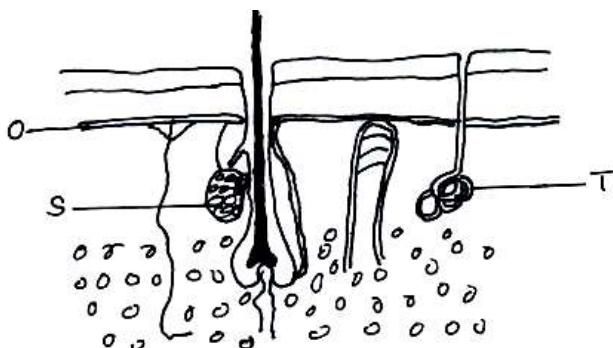
(ii) State function of part labelled **d**. (1 mark)
9. State **three** distinguishing features of mammalian rib bone. (3 marks)
10. Give **three** factors that determine the amount of energy a human being require in a day. (3 marks)
11. Name the antigens that determine human blood groups. (2 marks)
12. State the adaptation that enable red blood cell to move in blood capillaries. (1 mark)
13. (a) Give a reason why lumbar vertebrae have long and broad transverse processes. (1 mark)

(b) Which type of joint is found at articulation of pelvic girdle and femur? (1 mark)
14. Why is oxygen important in the process of active transport. (1 mark)
15. Study the reaction below.

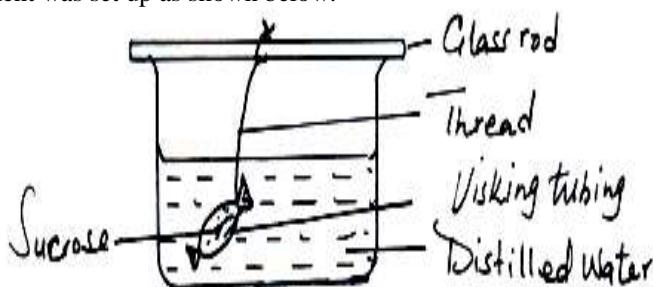
Hydrogen peroxide \xrightarrow{X} water and oxygen.

 - (a) Name enzyme X. (1 mark)
 - (b) Explain the importance of the above reaction in tissue of living organisms.(2 marks)
16. Give a reason why staining is important when preparing specimen for observation by use of light microscope. (1 mark)

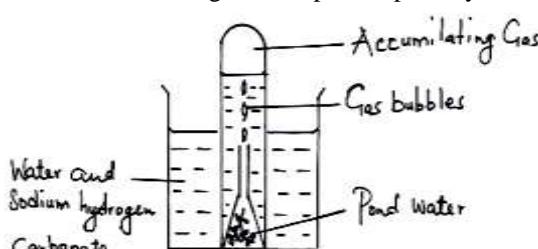
17. The diagram shows across section of mammalian skin.



- (a) Name parts T and S (2 marks)
 (b) State the function of part labelled S. (1 mark)
18. State **two** processes that occur during anaphase of mitosis. (2 marks)
19. What is the significance of meiosis? (2 marks)
20. State the site of production of progesterone. (1 mark)
21. An experiment was set up as shown below.



- The set up was left for 30 minutes.
- (a) State the expected results. (2 marks)
 (b) Explain the observation above. (2 marks)
22. How are leaves of submerged plants adapted for photosynthesis? (2 marks)
23. (a) The action of ptyalin stops at stomach explain. (1 mark)
 (b) State **two** factor that denatures enzymes. (2 marks)
 (c) Name the features that increase the surface area of small intestine. (2 marks)
24. The apparatus below are used to investigate an aspect of photosynthesis.



- (a) Name the aspect of photosynthesis being investigated. (1 mark)
 (b) How can one verify the identity of the gas that accumulates in test tube? (1 mark)
 (c) State the role of sodium hydrogen carbonate. (1 mark)
 (d) What environmental factor are required in order to give positive results? (1 mark)
25. (a) Name **two** forms in which carbon (IV) oxide is transported in blood. (2 marks)
 (b) What is tissue fluid? (1 mark)
26. How are the mitochondria adapted to their function? (2 marks)
27. State **three** structural differences between arteries and veins. (3 marks)
28. Name the hormone secreted by:-
 (i) Thyroid glands. (1 mark)
 (ii) Adrenal glands. (1 mark)
29. State the functions of the following parts of the ear.
 (a) Eustachian tube. (1 mark)
 (b) Cochlea. (1 mark)
 (c) Ossicles. (1 mark)
 (d) Semi circular canals. (1 mark)

30. Other than using quadrat method give two methods of estimating population of grass.

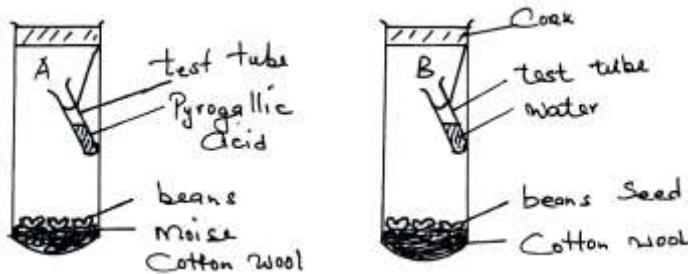
(2 marks)

KAHURU /KIHARU DISTRICT JOINT EXAMINATION - 2015

231/2**BIOLOGY****PAPER 2****(THEORY)****JULY/AUGUST, 2014****TIME: 2 HOURS**

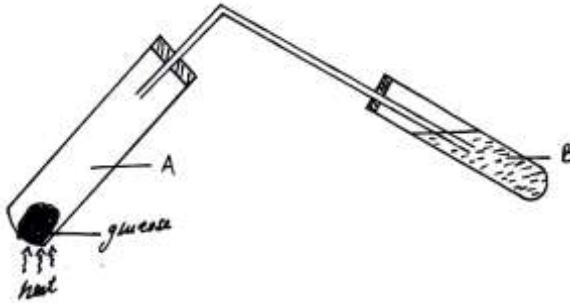
1. (a) Define the term sex linkage. (1 mark)
 (b) Name **two** sex linked traits in man. (2 marks)
 (c) In fruit flies (*Drosophila melanogaster*) inheritance of eye colour is sex linked. The gene for red eye is dominant. Across was made between homozygous red eyed female and white eyed male. Work out the phenotypic ratio of F_1 generation. (Use R to represent gene for red eyes). (5 marks)

2. In an experiment a group of students set up the test tubes as shown below.



- (a) What was the aim of the experiment? (1 mark)
 (b) Why was pyrogallic acid included in the gas jar **A**? (1 mark)
 (c) What results would you expect in each of the gas jar **A** and **B** at the end of experiment? (2 marks)
 (d) State **three** artificial ways of breaking seed dormancy. (3 marks)
 (e) Name **two** hormones that bring about rapid cell division in plants. (2 marks)

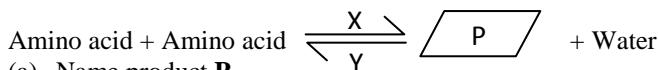
3. Students set up an experiment as shown below. Use it to answer the questions that follow.



- (a) What was the aim of the experiment? (1 mark)
 (b) What observation would be made in test tube **B**? (1 mark)
 (c) Explain the results in (b) above. (1 mark)
 (d) Write word equation for the process of anaerobic respiration in plants. (1 mark)
 (e) State **four** application of anaerobic respiration. (4 marks)

4. (a) Define a
 - (i) fossil. (1 mark)
 - (ii) vestigial structures. (1 mark)
 (b) Give **two** examples of vestigial structures in man. (2 marks)
 (c) List **four** evidences of organic evolution. (4 marks)

5. Study the equation below and answer the questions that follow.



- (a) Name product **P**. (1 mark)
- (b) Name the reaction represented by letter: X and Y (2 marks)
- (c) State the functions of the following enzymes.
 - (i) Pepsin. (3 marks)
 - (ii) Salivary amylase.
 - (iii) Enterokinase.

SECTION B:

6. In an ecological study a certain insect population and that of predators was estimated in a certain grassland over a period of 1 year (one year).

Month	J	F	MA	A	M	J	JU	A	S	O	N	D
No of insects	8	20	12	24	200	600	120	16	10	30	180	400
No of predator	10	8	2	4	16	30	10	4	2	2	5	20
Rainfall amount (mm)	20	6	55	350	500	250	12	10	25	190	240	30

- (a) Using the information above plot on the same axis the graph of number of insects and number of predators against time in months. (7 marks)
- (b) Suggest what happens to the insect's population during dry months. (2 marks)
- (c) Explain the relationship between the insect population and that of predators. (3 marks)
- (d) Suggest what happens to the predator's population during dry month. (2 marks)
- (e) Name the trophic level occupied by:- (3 marks)
- (i) Predator
 - (ii) Insects
 - (iii) Grass
- (f) Name the method used to estimate population of: (3 marks)
- (i) Predator
 - (ii) Insects
 - (iii) Grass
7. (a) (i) State **two** significances of transpiration. (2 marks)
- (ii) Discuss the forces involved in movements of water from roots to the leaves. (8 marks)
- (b) Describe the mechanism of opening and closing of stomata using photosynthesis theory. (10 marks)
8. Describe the adaptation of mammalian eye to its functions. (20 marks)

KAHURO/KIHARU DISTRICT JOINT EXAMINATION - 2015

231/3

BIOLOGY

PAPER 3

(PRACTICAL)

CONFIDENTIAL:

Each candidate should be provided with:

- Orange 1 piece (E).
- D.C.P.I.P 5cm³.
- Benedict's – access to.
- Dilute HCl – access to.
- Sodium hydrogen carbonate – access to.
- Copper (II) sulphate – access to.
- Sodium hydroxide – access to.
- Scalpel.
- Means of heating – access to.
- Test tube holder.
- Dropper.

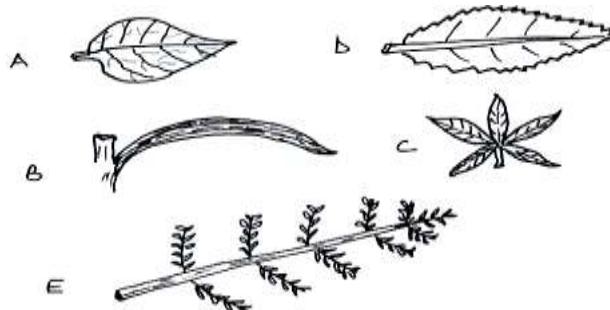
KAHURU /KIHARU DISTRICT JOINT EXAMINATION - 2015**231/3****BIOLOGY****PAPER 3****(PRACTICAL)****JULY/AUGUST, 2015****TIME: 1½ HOURS**

1. You are provided with Specimen E.
- Identify the part of plant the specimen belongs. (1 mark)
 - Give reason for your answer in 1(a) above. (1 mark)
 - Cut a transverse section of the specimen E and draw and label the parts of the specimen. (5 marks)
 - Calculate the magnification of your drawing. (1 mark)
 - State the type of placentation shown in the above specimen. (1 mark)
 - (i) Name the mode of dispersal. (1 mark)
 - (ii) Give reasons for d(i) above. (3 marks)
2. (a) Squeeze some juice from Specimen E to obtain juice E and use it to carry out food tests. Using the reagents provided.

TEST	PROCEDURE	OBSERVATION	CONCLUSION

(12 marks)

- (b) State the use of:
- Dilute hydrochloric acid. (1 mark)
 - Sodium hydrogen carbonate. (1 mark)
3. (a) The diagrams below shows leaves obtained from five different plants.



Using the key provided identify the plants from which the leaves were obtained in each case give the sequence of steps in the key which you followed to arrive at the identify.

- (a) Leaf simple ----- go to 2
(b) Leaf compound ----- go to 4
- (a) Leaf with parallel veins ----- Maize
(b) Leaf with network vein ----- go to 3
- (a) Leaf margin smooth ----- Bougainvillea
(b) Leaf margin serrated ----- Hibiscus
- (a) Leaflets emerging from one stalk like fingers ----- Bombax
(b) Leaflets emerging from several stalk attached to main stalk----- Acacia

Leaf	Steps	Identity
A		
B		
C		
D		
E		

(10 marks)

- (b) State **three** differences between the classes from which leaf A and leaf B were obtained from. (3 marks)

KAHURO/KIHARU DISTRICT JOINT EXAMINATION – 2015**231/1****BIOLOGY****PAPER 1****MARKING SCHEME**

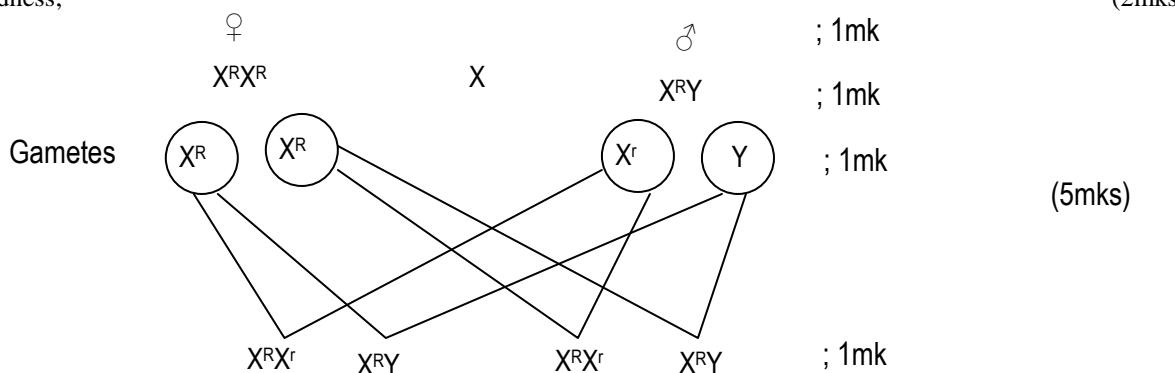
1. (i) Microbiology;
(ii) Mycology;
2. (a) Monera;
(b) - Number of body parts;
- Number of limbs;
- Presence or absence of antennae;
3. (a) - Stomata;
- Aerenchya;
- Pneumatophores;
- Epidermis;
- Cuticle;
(b) - Guard cells regulate the opening and closing of stomata, when they are turgid they bulge out and the thicker inner walls have a gap between them therefore opening the stomata;
4. (a) Homozygote is an organism containing a pair of identical alleles for a particular trait; while heterozygote is an organism having a pair of dissimilar alleles for a particular trait;
(b) - Meiosis or gamete formation / independent assortment of genes
- Fertilization;
- Mutation;
- Environmental conditions;
5. (i) Site for formation of Ribosomes;
(ii) Takes part during cell division; forming spindle app.
Helps in formation of cilia and flagella.
6. (i) Vibrio cholerae.
(ii) Candida albicans.
7. (a) This refers to the emergence or development of a new species of organism from a pre-existing one;
(b) The process by which the environment allows those organisms with favourable adaptive characteristics to survive, reach maturity and pass on favourable traits to offsprings; while at same time ensuring that those without favourable traits die young without passing on their traits to next generation;
(c) Evolution of homologous structures i.e. (structures of the same embryonic origin but have become modified in course of evolution to exploit a different ecological niche hence become structurally different);
8. (i) (a) Root cap;
(b) Apical meristem;
(c) xylem;
(ii) Translocation;
9. - Long and narrow;
- Curved shafts;
- Presence of capitulum and tuberculum;
10. - Age;
- Basal metabolic rate;
- Occupation;
- Activity;
11. - Antigen A;
- Antigen B;
- Rhesus factor / Antigen;
12. Flexible / able to change shapes;
13. (a) For attachment of powerful back muscles that maintain posture / flex the vertebral column / support abdominal organs;
(b) Bell and socket joint;
14. Oxygen is required for respiration that produces energy for active transport;
15. (a) Catalase;
(b) Hydrogen peroxide produced in aerobic respiration highly toxic; and must be broken into harmless substances, water and oxygen;
16. To make the specimen distinct / clearer / more visible;
17. (a) (i) Sweat gland;
(ii) Sebaceous glands;
(b) Responsible for sensitivity of skin to touch pain, pressure, heat and cold;

18. Sister chromatids separate / sister chromatid move to the opposite poles of spindle fibres; (1mk)
19. - Helps in gamete formation;
- Source of variation; (2mks)
20. - Ovary;
- Corpus luteum (1mk)
21. (a) - The visking tubing enlarges;
- Level of sucrose solution in visking tubing increases;
- Level of water in beaker decreases;
(b) - Water move from the beaker into visking tubing by osmosis; through the semi-permeable visking tubing, with hypertonic solutions;
22. - Have sensitive chloroplast that photosynthesize in low light intensity.
- Have branched leaves to increase the surface area;
- Have large air spaces for buoyancy / storage of air for gaseous exchange; (max. 2mks)
23. (a) Acidic medium due to the presence of hydrochloric acid; (1mk)
(b) High temperature rej. Temperature alone.
- Extreme change in PH rej. PH alone
(c) - Highly coiled;
- Presence of villi and microvilli; rej. Microvilli alone.
24. (a) Whether oxygen is produced during the process of photosynthesis;
(b) Using a glowing splint; when the splint is inserted into test tube it is relighted;
(c) To produce carbon (II) oxide;
(d) Presence of sunlight;
Optimum temperature; any one factor
25. (a) - Carbominohaemoglobin;
- weak carbonic acid;
- in blood plasma (in solution form);
(b) Blood plasma that lacks blood cells and plasma proteins;
26. Inner membrane is highly folded / have cristae to provide large surface area for attachment of enzyme; / respiratory reactions.
27. Arteries Veins
- Thick muscular walls
- No valves
- Narrow lumen
- Thin muscular walls;
- Valves present;
- Wide lumen; (3mks)
28. (i) Thyroxine; (1mk)
(ii) Adrenalin; (1mk)
29. (a) Balances pressure in middle ear to that of outer ear;
(b) Converts sound vibrations to nerve impulses;
(c) Transmit and magnify sound vibrations;
(d) Maintenance of posture and balance. (4mks)
30. - Belt transect;
- Line transect; (2mks)

KAHURU/KIHARU DISTRICT JOINT EXAMINATION – 2015**231/2****BIOLOGY****PAPER 2****MARKING SCHEME**

1. (a) Genes located on sex chromosomes and are transmitted along with those that determine sex; (1mk)
- (b) Colour blindness;
Haemophilia;
Hairy ears / pinna;
Baldness;

(c)



Phenotypic ratio => Red eyed males : Red eyed females;
1 : 1

2. (a) To show that oxygen is necessary for germination;
 (b) To absorb oxygen present in jar;
 (c) A – No germination occurred in A;
 B – Germination occurred;
 (d) - Scarification;
 - Soaking in Gibberelic acid;
 - Providing adequate water, oxygen moisture and appropriate temperature;
 - Boiling seeds in water;
 (e) - Gibberellins;
 - Auxins;
3. (a) To show that Carbon (IV) oxide is produced when glucose is heated;
 (b) A white precipitate was formed;
 (c) Carbon (IV) oxide combines with calcium hydroxide to form calcium carbonate that is insoluble.
 (d) Glucose \Rightarrow Ethanol + Carbon (IV) oxide + Energy. (1mk)

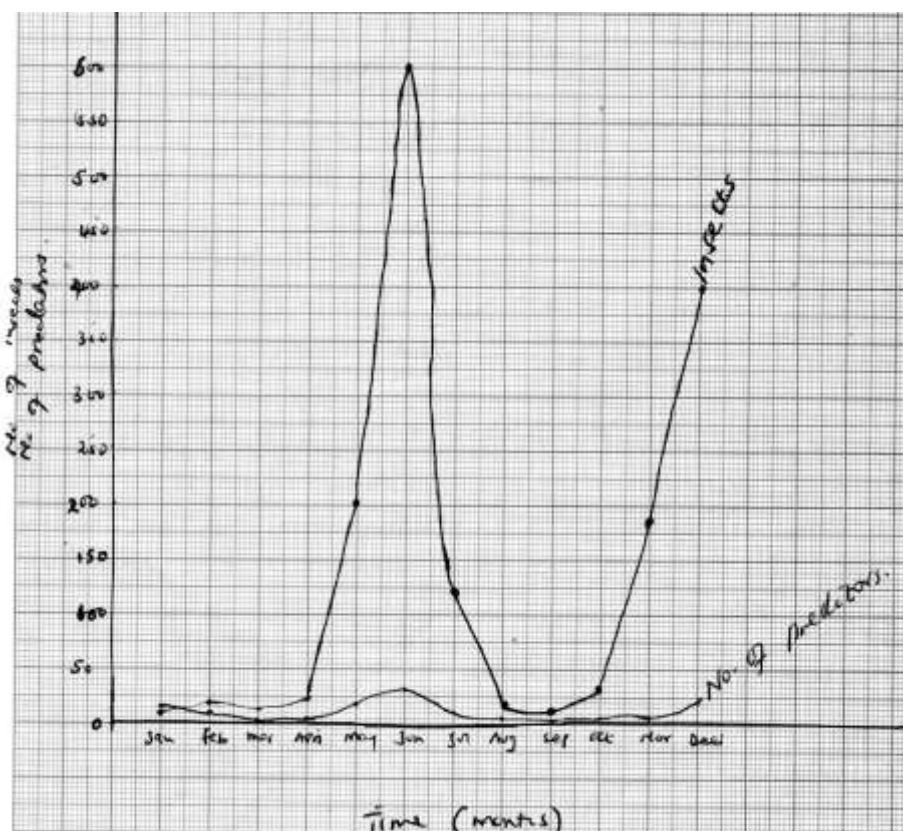
- (e) - Biogas production;
 - Treatment of sewage;
 - Manufacture of alcoholic drinks
 - Manufacture of milk products
 - Manufacture of organic acid
 - Leavening of bread (any 4 x 1 = 4mks)

4. (a) (i) Preserved remains of dead organism that lived in ancient times and were accidentally preserved under sedimentary rocks;
 (ii) Structure that are greatly reduced in size and have ceased to be functional; (1mk)

- (b) - Nictitating membrane;
 - Appendix;
 - Body hair;
 - Caecum;
 (c) - Comparative embryology;
 - Comparative serology;
 - Comparative anatomy;
 - Geographical distribution of organisms;
 - Fossil records; (any 2x1 = 2mks)

5. (a) dipeptide; (1mk)
 (b) X – Condensation; (1mk)
 Y – Hydrolysis; (1mk)
 (c) Pepsin breakdown proteins into peptides; salivary amylase breakdown starch into maltose; enterokinase activates trypsinogen into trypsin; (3mks)

6. (a)

Marks distribution

- ✓ Drawing of correct x and y axis with units. (2mks)
 - ✓ x and y axis scales. (2mks)
 - ✓ plotting of smooth curves for x and y. (2mks)
 - ✓ naming of the two graphs. (1mk)
- (b) Insect Population decrease; due to drying of grass hence less food and little habitat and camouflage from predators; migration, stiff competition for food; (2mks)
- (c) As the insect population increases the number of predators increases; due to adequate food; and as the insect population decreases the number of predators decrease due to less food; (3mks)
- (d) Decreases due to fewer insects hence less food; more competition (for food) hence migration or death which causes the population to decrease; (2mks)
- (e) (i) Secondary consumers;
 (ii) Primary consumers;
 (iii) Producers
- (f) (i) Capture recapture;
 (ii) Capture recapture;
 (iii) Qudrat / Belt transect
7. (a) (i) It serves to cool the leaves especially during hot environment;
 (b) It provides a mechanism through which mineral salts are transported in the plants;
 (c) Allows loss of excess water from the plants;
- b. Root pressure: This is the force which push water from the root to the stem.

Cohesion and adhesion force

Cohesion force – force which attracts water molecules together maintaining a continuous column of water preventing the break of water column.

Adhesion force – water molecules cling to the sides of the xylem vessels wall.

Capillary force – The forces of adhesion and cohesion are the basis of capillarity the rise of liquids in capillary tubes. Transpiration pull – as water evaporates from the cells on the exposed parts of plants, water molecules are drawn from the adjacent cells. Eventually those cells that are adjacent to the xylem vessels draw water from them by osmosis.

- c. The guard cells have chloroplasts; in presence of light; photosynthesis occur in the guard cells of stomata; producing sugar in guard cells; This increases the osmotic pressure of guard cells; water is drawn from the neighbouring cells by osmosis; causing turgidity of guard cells; the inner walls of the guard cells which are thicker than outer wall stretch more causing the guard cells to bulge outwards; stomata open.

In absence of light, no photosynthesis in guard cells; sugar in guard cells is converted into starch; osmotic pressure lowers; guard cell lose water to adjacent epidermal cells by osmosis; become flaccid; the inner

walls of guard cells shrink; the thicker wall reduces; this closes this stomata.

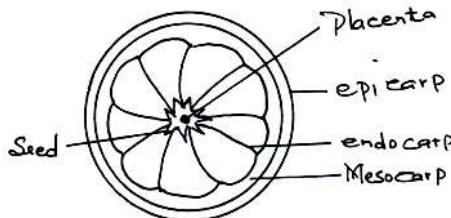
8. Adaptation of mammalian eye

- Have conjunctiva: colourless epithelium which protects the eyeball from mechanical damage, also enables the eyeball to move / rotate easily by secreting mucus;
- Cornea is transparent; to allow light into the eye and curved to refract light entering the eye;
- Have aqueous and vitreous humours; which are thin, aqueous and jelly like fluids; to allow light to pass through and refract light. The fluids also act as hydrostatic pressure maintaining the shape of eye ball.
They also contain sugars, salts and proteins that provide nourishment to the eye;
- The Iris; is opaque and contractile to control light intensity / amount of light entering the eye (by controlling the size of the pupil).
- Ciliary body; contains ciliary muscles; which are contractile for controlling the curvature and hence focal length of the lens; the ciliary body is also glandular to secret aqueous and vitreous humour;
- Presence of suspensory ligaments; are fibrous to hold the lens in position;
- Has transparent biconvex lens; to allow light to pass through and to refract light and focus it onto the retina.
- Retina; contains light sensitive / photosensitive cells which receive light and send impulses to the brain through optic nerves where image is focused.
- Has cones; which have iodopsin pigment; for colour vision / bright light, rods have rhodopsin for dim light vision.
- Fovea centralis; have high concentration of cones for accurate vision.
- Choroids layer; for nourishment of the eye, the layer is dark pigmented to stop / reduce light reflection and absorb stray light;
- Have tough fibrous sclera / scleroid / sclerotic layer to protect the eye.
- Optic nerves; contain sensory neurone for transmission of impulses from retina to the brain.
- Pupil; aperture through which light passes through.

(max. 20mks)

KAHURO/KIHARU DISTRICT JOINT EXAMINATION - 2015**231/3****BIOLOGY****PAPER 3****MARKING SCHEME**

1. (a) Fruits;
 (b) Has two scars; Has enclosed seeds.
 (c)



- A well drawn diagram (1mk)
- Any of four labelled parts.

(1 x 4 = 4mks)

Rej. drawing if shaded

$$(d) \text{ Magnification} = \frac{\text{Length of drawing}}{\text{Length of object}}$$

Range between x ½ to x 3 (1mk) NB:

- Measurements units must be shown.
- Final answer should have no limits.
- The X sign must appear.

- (e) Axile placentation;

- (f) (i) Animal;

- (ii) Seed have hard/slimy seed coat/to prevent digestion;
 Scented to attract animals;
 Succulent to attract animals;

Test	Procedure	Observation	Conclusion
Vitamin C	- Put 2cm³ of DCPIP in a test tube than add juice E drop by drop;	DCPIP is decolourised;	- Presence of vitamin C;
Reducing sugars	- Place 2cm³ of juice E into add benedicts solution and heat;	- Colour change from blue to green and finally to orange.	- Presence of reducing sugars.
Non reducing sugars	- Place 2cm³ of juice E into a test tube add a few drop of dilute HCl heat then cool. Add NaHCO₃ drop by drop until fizzling stops; Add benedicts solution and heat.	- Colour change from blue to green and then to orange.	- Presence of non reducing sugars.
Proteins	- Place 2cm² of juice E into a test tube. - Add sodium hydroxide and then copper (II) sulphate dropwise.	- Blue colour of copper (II) sulphate retained.	- No proteins.

- (b) (i) Hydrolyses non reducing sugars to reducing sugars;
 (ii) Neutralises the dilute HCl.

Leaf	Steps	Identity
A	1a, 2b, 3a;	Bounga budlen;
B	1a, 2a;	Maize;
C	1b, 4a;	Bombax;
D	1a, 2b, 3b;	Hibiscus;
E	1b, 4b;	Acacia;

(b) Differences

A dicotyledonae	B monocotyledonae
<ul style="list-style-type: none"> - Leaf with network venation. - Tap root system. - Vascular bundles arranged in a ring in the stem. 	<ul style="list-style-type: none"> - Leaf with parallel venation; - Fibrous root system; - Vascular bundles randomly arranged in the stem;

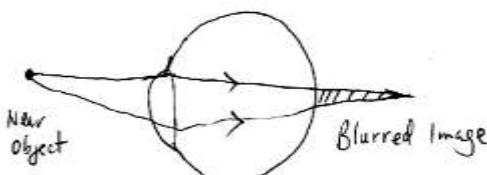
- Presence of pith in stem.

- Absence of pith in stem;

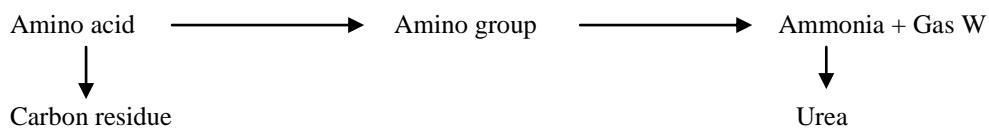
1Max 3 (3mks)

KURIA EAST SUB-COUNTY JOINT EXAMINATION COUNCIL 2015**231/1****BIOLOGY****PAPER 1****(THEORY)****JULY/AUGUST 2015****TIME: 2 HOURS**

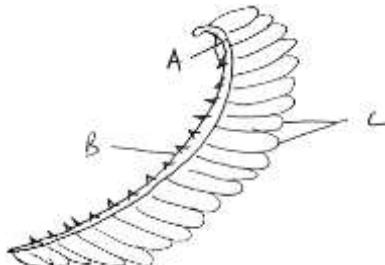
1. a) Identify **two** environmental factors that are necessary for germination of seeds. (2 marks)
b) Name **two** growth hormones in insects which influence their growth pattern (2 marks)
2. A process that occurs in plants is represented by the equation below
Glucose \longrightarrow Ethanol + Carbon (IV) oxide + Energy
a) Identify the process. (1 mark)
b) State **two** economic importance of the process in (a) above (2 marks)
c) Name the products that would be formed if a similar process occurred in animals. (1 mark)
3. a) Explain why
i) Blood group O is a universal donor. (1 mark)
ii) Blood group AB is a universal recipient. (1 mark)
b) i) Name the blood vessel that links arterioles to venules (1 mark)
ii) What is the adaptive advantage of arteries having a narrower lumen? (1 mark)
4. The diagram below represents an eye defect



- a) Name the above eye defect. (1 mark)
- b) Draw a labelled diagram to show the defect may be corrected. (2 marks)
- c) State **one** structural difference between a motor neurone and a sensory neurone. (1 mark)
5. a) A student from Kegonga used a microscope with X40 objective lens and X5 eye piece lens which had 2mm radius and counted 5 cells. Calculate the area of the field of view in micrometers (2 marks)
b) What is the average size of the cell in micrometers? (1 mark)
6. a) State **two** biological evidence of organic evolution. (2 marks)
b) What are analogous structures? Give an example. (2 marks)
7. a) Name the part of an organelle where the following occur;
i) Carbon IV oxide fixation (1 mark)
ii) Photolysis of water (1 mark)
b) State two functions of light in the process of photosynthesis. (2 marks)
8. Mr. Mwita has blood group AB and Mrs. Mwita is of blood group B heterozygous. Using the punnet square method work out the possible blood groups of their children. (4 marks)
9. a) Distinguish between tendons and ligaments. (2 mks)
b) State the reason why the pelvic girdle is more enlarged in females than males. (2 mks)
c) Name the structure on the pelvic girdle that allows entry of blood vessels and nerves. (1 mk)
10. a) State two roles of the testis in mammalian males. (2 mks)
b) Give the function of each of the following hormones in humans. (2 mks)
i) Testosterone
ii) Oxytocin
11. a) Name the causative agent of the following human diseases (2 mks)
i) Malaria
ii) Cholera
b) State **two** ways other than sexual intercourse through which HIV/AIDS is transmitted. (2 mks)
12. a) Explain how the Tracheoles of an insect are adapted to gaseous exchange. (3 mks)
b) Name the compound formed between haemoglobin pigment and the following gases in the human body. (2 mks)
i) Carbon IV Oxide
ii) Carbon II Oxide
13. a) Name a condition characterised by insufficient production of:- (2 mks)
i) Anti diuretic hormone
ii) Insulin
b) The process shown by a flow chart diagram occurs in the mammalian body



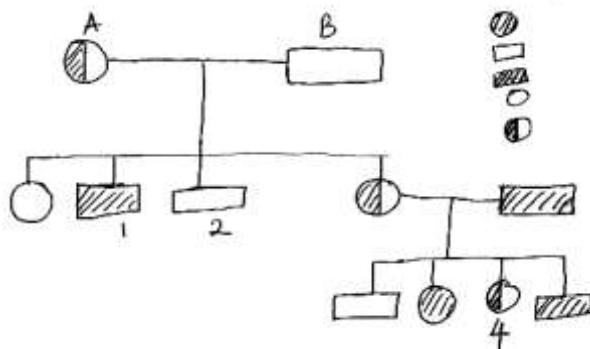
- i) Name the organ where the process occurs (1 mark)
 ii) Name the metabolic process that gives rise to gas W in the body (1 mark)
 b) Give a reason why ammonia is converted to urea. (1 mark)
14. a) A form three on a field trip collected termites and brought them to the laboratory. State two characteristics features that would enable her to group them under phylum arthropoda. (2 marks)
 b) State two distinguishing features of members of the phylum chordata. (2 marks)
15. Name the cell organelles that:- (3 marks)
- produce lysosomes
 - Contain chromosomes
 - Selectively control movement of substances in and out of the cell.
16. a) State two roles of irritability in living organisms (2 marks)
 b) Identify a suitable equipment that is used in collecting
- Small crawling organisms
 - Flying insects
17. a) How do the etiolated plant differ from the normal plant? (2 marks)
 b) State the significance of etiolation in plants. (2 marks)
18. a) Distinguish between natural and artificial immunity. (2 marks)
 b) State two ways through which a baby may attain natural immunity (2 marks)
19. a) Name two sites where gaseous exchange occurs in an aquatic plant. (2 marks)
 b) The diagram below represents a gill of a bony fish. Study it and answer the questions that follow.



- Give the function of each of the labelled parts A, B and C (3 marks)
 20. What is the effect of eating a meal with too much salt to urine production in man. (2 marks)

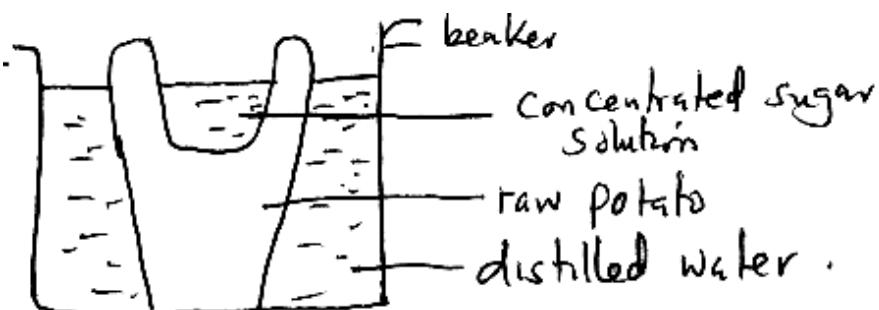
KURIA EAST SUB-COUNTY JOINT EXAMINATION COUNCIL 2015**231/2****BIOLOGY****PAPER 2****(THEORY)****JULY/AUGUST 2015****TIME: 2 HOURS**

1. The Haemophilia is an sex-linked recessive condition. The following pedigree shows a portion of a family in which members have haemophilia. Use H for non-haemophilia and h for hemophilia.



Key
 Haemophilic female
 Normal male
 Hemophilic male
 Normal female
 Normal carrier

- a) Identify the genotype of parents A and B. (2 marks)
 b) What is the genotype of offspring 1? (1 mark)
 c) A carrier woman marries a haemophilic man. What is the probability that, the couple will have a son who is haemophiliac?. Show your working. (4 marks)
 d) Name **one** defect of non-disjunction chromosomal mutation. (1 mark)
2. The diagram below represents a set-up to investigate a certain physiological process.



After some time the level of sugar solution was observed to have risen.

- a) What physiological process was being investigated. (1 mark)
 b) Account for the rise in the level of sugar solution. (4 marks)
 c) Suggest the result that would be observed if the experiment was repeated using a piece of boiled potato. (1 mark)
 d) Define the following terms
 i) Crenation (1 mark)
 ii) Turgidity (1 mark)
3. a) Give the differences between the following structures in wind and insect pollinated flowers. (6 marks)

PART **INSECT** **WIND**

Anther

Stigma

Pollen grain

- b) State **two** mechanism that hinders self pollination in flowering plants. (2 marks)

4. The diagram below represents epidermis of a leaf



- a) Name the parts marked E, F and G (3 marks)
 b) State **two** aspects of cell E that are an adaptation to its function. (2 marks)
 c) Describe the changes that would take place in E if the cells were placed in concentrated sugar solution for a long period. (3 marks)
5. a) Name an enzyme that is found in the saliva of man and state its function. (2 marks)
 b) Give the function of the following organs in digestion. (2 marks)
 i) The Tongue
 ii) The oesophagus
 c) State the PH in the following part of the digestive system. (3 marks)
 i) Mouth
 ii) Stomach
 iii) Duodenum
 d) Define the term assimilation. (1 mark)

SECTION B

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

6. In an ecological study a grass hopper population and that of crows was estimated in a certain grass land area over a period of one year. The results are as shown in the table below.
- | MONTH | J | F | M | A | M | J | J | A | S | O | N | D |
|----------------------|----|----|-----|-----|------|------|-----|----|----|-----|-----|-----|
| No. of Adult | 90 | 20 | 11 | 25 | 2500 | 1652 | 120 | 15 | 10 | 35 | 195 | 456 |
| Grasshopper X 10^2 | | | | | | | | | | | | |
| Number of Crows | 4 | 2 | 1 | 1 | 8 | 22 | 7 | 2 | 1 | 1 | 5 | 15 |
| Amount of rainfall | 20 | 0 | 320 | 350 | 520 | 350 | 12 | 10 | 25 | 190 | 256 | 350 |
- a) i) What is the relationship between the rainfall and grasshoppers population? (1 mark)
 ii) Account for the relationship stated in a (i) above (3 marks)
 b) Explain the relationship between the grasshopper and the crows population. (3 marks)
 c) If the data was used in the construction of pyramid of numbers, what would be the trophic level of:
 i) Grasshopper
 ii) Crows
 iii) The grass in the study area
 d) If the area studied was on a square kilometer, state
 i) One method that could have been used to estimate the grasshopper population. (1 mark)
 ii) One method that could have been used to estimate the crows population. (1 mark)
 e) Suggest what would happen if a predator for grasshoppers entered the study area. (2 marks)
 f) What is meant by the term carrying capacity? (1 mark)
 g) Why would the carrying capacity of wild gazelles in woodland be higher than that of cattle. (2 marks)
 h) What is ecosystem? (3 marks)
 i) Name **three** climatic factors which are abiotic. (3 marks)
7. Describe how the human skin is adapted to its function. (20 marks)
8. a) Describe the characteristics and functions of the three types of muscle found in mammalian body. (10 marks)
 b) Describe the influence of auxin on the shoot and root responses in seedling lying horizontally (10 marks)

KURIA EAST SUB-COUNTY JOINT EXAMINATION COUNCIL 2015

231/3

BIOLOGY**PAPER 3****(PRACTICALS)****JULY/AUGUST 2015****TIME: 1 $\frac{3}{4}$ HOURS**

1. a) Use the photograph of plant experiment to answer the questions that follow.



- i) Name the process being investigated. (1 mark)
 ii) Name the plant tissue involved in the physiological process illustrated above. (1 mark)
 iii) Name the physiological process involved in the process illustrated above. (1 mark)
 iv) How is the plant tissue named in 1 (a) (iii) above adapted to its function.
 b) Study photographs C and D and answer the questions.

Photograph C

Photograph D



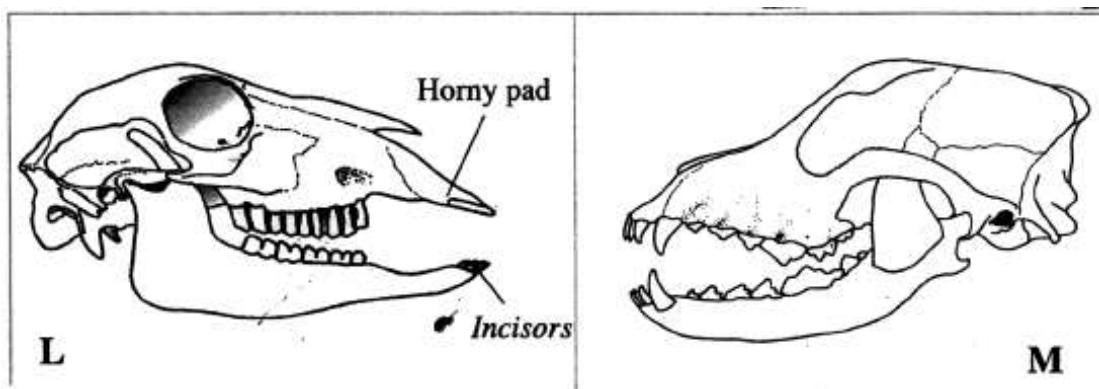
- i) With a reason state the agent of pollination of each of the flowers. (4 marks)
 ii) Classify the animal in photograph D using the taxonomic units below and reasons for your answer (4 marks)

Taxonomic unit**Reason**

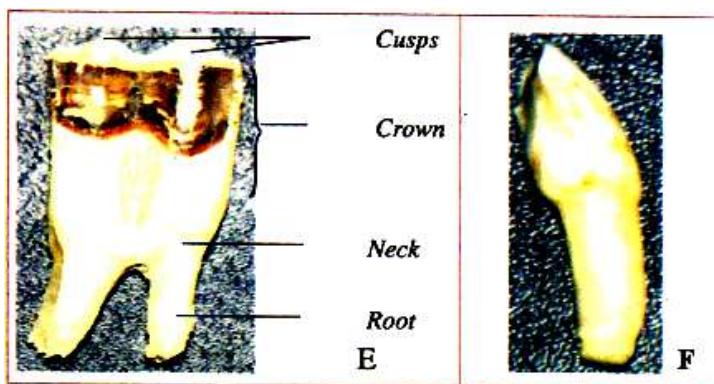
Phylum

Class

2. Below are photographs of specimen labelled L and M which were obtained from different animals. Examine them.



- a) Suggest the diet of each of the animals whose skulls are shown in the diagram. Give reasons for your answer (6 marks)
 b) Write the dental formula of the animal whose skull are shown in diagrams L and M. (2 marks)
 c) Examine the following diagrams labelled E and F.



- i) With reasons identify E and F
 Identify E (1 mark)
 Reasons (2 mks)
 Identify F (1 mark)
 Reasons (2 marks)
3. You are provided with a sample of food labelled P in solution form. Using the reagents, carry out tests on the food sample to identify the type of food substances present. (12 marks)

Food substance	Procedure	Observation	Conclusion
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KURIA EAST DISTRICT JOINT EXAMINATION COUNCIL
BIOLOGY PAPER 231/1
PAPER 1
MARKING SCHEME

1. (a) – Optimum temperature/Warmth
 - Water/moisture
 - Oxygen
- (b) Exdysone hormone/moultling hormone
2. (a) – Alcoholic fermentation/Aerobic respiration.
 - (b) Baking of bread
 - Alcoholic fermentation to make beer
 - Milk fermentation in dairy industry to make yoghurt
 - Making of compost manure
 - Production of organic acids such as acetic acid
 - Production of biogas
 - (c) Lactic acid + Energy
N/B Both products must be present to award a mark
3. (a) (i) Lacks antigens to react with the recipient's antibodies (to cause agglutination)
(ii) Has no antibodies to react with the donor's antigen (causing agglutination)
- (b) (i) To create/sustain higher blood pressure which moves the blood to all body parts from the heart.
4. (a) Long sightedness/Hypermetropia;

Motor neurone	Sensory neurone
(i) Cell body is medially located	(i) Cell body is terminally located
(ii) Is a multi-polar neurone	(ii) Is a bipolar neurone

$$\text{Radius in micrometers} = 2\text{mm} \times 100 = 2000\mu\text{m}$$

5. (a) Area = πr^2
 $= \frac{\pi}{7} \times 2000\mu\text{m}; \checkmark$
 $= 12,571,429\mu\text{m}$
- (b) Diameter of field of view $r \times 2 = 2\text{mm} \times 2 = 4\text{mm}$
 $4\text{mm} = 4000\mu\text{m}$
 $\therefore 1 \text{ cell} = \frac{4000\mu\text{m}}{5}; \checkmark$
 $1 \text{ cell} = 80\mu\text{m} \checkmark$
6. (a) – Fossil records/palaetology
 - Geographical distribution of organism
 - Cell biology/serology
 - Comparative embryology
 - Comparative anatomy
- (b) These are organs/structures with similar/different + embryonic origin but modified during the course of evolution to carry out similar function; for example the wing of a bird and that of an insect;
7. (a) (i) Stroma;
(ii) Grana

Gametes	♂	♀	BO✓	
	AB	X		
			A	B
			B ✓	AB
			AB	BB
			O	AO
				BO ✓

Reject if cross sign missing

; For crossing

For offspring genotypes

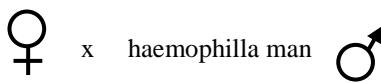
Total mks

9. (a) Tendons are fibres which attach muscles to bones while ligaments are fibres which attach bone to bone at a joint to strengthen the joint; ✓✓ Mark tied and awarded at the end
- (b) Females have a more enlarged pelvic girdle than males to facilitate passage of the head of a baby

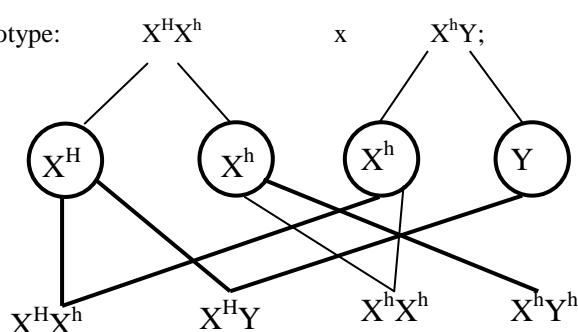
- during birth; ✓ while males do not give birth; ✓
- (c) Oburator foramen;
10. (a) - Offer site for spermatogenesis;
 - Site for production of androgens such as testosterone;
- (b) (i) Brings about secondary sexual characteristics in males;
 (ii) – Stimulate milk let down process
 - Stimulate onset of labour pains during birth;
11. (a) (i) Plasmodium falciparum
 Plasmodium ovale
 Plasmodium malariae
 Plasmodium vivax
 (ii) Vibrio cholerae;
- NB: RJ If binomial nomenclature rules are ignored.
- { Any one correct response
- (b) – Infected mother to unborn baby during birth
 - Infected mother to her suckling baby;
 - Use of contaminated surgical instruments e.g. syringe/injecting needle/circumcision knives
 - Blood transfusion using infected blood.
 - Deep kissing if both have wounds in the mouth.
 - Through open wounds if both the patient and the handler have wounds.
12. (a) – Being numerous to increase surface area over which exchange of gases occur.
 - Highly branched and spread throughout the insect body to deliver oxygen to body tissues.
 - Moist to dissolve gases being exchanged.
- (b) (i) Carbarnino haemoglobin;
 (ii) Carboxy haemoglobin;
13. (a) (i) Diabetes inspidus;
 (ii) Diabetes mellitus;
- (b) (i) Liver;
 (ii) Deamination;
 (iii) Urea is less toxic than ammonia hence requires less water for elimination from the body;
14. (a) – Segmented body/appendages;
 - Presence of an exoskeleton;
 - Number of body divisions;
 Mark first two
- (b) – Have a notochord at least in their developmental stages/embryonic stage.
 - Have a single dorsal nerve cord/spinal cord (enlarged to form the brain)
 - Have segmented muscle blocks/Myotomes
 - Have closed circulatory system with a ventrally located heart;
 Mark first two
15. (a) – Golgi body/apparatus;
 (b) – Nucleus
 (c) – Cell membrane;
16. (a) – Enable them escape from their predators/unfavourable to favourable environment.
 - Enable them search for food/mates
- (b) (i) Pitfall trap;
 (ii) Sweep net;
17. (a)
- | Etiolated plant | Normal plant |
|---|--|
| - Yellow in colour | - Green in colour |
| - Has elongated stem with long internodes | - Has shorter stem with shorter internodes |
- (b) Enables the stem to elongate faster exposing the leaves to move light needed for photosynthesis;
18. (a) Natural immunity is innate/inborn while artificial immunity is induced during immunization/vaccination
 (b) (i) By antibodies passing passively from the mother across the placenta to unborn baby/through breast milk/colostrums;
 (ii) When the baby suffers from a disease and recovers enabling the body to produce own antibodies;
 NB: Mark first two
19. (a) (i) – Stomata on leaves;
 (ii) – Pneuma pneumatophores/breathing;
- (b) A – Trap mud/solid matter in the water before passing over the delicate gill filaments.
 B (i) Provide firm attachment for gill rakers and gill filaments.
 (ii) Has blood vessels which carry away absorbed oxygen from the gill filaments.
20. Too much salt make the blood in the body hypertonic; hence more water is reabsorbed from the glomerular filtrate making urine produced less in quantity and highly concentrated;

KURIA SUB-COUNTY JOINT EXAMINATION COUNCIL 2015**BIOLOGY PAPER 231/2****PAPER 2****MARKING SCHEME**

1. (a) A. $X^H X^h$ (1 Mark)
 B. $X^h Y$ (1 Mark)
- (b) $X^h Y$
 (c) Phenotype: Carrier woman



Genotype: $X^H X^h$ x $X^h Y$; (4 Marks)



50% / $\frac{1}{2}$ tied to the correct working

- (d) Down's syndrome/Tuner syndrome/Kline felter's syndrome. (1 Mark)
2. (a) Osmosis; (1 Mark)
- (b) Sugar solution is hypertonic to the cell sap; Potato cell (in contact with sugar solution) loses water by Osmosis; making cells to draw water from other neighbouring cells (by osmosis); the process Continue until potato cells draws water from the beaker;
- (c) No change in the level of sugar solution; 1mk
 (i) Process by which red blood cell/animal cells lose water by osmosis when placed in hypertonic medium/solution;
 (ii) Process by which plant cell gain water by osmosis when placed in a hypotonic solution/medium until it becomes firm and rigid; (1 Mark)

3. (a)

PART	INSECT	WIND
Anther	Short/small firmly attached to filament	Long/large loosely attached to filament
Pollen	Large/hairy/spiky	Small/light/smooth
Stigma	Small/sticky	Large/feathery

- (b) – Protandry/Protogyny

- Dioecious;
- Monoecious;
- Heterostylous;

4. (a) E – Guard cell; (3 Marks)
 F – Stomatal opening/stoma;
 G – Epidermal cell;

- (b) Thick inelastic inner wall; thin elastic outer wall

- (c) Water would leave vacuole and cytoplasm by osmosis; They shrunk the cytoplasm draws away from the cell wall; the guard cell becomes plasmolysed;

5. (a) Ptyalin (salivary amylase)
 Function – Breaks down starch to maltose
- (b) (i) Tongue – Taste food
 - Push food to the back of the mouth. (1 Mark)
 (ii) It muscle contract and relax causing (peristalsis) which allow swallowing of food. (1 Mark)
- (c) (i) Alkaline;
 (ii) Acidic
 (iii) Alkaline; (3 Marks)
- (d) Incorporation and utilization of digested food substances in the body cells; (1 Mark)

6. (a) (i) Number of Grasshopper increases with increase in rainfall. (1 Mark)
 (ii) During rainfall; plant sprout; act as food for locust; Abundant food, they reproduce rapidly and number increases. (3 Marks)

- (b) Number of crows increases with increase in number of locust; crows feed on locust; As locust increase crows has abundant food; reproduce fast and increase in number. (3 Marks)

- (c) Grasshopper – Primary consumer
 Crows – Secondary consumer
 Grass – Producers (3 Marks)

- | | |
|---|-----------|
| (d) (i) Capture – recapture | (1 Mark) |
| (ii) Physical count | (1 Mark) |
| (e) Grasshopper reduces(some eaten or migrate) | (2 Marks) |
| Grass increases | |
| (f) Maximum number of organism an ecosystem can accommodate without depletion of resources. | (1 Mark) |
| (g) A woodland is a habitat where trees are the dominant plant form because of canopy grass may not grow enough to hold more cattle (grazers); Enough trees to sustain more gazelles. | (2 Marks) |
| (h) Ecosystem – A self – adjusting system that allow interaction between biotic and abiotic factors. | (1 Mark) |
| (i) Temperature; Light; Wind; Atmospheric pressure; water; Rainfall; Humidity; (any three) | |
| 7. - Cornified layer; made up of dead cell that protect against mechanical injury/desicators/entry of microbes; | |
| - Glandular layer; made up of living cells that gives rise to cornified layer; | |
| - The manlphigian layer; has actively living cells that give rise to new epidermal cells that contain melanin that protect the skin against ultraviolet rays; | |
| - Has hair which stand erect to trap air when cold low temperature to reduce heat loss/insulate/lies flat to allow heat loss when the temperature is high. | |
| - Has nerve ending; which are sensitive to stimuli/touch/heat/cold/poisonous/pain. | |
| - Has subcutaneous flat/adipose tissues/that insulate the body against heat loss. | |
| - Has arteries/capillaries blood vessels; that supplies oxygen/remove excretory product. | |
| - Arteries vasodilate when temperatures are high to loose heat by radiation/convection to loose heat by radiation/convection/vasoconvection when temperatures are low to which conserve heat. | |
| - Has sebaceous gland which secretes sebum an antiseptic/water repellant substance/prevent drying/cracking of skin/make skin supple. | |
| 8. (a) – <u>Skeletal muscles</u> | |
| - Attached on the skeleton. | |
| - Have strips running across them thus called striped or striated muscles. | |
| - Are multinucleated; | |
| - The covering of muscle fibre is called sarcolemma; | |
| - The functional unit of the muscle is the myofibrils; | |
| - The muscle innervated by the voluntary part of the nervous system. | |
| - <u>Smooth muscle</u> | |
| - Found on the walls of tubular visceral organs. | |
| - Cells are spindle shaped with a single nucleus. | |
| - Lack of striations. | |
| - Innervated by the autonomous part of nervous system (are involuntary) | |
| - <u>Cardiac muscle</u> | |
| - Each muscle fibre consist of short cells with centrally placed nuclei and numerous striated fibrils. | |
| - Ends of cells marked by intercalated discs. | |
| - Are myogenic and independent of nervous stimulations. | |
| - Capable of continuous contraction without fatigue; | |
| (b) ✓ Auxin is manufactured by the shoot tip; and translocated to other part of plant where it stimulate growth; | |
| - High auxin concentration stimulate growth on the shoot; but inhibit growth of the growth; | |
| - Movement of auxin is influenced by gravity; The lower part of a plant has high auxin concentration than the upper part; | |
| - Part of the shoot with high auxin concentrating grows more; than the part with low auxin concentration; which make the shoot to curve upward; this is negative geotropism ; | |
| - High auxin concentration in the root inhibit growth while low auxin concentration stimulate root growth; part with low auxin concentration grows more than the part with the high auxin concentration and hence are root curves downwards; This is positive geotropism; | |

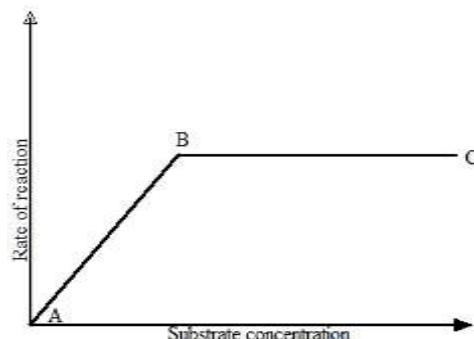
KURIA EAST DISTRICT JOINT EXAMINATION COUNCIL
BIOLOGY PAPER 231/3
PAPER 3
MARKING SCHEME

1. (a) (i) Translocation
(ii) Phloem tissue
(iii) Active transport/mass flow through diffusion.
(iv) - Have sieve plates that support the phloem tissue.
- Have sieve pores that acts as a pathway to allow movement of materials.
- Sieve tubes are cylindrical and joined end to end interconnected by cytoplasmic filaments.
- Sieve elements lack other cell components like nucleas.
- Has companion cells that have numerous mitochondria to supply energy needed for active transport.
- Presence of plasmodesmata between sieve elements and companion cells to facilitate movement of materials between.
- (b) (i) C wind – Inconspicuous petals/large anthers loosely attached to flexible filaments/long feathery stigma which hang outside the flower.
D – Insect – Large flowers with brightly coloured petals/produce nectar (insect on diagram)
Reason
(ii) Phylum Arthropoda - Jointed appendages/presence of exoskeleton/segmented body/
3 body parts (2 mks)
Class Insecta - 3 body parts/ A pair of antennae pair of compound eyes/spiracles for breathing.
2. (a) Skull L. Vegetation/grass/herbs/plants (1 mk)
Reasons
(i) Presence of diastema
(ii) Presence of horny
(iii) Pronounced cusps/ridges in the molars for grinding vegetation
Skull M – Flesh/meat/bones/carnivore rej. carnivorous
- Reasons
- Pronounced long curved sharp/pointed canines for grasping/grinding/tearing prey.
- Carnassial teeth for cutting and crushing bones.
- (b) I $\frac{0}{3}$ C $\frac{0}{1}$ PM $\frac{3}{3}$ M $\frac{3}{3}$ = 32
M I $\frac{3}{3}$ C $\frac{1}{1}$ PM $\frac{4}{4}$ M $\frac{2}{3}$ = 42
- (c) E – Molar tooth
Reasons
- Has two roots
- Cusps
F - Canine
Reasons
- Sharp
- Has one root

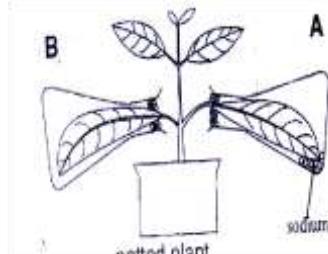
Food substance being tested	Procedure	Observation	Conclusion
Protein	To 2ml of food substance P, add equal amounts of Sodium Hydroxide solution. Shake then add Copper (II) Sulphate dropwise	Colour changes to purple	Protein present
Ascorbic acid/Vitamin C	To 1cm ³ of DCPIP in a test tube, add the food substance dropwise	DCPIP decolourises	Ascorbic acid present
Starch	Put 1cm ³ of substance P into a test tube. Add 3 drops of iodine solution	Colour changes to blue black/blue/black	Starch present

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015**Kenya Certificate of Secondary Education.****231/1****BIOLOGY****PAPER 1****FORM FOUR****JULY / AUGUST 2015****2 HOURS.****Answer all questions.**

1. (a) What is the function of centriole in a cell? (1 mark)
- (b) Name a cell organelle that would be abundant in a skeletal muscle. (1 mark)
2. State the importance of osmosis in plants. (3 marks)
3. State **two** functions of saliva. (2 marks)
4. Describe what happens during the light stage of photosynthesis. (3 marks)
5. The graph below shows the effect of substrate concentration on the rate of enzyme controlled reaction.

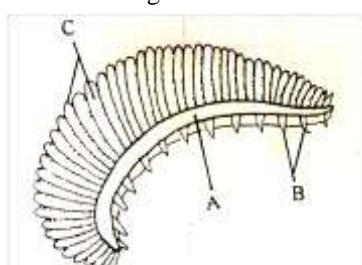


- (a) Account for the shape of the graph between B and C. (2 marks)
- (b) State **two** other factors that affect the rate of enzyme reaction. (2 marks)
6. State **three** roles of active transport in the human body. (3 marks)
7. A student set up an experiment as shown below. Study the set-up and then answer the questions that follow.



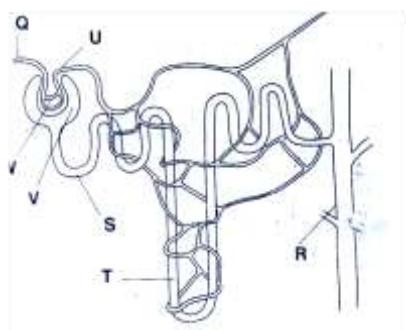
Before setting the experiment, the potted plant was kept in darkness over night.

- (a) Explain the importance of keeping the plant over night before the experiment. (1 mark)
- (b) What was the role of sodium hydroxide in the experiment? (1 mark)
- (c) What were the expected results at the end of the experiment? (2 marks)
8. Name the;
 - (a) Material that strengthens xylem tissue. (1 mark)
 - (b) Tissue that is removed when the bark of the dicotyledonous plant is ringed. (1 mark)
9. The diagram below shows the structures of a gill of a fish.

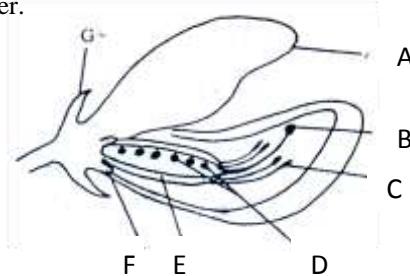


- (a) State **three** ways the structure labelled C are adapted for the function. (3 marks)
- (b) What is the function of structure labelled B? (1 mark)
- (c) In a body of fish, water flows along the gill filament in a direction opposite that of the blood. Explain the importance of this. (2 marks)

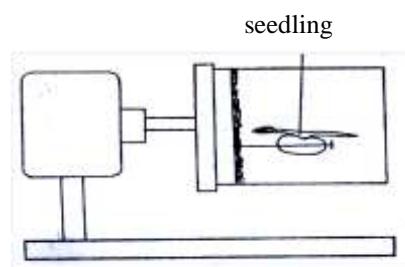
10. List **four** differences between aerobic respiration and photosynthesis. (4 marks)
 11. Explain the role of vasodilation in thermoregulation. (3 marks)
 12. Study the diagram below and then answer the questions that follow.



- (a) Name the structures labelled S and R. (2 marks)
 (b) When some pressure is applied at W, a fluid appears at V. Name the fluid formed at V. (1 mark)
 (c) State the structural difference between structure labelled Q and the one labelled U. (1 mark)
13. A student collected a bone from the school garden. The bone was measuring 45 cm. He drew the bone in his book and his diagram was 9 cm long.
 Calculate the magnification of his drawing. (2 marks)
14. (a) Distinguish between intraspecific and inter specific competition. (2 marks)
 (b) What is the meaning of a phrase "biological control of a population"? (1 mark)
15. Explain why the number of predators in any ecosystem is always less than the number of preys. (2 marks)
16. The diagram below shows half a flower.



- (a) Identify the structure that develop into a fruit wall after fertilization. (1 mark)
 (b) Name the structure labelled B and F. (2 marks)
 (c) What is the function of the structure labelled G? (1 mark)
17. (a) State **three** factors necessary for seed germination. (3 marks)
 (b) Name the tissue responsible for secondary thickening in plants. (1 mark)
18. (a) State **three** effects of dumping untreated sewage into a river. (3 marks)
 (b) Name **one** process that is responsible for loss of energy from one trophic level to the next. (1 mark)
19. What is meant by:
 (a) Adaptive radiation. (2 marks)
 (b) Organic evolution. (2 marks)
20. State the functions of the following parts of the mammalian ear.
 (a) Tympanic membrane. (2 marks)
 (b) Ear ossicles. (2 marks)
21. State the function of each of the following parts of a neurone.
 (a) Myelin sheath. (1 mark)
 (b) Node of Ranvier. (1 mark)
22. The diagram below shows a bean seedling pinned in a klinostat. Study the diagram and then answer the questions that follow.



Account for the observation made after 48 hours with the klinostat moving.

(4 marks)

23. State **four** functions of bones in mammals. (4 marks)
 24. Name **three** meristems in woody plants. (3 marks)

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015

Kenya Certificate of Secondary Education.

231/2

BIOLOGY

PAPER 2

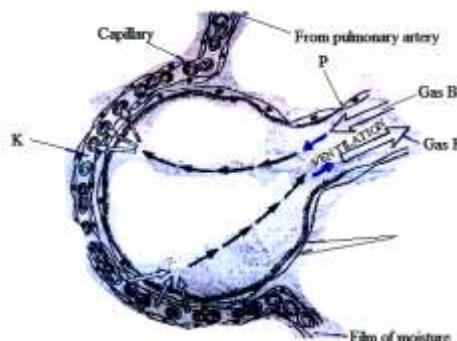
JULY / AUGUST 2015

2 HOURS.

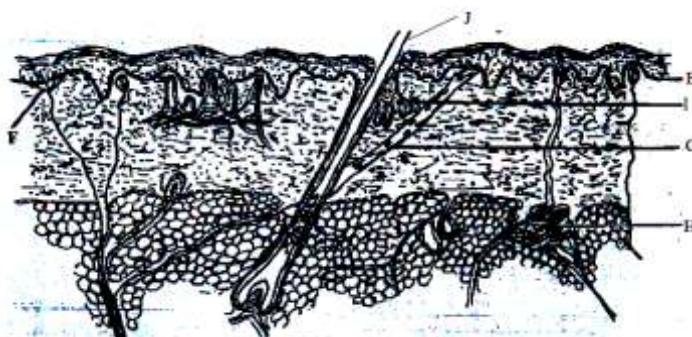
SECTION A

Answer all questions in this section in the spaces provided.

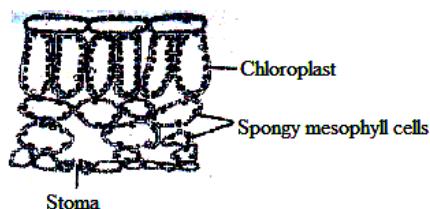
1. The diagram below shows the exchange of gases in the alveolus. Study it and answer the questions that follow.



- (a) Name the gases named F and B. (2 marks)
 (b) State the importance of the gas marked B in the tissue. (1 mark)
 (c) Name the parts marked K and P. (2 marks)
 (d) State the adaptations of the alveolus to its function. (3 marks)
2. In a family with four children three were found to have normal skin pigmentation while one was an albino. Using letter A to represent gene for normal skin pigmentation and a to represent the gene for albinism.
 (a) What are the possible genotypes of the parents? (1 mark)
 (b) Work out the genotypic ratio of their children. (5 marks)
 (c) Apart from albinism, name **two** disorders that are genetically inherited in human beings. (2 marks)
3. The diagram below shows a section through the mammalian skin.

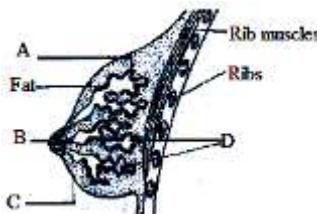


- (a) Name the parts labelled E, F, G and J. (4 marks)
 (b) State **two** functions in each case of the substances secreted by the structures labeled; H and I (4 marks)
4. (a) The figure below shows a section through a leaf. A leaf is designed for photosynthesis and this process provides a supply of simple sugars for a plant.



- (i) State the function of the chloroplasts in photosynthesis. (1 mark)
 (ii) Explain the advantage of the distribution of the chloroplasts as shown in the figure above. (2 marks)
 (iii) Suggest the function of the stomata and the spaces between spongy mesophyll cells in the process of photosynthesis. (1 mark)

- (b) (i) Name the tissue that transports the sugars made by photosynthesis to other parts of the plant. (1 mark)
(ii) Name the mineral ion that is used to form proteins. (1 mark)
(c) Explain the effect of light on the opening of the stomata. (2 marks)
5. The diagram below shows a section through the human breast during lactation.



- (a) (i) Identify each of the part labelled A and B. (1 mark)
(ii) State functions of the part labelled C and D. (2 marks)
- (b) (i) Define the term lactation. (2 marks)
(ii) Explain how lactation is initiated within the mammary glands. (3 marks)

SECTION B

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

6. An experiment was carried out to investigate the population growth of organisms under laboratory conditions. The procedure was as follows. Twenty young mice were placed in a cage. The amount of available food to the mice each day was kept constant. The results obtained were as shown below.
- | Time in months | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
|----------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| Number of mice | 20 | 20 | 65 | 115 | 310 | 445 | 450 | 190 | 145 | 160 |
- (a) Using a suitable scale plot a graph of number of mice against time. (6 marks)
(b) With reference to the graph account for the changes in mice population between;
- 0 - 2 months. (2 marks)
 - 2 - 10 months. (2 marks)
 - 12 - 16 months. (2 marks)
- (c) Between which **two** months was population change greatest? (2 marks)
(d) Calculate the rate of population change over the period you have named in (c) above. (2 marks)
(e) After the experiment some mice were fed to a snake near a laboratory. After some months the snake was found dead nearby. On analysis it was found out that its blood had an abnormal accumulation of a chemical X which was in small amount in the food the mice ate.
Explain why the snake died and not the mice. (2 marks)
(f) List **two** density dependant factors that affect population growth in an ecosystem. (2 marks)
7. (a) State **three** defects of the eye and how each can be corrected. (6 marks)
(b) How are the structures of the human eye adapted to their functions. (14 marks)
8. (a) Explain how terrestrial plants are adapted to deal with problems of transpiration. (10 marks)
(b) Explain the causes of seed dormancy. (10 marks)

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015
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231/3

**BIOLOGY
PAPER 3
(PRACTICAL)
JULY / AUGUST 2015**

CONFIDENTIAL

1. Supply each student with the following:

- Benedict's solution about 20 ml.
- Iodine solution about 20 ml
- 5 clean test tubes in a rack.
- Access to means of heating (can be shared)
- A test tube holder.
- 2 droppers.
- Visking (dialysis) tubing - about 9 cm
- A thread about 20 cm
- An empty beaker (100 ml)
- Measuring cylinders (can be shared) (250 ml cylinder)
- About 80 ml solution Y.
- About 40 ml solution X.
- Distilled water.

NB/ Solution X is distilled water.

Solution Y - Dissolved 20 gm of starch in warm water and stir completely. Add about 50 mg of glucose in 100 ml of distilled water.

2. No requirement.
3. No requirement.

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015**Kenya Certificate of Secondary Education.****231/3****BIOLOGY****PAPER 3 (PRACTICAL)****JULY / AUGUST 2015****1 $\frac{3}{4}$ HOURS.**

1. You are provided with liquids labelled X and Y. Spare about 10 ml of X and 50 ml of Y for part (b) of this question.

- (a) Using reagents provided carry out food tests for food substances in liquid X and Y. (6 marks)

Record your observation in table (I) below.

Table I

Liquid	Food substance	Procedure	Observation	Conclusion
X				
Y				

- (b) Using a thread, the one end of the visking tubing, open the other end of the tubing and half fill it with liquid X. Tightly tie the other end ensuring that there is no leakage in both ends. Immerse the tubing in the beaker containing liquid Y. Leave the set-up for atleast 30 minutes.

After 30 minutes remove the tubing from the beaker thoroughly wash the outside of the tubing to remove all traces of liquid Y. Using reagents provided carry out food tests in liquid X. In the visking tubing.

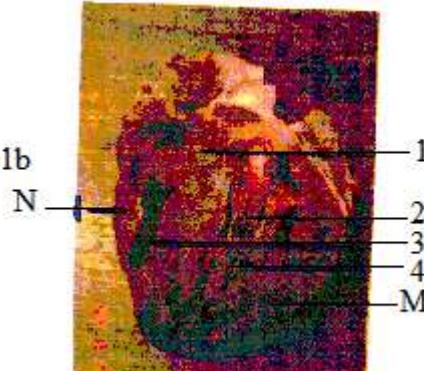
Record your observation in the table below. (2 marks)

Table II

Liquid	Food substance	Procedure	Observation	Conclusion
X				

- (c) (i) Name the physiological process being demonstrated by this experiment. (1 mark)
 (ii) State any two parts of a human body where the above named physiological process takes place. (2 marks)
 (iii) Account for the observation in table (II) above. (3 marks)

2. Study the photographs of organs in mammalian circulatory system and answer the questions that follow.

Photograph 2. 1a**Photograph 2. 1b**

- (a) Identify the organ whose photograph appears in 2.1. (1 mark)
- (b) Name the tissue marked W in the photograph 2.1a and state its function.
 Tissue W. (1 mark)
 Function. (1 mark)
- (c) The photograph 2.1b is a longitudinal section of organs in photograph 2.1a. Observe it and answer the questions that follow.
 (i) Name the parts marked 1, 2, 3, 4 and 4. (4 marks)

- (ii) Compare the thickness of arts marked M and N in photograph 2.1b and explain the difference. (2 marks)



- (d) Photograph 2.2 shows blood vessels labelled 5 and 6. Examine them carefully and answer the questions below.
- (i) Identify blood vessels labelled 5 and 6. (2 marks)
- (ii) State any **two** observable differences between blood vessels 5 and 6. (2 marks)

3. Use the photographs on plant responses to stimuli to answer the questions that follow.

The photograph shows various phenomena.

- (a) (i) State the type of response shown, the seedlings in photograph G.. (1 mark)



- (ii) Explain the mechanism of the response shown in question 3(i) above. (5 marks)
- (b) (i) Using observable features only compare the seedlings in photograph G and H. Record their differences in the table below. (3 marks)

Photograph G	Photograph H

- (ii) State the biological phenomenon shown by seedling in photograph H. (1 mark)
- (c) State the type of germination exhibited by seedlings in photograph I. Give reasons.



Photograph I

- Type of germination. (1 mark)
- Reasons. (2 marks)

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015

Kenya Certificate of Secondary Education.

231/1

BIOLOGY

PAPER 1

FORM FOUR

JULY / AUGUST 2015

2 HOURS.

Answer all questions.

Marking scheme

1. (a) Formation of spindle fibres / flagella / cilia ;
(b) Mitochondria ;
2. Absorption of water (from the soil) :
R: If water is combined with mineral salts
Movement of water from cell to cell ;
Mechanical support due to turgidity; Opening and closing of stomata ;Feeding in insectivorous plant ;
3. Lubricate food; Digest starch (to maltose) ;Provide an alkaline medium ;Softens food ;Moisten food ;Dissolves food ;
4. Light (energy) is absorbed by chlorophyll;Light splits water molecules / photolysis ; to form hydrogen ions and oxygen gas / molecules ;(Light is converted to ATP)
5. (a) All the active sites are occupied; hence the rate of reaction remain constant; (even when substrate concentration is increased)
(b) pH; temperatures ; Inhibitors / co-factors ;
6. Reabsorption of glucose and some salts in the kidney / kidney tubules; Absorption of digested food / mineral salts / vitamins from the alimentary canal. Excretion of waste products from body cells ;Reabsorption of useful materials in the blood stream ; Sodium pump mechanism in the cell ;
7. (a) To starch the plant ;
(b) To absorb carbon (IV) oxide in the flask
(c) The leaf in flask A will photosynthesise and produce starch ; Leaf in flask B will not photosynthesise due to absence of carbon (IV) oxide ;
8. (a) Lignin
(b) Phloem
9. (a) - Many thus provide a large surface area for gaseous exchange.
- Have thin epithelial lining hence reduce the distance over which gases have to diffuse ;
- Highly vascularised / rich blood supply for transportation of gases ;
(b) Prevent entry of food particles / trap ; particles that might damage the delicate filaments..
(c) This ensure that blood gets progressively oxygenated as it meets water that is progressively richer in oxygen ; This allows continuous diffusion of oxygen to blood from the water ;
10. Aerobic respiration

(i) Occur in all living cells in both plants and animals	Photosynthesis Take place in only plant cells (that have chlorophyll) ;
(ii) Take place (continuously) both in presence and absence of light	Take place only in presence of light ;
(iii) Involve breakdown of complex food molecules into simple molecules	Involves synthesis / manufacture of complex molecules from simple molecules ;
(iv) Uses Oxygen ;	Releases oxygen ;
(v) Releases energy	Stores energy in chemical bonds of organic molecules ;
(vi) Release carbon (IV) oxide and water	Uses carbon (IV) oxide and water ;
(vii) Takes place in the mitochondria	Takes place in the chloroplasts
11. When the blood vessels dilate more blood flows near the skin surface ; heat is lost from the blood through radiation ; This lowers body temperature ;
12. (a) S - Proximal convoluted tubule
R - Collecting duct

- (b) glomerular filtrate
 (c) Q has a wide lumen while U has a narrow lumen.

13. Linear magnification = Length of drawing

Length of object ;

$$= \frac{9}{45} \text{ cm}$$

$$= \frac{1}{5}$$

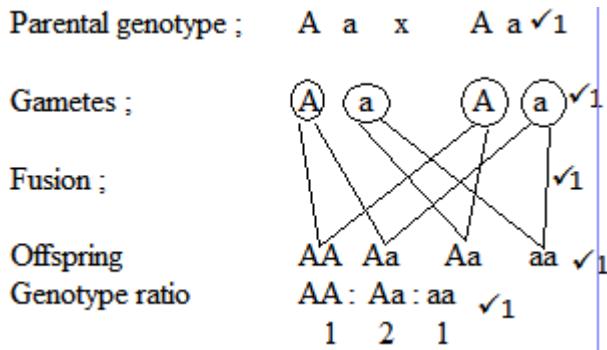
$$= X 0.2 ;$$

14. (a) Intraspecific competition is competition between members of the same species ; While interspecific competition involve members of different species ;
 (b) It is the use of natural enemies (such as predators, grazers or parasites) to control the population of unwanted species ;
15. This is because in a food chain organisms in the higher trophic level require more biomass of organisms in the lower trophic level for their support ; due to the fact that not all energy in one trophic level is passed to the next since some of it is lost ;
16. (a) Structure E
 (b) (i) stigma
 (ii) nectary / nectary glands.
 (c) Protect the flower during the bud stage
17. (a) - Water moisture
 - Optimum temperature
 - Oxygen.
 - Seed viability.
 Absence of hormones that stimulate germination;
 (b) Cambium ;
18. (a) Kill organisms in water ; Reduce amount of oxygen in water ; Reduce the quality of water for consumption ;
 Change water pH; Interfere with food chain / trophic level; Lead to Eutrophication ;
 Causes water borne diseases; Accept any three
 (b) Respiration / defecational / excretion;
19. (a) A situation where organisms have homologous structure / structures with a common embryonic origin which are modified to perform different functions ; to adapt the organism to different ecological habitats ;
 (b) It is emergence of present forms of organisms gradually from pre-existing ones;
20. (a) It receives sound waves (from air) and vibrates/ transform sound waves into vibrations ; to transmit them to ear ossicles.
 (b) Transmit / amplifies vibrations; from the tympanic membrane to the inner ear / fenestra ovalis / oval window;
21. (a) It insulates the axon.
 (b) It increases the speed of transmission of impulses.
22. Both the root and the shoot would continue growing horizontally ; thus is because the rotating klinostat ensured that all sides of the root and shoot got uniform exposure to gravity ; There was therefore uniform distribution of auxins ; causing a corresponding uniform growth on all sides of root and shoot ;
23. - They support the body off the ground and give it form and shape;
 - Bones work together with muscles to bring about movements;
 - Bones protect delicate internal organs.
 - Bones serve as storage sites for excess calcium and phosphorus;
 - Bones marrow of some bones are the site of formation of red blood cells;
24. Apical meristems ;
 Lateral buds;
 Vascular cambium;
 Cork cambium;

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015*Kenya Certificate of Secondary Education.***231/2****BIOLOGY****PAPER 2****FORM FOUR****JULY / AUGUST 2015****2 HOURS.****Answer all questions****MARKING SCHEMES**

1. (a) A - Carbon dioxide ; (Rej CO₂)
 B - Oxygen ; (Rej O₂)
 (b) Oxygen - Needed for tissue respiration to provide energy;
 (c) K - plasma rej. Blood
 P - Walls of alveolus
 (d) - Moist to dissolve gases which diffuse in solution form ;
 - Thin alveolus wall for gases to diffuse across a short distance;
 - Supplied with dense network of capillaries for the transportation of gases to end from exchange surface ;
 - Have large surface area to volume ratio to increase the rate of gaseous exchange ;

2. (a) Aa
 (b)



- (c) Sickle cell anaemia / hemophilia / colour blindness ; chondrodystrophic dwarfism / achondroplasia.
 3. (a) E - Malpighian layer
 F - Nerve endings
 G - Erector pili muscle
 J - Hair
 (b)(i) - Evaporates cooling the body;
 - Removal of excretory products;
 - Make hair / skin water proof.
 (ii) - Has antiseptic properties / kill bacteria
 4. (a) (i) Trap light energy and convert it to chemical energy's for photolysis of water // carbon (IV)oxide fixation ;
 (ii) Most chloroplast located in the palisade mesophyll which is nearer to the upper epidermis and thus exposed to more light // higher light intensity // optimum light intensity hence better rates // optimum photosynthesis.
 (iii) Allows entry of carbon (IV) oxide; which combines with hydrogen atoms (from light stage)to form glucose.
 (b)(i) Phloem
 (ii) Nitrogen
 (c) Light causes stomata to open ; in presence of light, photosynthesis occurs producing glucose which raises osmotic pressure of guard cells ; guard cell draw in water by osmosis from surrounding epidermal cells ; swell and eventually bulge causing stomata to open ; (Accept explanation of pH or ion exchange theories)
 5. (a)(i) A - Secretory cell
 B - Nipple
 (ii) C - Conduction of milk from the alveoli to nipple
 (during suckling of the baby)
 D - For temporary storage of milk.
 (b)(i) Secretion of milk for the new born baby by the mammary glands;
 (ii) During pregnancy increasing quantities of oestrogen and progesterone are secreted by the placenta, stimulating the secretory cells to become active ; Immediately after birth ; the sharp drop in progesterone stimulate pituitary glands to secrete hormone prolactin ; prolactin cause the milk secreting cells to release milk into the alveoli of the breast ;

6. (a) On the graph
 (b)(i) No increase in population, because the number of reproducing individuals are few ; and the mice are still adapting to the environment ;
 (ii) Rapid increase in population ; number of reproducing individuals is high ; due to suitable environmental conditions (accept examples) ; the mice have adjusted to the environmental conditions ; and very few are dying (no environmental resistance ;)
 (iii) Rapid decline in population ; number of mice dying is greater than number of births ; environmental resistance sets in ; accumulation of waste which kill mice ; depletion of nutrients ;leading to death ; overcrowding leading to competition for food and space, food etc ;
 (c) 6th and 8th months.
 (d) $\frac{310 - 115}{2} = \frac{195}{2} = 98$ mice per month ;
- (e) The chemical is fat soluble ; and thus not eliminated with water soluble excretory wastes ;its concentration thus builds trophic level (bio accumulation) ; causing death to organisms at higher feeding levels.
 (f) Predation ; parasitism ; competition ; and disease infestation ;
7. (a) - Myopia / short sightedness ; corrected by using biconcave / diverging lenses.
 - Hypermetropia / long sightedness ; corrected by biconvex / converging lenses ;
 - Astigmatism ; corrected by use of cylindrical lenses with combined curvature
- (b) - Sclera ; tough / fibrous ; protect inner parts / give shape to the eye.
 - Conjunctiva ; thin transparent membrane ; protects cornea and eyeball from mechanical / pathogenic damage ;
 - Cornea ; transparent / curved ; allow light / reflects light into the eye.
 - Aqueous / vitreous fluids ; transparent / allow light / refracts light / maintain shape of the eyeball ;
 - Iris ; opaque and contractile ; controls light intensity / amount of light to the eye.
 - Lens ; transparent and biconvex ; to refract and focus light to the retina ;
 - Ciliary body ; contains muscles that relax and contract ; control curvature of the eye and secret humor ;
 - Suspensory ligaments; are fibrous; hold lens in position.
 - Choroids; contains blood capillaries; supply oxygen and nutrients to the eye;
 - Retina; contain light sensitive cells; receive light/where image is formed;
 - Optical nerves; contain sensory neurones ; transmit impulses from retina to brain ;
8. (a)- Leaves are modified to spines or thorns, to reduce surface area over which transpiration occurs ;
 - Some shed their leaves during dry season; to reduce surface area exposed for transpiration.
 - Some have thick, waxy cuticle; to minimise rate cuticular transpirations.
 - Some can roll (fold) their leaves; to reduce the rate of transpiration by exposing fewer stomata to environmental factors ; and reduce the leaf surface area exposed to transpiration.
 - Have sunken stomata ; which accumulate moisture in sub stomatal air spaces hence low diffusion gradient thus reducing transpiration rate; Some have reduced number of stomata ; hence low transpiration rate ; Since the surface for water loss is reduced ;
 - Some have reversed stomatal rhythm (opening stomata at night and closing them by day); to prevent excessive water loss by transpiration ;
 - Possession of very deep roots; to absorb water from deep in the soil e.g. Acacia.
 - Others have superficial roots which grow horizontally close to soil surface; to absorb water after a short / light shower of rain.
 - Possession of parenchyma cells in swollen stems and leaves; for storage of water of cactus with swollen stem.
 - Many leaves posses resin coating; to increase reflection of solar radiation hence low transpiration rate of olea spp, ziziphus spp.
- Total 24 mks (maximum - 10 mks)*
- (b) - Impermeable testa / seed coat prevent entry of water; and oxygen; for germination; prevents penetration of radicle / plumule.
 - Immature embryo; hence seed cannot germinate due to incomplete development;
 - Growth inhibitors; prevent growth by limiting enzymatic reactions;
 - Very high temperatures; denatures enzyme; very low temperature, make enzymes inactive; hence no growth.
 - Absence of water ; require to dissolve food.
 - Absence of oxygen; necessary for respiration.

GATUNDU NORTH SUB-COUNTY JOINT MOCK EXAM 2015*Kenya Certificate of Secondary Education.***231/3****BIOLOGY****PAPER 3****FORM FOUR****JULY / AUGUST 2015****2 HOURS.****Answer all questions****MARKING SCHEMES**

(a)	Liquid	Foods	Procedure	Observations	Conclusion
X		Starch ;	To the food substance add iodine solution ;	Colour of iodine solution remains / brown colour remains;	Absence of starch ;
		Reducing sugars;	To the food substance add Benedict's solution and heat/warm/boil/put in hot water bath ;	Blue colour observed /Benedict's colour remain /No colour change ;	Reducing sugars absent ;
Y		Starch	To the food substances add iodine solution.	Blue black /blue colour observed ;	Starch present ;
		Reducing	To the food substances add Benedict's solution and heat / warm/ boil / put in hot water bath	Colour changes to yellow/ orange / brown ;	Reducing sugars present

*Reject wrong spellings for reagents**Reject red as final colour in reducing sugars**12/2 = 6 mks*

(b)	Liquid	Foods	Procedure	Observations	Conclusion
X		Starch ;	To the food substance add iodine solution ;	Colour of iodine solution remains ;	Starch absent ;
		Reducing sugars;	To the food substance add Benedict's solution and heat.	Colour changes to green/ yellow / orange / brown ;	Reducing sugars present ;

(c) (i) Diffusion ; *1 mk*(ii) Ileum / small intestine ;
Placenta ; convoluted tubule ;
Lungs ; any two (*2 mks*)(iii) Initially X lacked both starch and reducing sugars but were present in solution Y. On immersing the visking tubing in solution Y reducing sugars whose molecules are small in size diffused through the pores of the tubing but starch did not ; This made contents in the tubing to test positive for reducing sugars and negative for starch ; *2 mks*2. (a) Heart / mammalian heart *1 mk*(b) Adipose tissue / Fat layer.
Acts as shock absorber ; protecting the heart (organ) from mechanical damage. *1 mk*(c) (i) 1 - Septum
2 - Valve tendons
3 - Right ventricle
4 - Left ventricle *4 mks*(ii) Part M is thicker than part N, part M pumps blood to the rest of the body organs while part N pumps blood to the lungs ; thus M is more muscular to generate higher pressure ; *3 mks*(d) (i) 5 - Artery
6 – Vein *2 mks*(ii) Vessel 5
Narrow lumen
Thicker layer of muscles
Regular lumen
Vessel 6
Wide lumen ;
Thin layer of muscles ;
Irregular lumen ; *3 mks*

3. (a) (i) (positive) phototropism. *1 mks*
(ii) Unilateral / unidirectional light causes lateral migration of auxins ; to the darkside; illuminated side therefore has less concentration of auxins than dark side ; Due to high concentration of auxins in the dark side there is more elongation / faster growth ;causing curvature ; towards light. *5 mks*
- (b) (i) Photograph G Photograph H
Have large green leaves Small yellow leaves ;
Have green stems Have white stems ;
Have short stems Have long stems ;
Have thick stems Have thin / slender stem ;
 any 3 (*3 mks*)
- (ii) Etiolation ; *1 mk correct spellings*
(c) Epigeal (germination) ; *1 mk*
Reason : The hypocotyl is curved / elongated ; cotyledons are above the soil surface / ground.
 2 mks

KANGEMA/MATHIOYA FORM FOUR JOINT EVALUATION

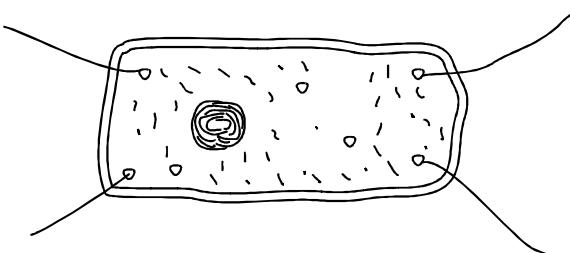
Kenya Certificate of Secondary Education

BIOLOGY

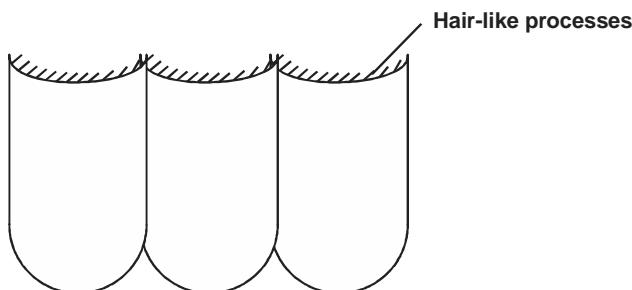
Paper - 231/1

July/August 2015**Time:** 2 hours

- 1.** The diagram below represents a bacterium cell.



- a) Name the kingdom to which the bacterium belong. (1 mark)
 b) State two distinguishing characteristics of the members of the kingdom named above. (2 marks)
- 2.** a) Name one element found in proteins but not in carbohydrates. (1 mark)
 b) State TWO functional roles of proteins in the body. (2 marks)
- 3.** The diagram below shows a type of epithelial tissue.

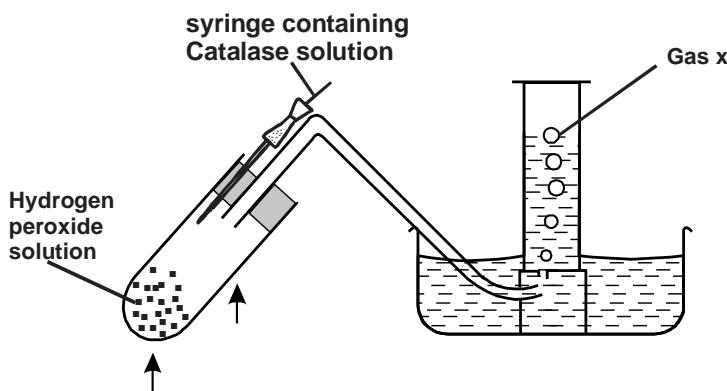


- a) State the possible functions of the hair-like processes on the tissue. (1 mark)
 b) Name two mammalian organs where this type of epithelium is found. (2 marks)
- 4.** State the major role of the following features of the mammalian vertebra.
 i) Odontoid process. (1 mark)
 ii) Neural canal. (1 mark)
 iii) Vertebral canal. (1 mark)
- 5.** a) In which phase of photosynthesis are carbohydrates formed? (1 mark)
 b) Explain the biological disadvantage of growing some aesthetic plants in the living rooms. (2 marks)
- 6.** A certain organ K was surgically removed from a rat. It was later found that there was a drastic increase in glucose level in the blood. When substance Q was injected into the animal the glucose in the blood went back to normal. Identify
 i) Organ K (1 mark)
 ii) Substance Q. (1 mark)
- 7.** When the tip of a plant is cut, lateral branches develop.
 a) What name is given to this phenomenon? (1 mark)
 b) Which plant hormone is responsible for the phenomenon above? (1 mark)
- 8.** The table represents certain aspects of the circulatory system in certain animals. Fill in the missing spaces. (3 marks)

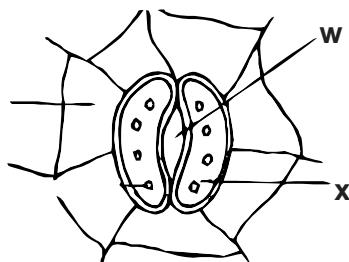
Heart	No. of atrium	No. of ventricles	Type of circulation
A	2	2	
B	2	1	
C	1	1	

- 9.** Name the tissue that carry out the following functions in mammals.
 a) Binds and supports various organs in the body. (1 mark)
 b) Transport oxygen throughout the body. (1 mark)
 c) Contract and relax to bring about movement. (1 mark)

10. The apparatus shown below was set up by form two students in a certain school.



- a) Name the gas X. (1 mark)
- b) Write a word equation for the reaction which produces the gas. (1 mark)
- c) Where in the human body does this type of reaction occur. (1 mark)
11. a) is the basic unit of the DNA (1 mark)
- b) Explain why it is genetically unwise for sisters to marry brothers or father to marry their daughters. (3 marks)
12. The diameter of the field of view of a microscope was found to be 6mm. There were 8 cells across the diameter of the field of view.
- a) Calculate the size of one cell in micrometer. (2 marks)
- b) State the difference between an electron microscope and a light microscope . (2 marks)
13. a) Name the components of the enamel of teeth. (2 marks)
- b) Name the diseases of the teeth characteristics by
- Formation of cavities in the teeth. (1 mark)
 - Gums become soft and flabby and bleeding of the gums occur. (1 mark)
14. a) Name three defects of the eye. (3 marks)
- b) Which structure in the ear detect:
- Change in posture (1 mark)
 - Sound waves. (1 mark)
15. What is the importance of a pooter to an ecologist? (1 mark)
16. The red blood cells lack mitochondria.
- a) How is this advantages to red blood cells? (1 mark)
- b) Apart from the reason stated above, give one other reason. (1 mark)
- c) State two other characteristics of the red blood cell. (2 marks)
17. If a solution of 0.9% salt solution is isotonic to a certain type of animal cell, explain what happens when the animal cell is placed in a solution of 1.2% salt solution. (3 marks)
18. Two glucose molecules combine to form the disaccharide sucrose. The molecular formula of glucose is $C_6H_{12}O_6$ while a single sucrose molecule has the molecular formula $C_{12}H_{22}O_{11}$. Account for the observation. (3 marks)
19. How is the dark stage of photosynthesis dependent to light stage. (2 marks)
20. A horse has 64 chromosomes in its somatic cells while a donkey had 62. A mule is produced when a horse mates with a donkey. However a mule is sterile.
- a) Work out the number of chromosomes in a mule. Show your working. (2 marks)
- b) Why is the mule sterile? (1 mark)
21. Name the three processes that takes place in the liver to bring about difference in composition of blood in hepatic portal vein and hepatic vein. (3 marks)
22. Explain why the rate of transpiration is reduced when humidity is high. (1 mark)
23. The diagram below shows part of the plant tissue.



- a) Name the cell labelled X and part labelled W. (2 marks)

b) State two adaptations of cell labelled X to its function.

24. The diagram below represents part of a mammalian respiratory system.



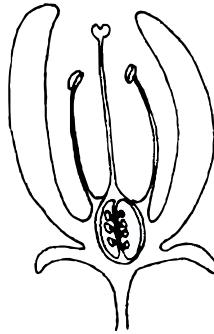
a) Name the structure. (1 mark)

b) State two observable ways in which the structure is suited to its function. (1 mark)

25. a) Define Eutrophication. (1 mark)

b) List two effects of Eutrophication in aquatic ecosystem. (2 marks)

26. Below is a simplified diagram of a flower.



i) Suggest its agent of pollination. (1 mark)

ii) Name the type of ovary shown above. (1 mark)

iii) Explain one observable mechanism that will hinder self pollination and fertilization in the above flower. (1 mark)

27. State two functions of muscles found in the reproductive system in females. (2 marks)

KANGEMA/MATHIOYA FORM FOUR JOINT EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/2

July/August 2015**Time:** 2 hours**SECTION A : (40 marks)****Answer ALL the questions in this section in the spaces provided.**

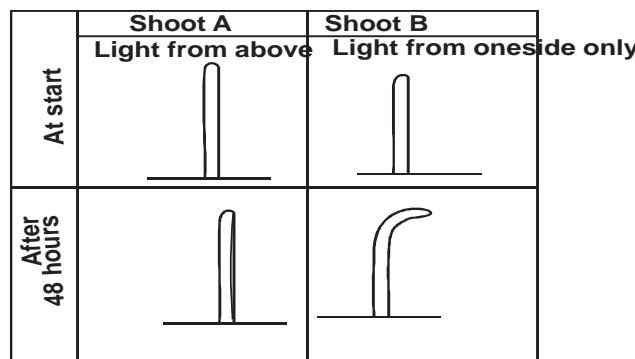
1. a) State four adaptive features that make schistosoma a successful endoparasite. (4 marks)
 b) Name the disease caused by the schistosoma. (1 mark)
 c) Complete the table below which shows some parasites and the disease they cause. (3 marks)

Parasite	Disease
i)	Malaria
ii)	Cholera
iii) Entamoeba histolytica	

2. a) What is mutation? (1 mark)
 b) Explain why certain bacteria and other pathogens become resistant to drugs after sometime. (2 marks)
 c) Work out a cross between a haemophilic man married to a carrier woman for haemophilia. (4 marks)
 d) State the phenotypic ratio of the children. (1 mark)
3. a) What problems are experienced by fresh water and marine fish in their habitats. (2 marks)
 b) Compare how the fresh water and marine fish overcome the problem identified above. (4 marks)
 c) Explain why a person discharge urine more often when the environmental temperature are low than when they are high. (2 marks)
4. A group of students set up the following experiments to investigate the factors that affect enzymes

Tube 1	Tube 2	Tube 3	Tube 4
Egg white Amylase / Ptyalin at 36°C	Boiled starch dilute acid Amylase 36°C	Boiled starch amylase 36°C	Boiled starch amylase 60°C

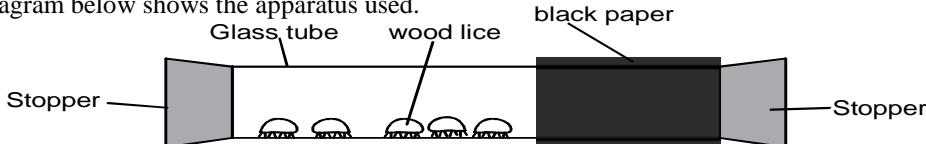
- a) Identify the property of enzymes being investigated in tubes 1 and 2. (2 marks)
 b) After 3 hours the students tested the content in the four tubes for starch. They obtained the following results in tube 2, 3 and 4.
 Tube 2 - Blue-black colour
 Tube 3 - Brown colour of iodine remained
 Tube 4 - Blue black colour.
 Account for the results obtained in tube 3 and 4. (2 marks)
- c) What results would you expect in tube 3 if temperature was maintained at 5°C? Give a reason for your answer. (2 marks)
 d) Name three enzymes found in the pancreatic juice. (3 marks)
- 5) In an investigation, young plant shoots were exposed to 48hrs of light from above or from one side only. Their growth responses are shown in the diagrams below.
- i) Name the response shown by the shoots and explain the advantages of this response to the plants. (1 mark)



- ii) Account for the growth response of **shoot B** after 48 hours.

- b) An experiment was set up to study the response of woodlice to light. Ten woodlice were placed in a glass tube. After five minutes one end of the tube was covered with black paper to make it dark. The number of woodlice in light and dark was then recorded every minute for five minutes.

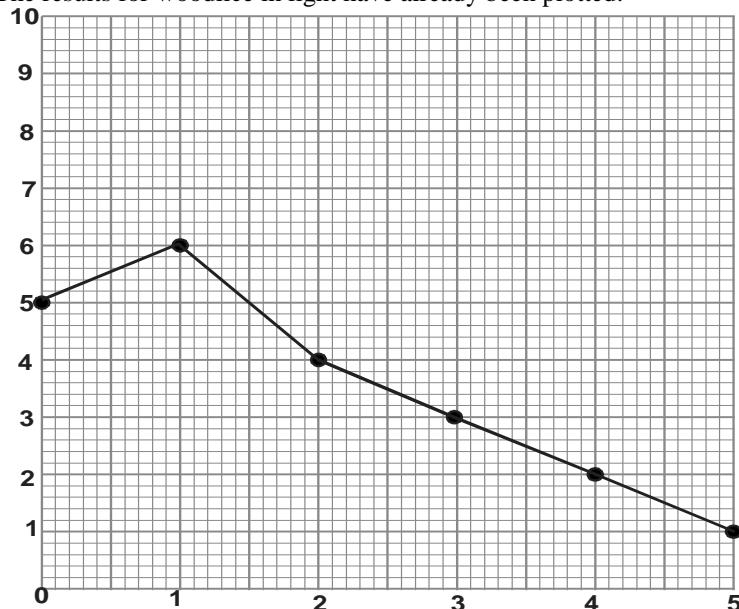
The diagram below shows the apparatus used.



The table below shows the results of the experiment.

Time		0	1	2	3	4	5
Number of woodlice	In light	5	6	4	3	2	1
	In darkness	5	4	6	7	8	9

- i) Why were the woodlice left there for five minutes before the pack paper was placed on the tube? (1 mark)
- ii) Complete the line graph on the grid below to show the number of woodlice found in the dark at each minute during the experiment. The results for woodlice in light have already been plotted. (1 mark)



- iii) State a conclusion which can be drawn from the results of this experiment. (1 mark)
- c) A student repeated this experiment.
- i) How could the design be changed to make the results more reliable? (1 mark)
- ii) State one environmental factor which would be kept the same to allow a valid comparison with the first experiment. (1 mark)

SECTION B (40 marks)

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

6. The percentage germination of certain seeds at different temperature was determined as follows.

Temperature (°C)	0	10	20	30	40	50
% germination	0	30	40	90	2	0

- a) Using a suitable scale plot a graph of % germination against temperature
- b) Account for % germination at
- i) 0°C (1 mark)
 - ii) 30°C (2 marks)
 - iii) 50°C (1 mark)
- c) What is seed viability. (2 marks)
- d) State the factors that determine seed viability. (4 marks)
- d) How can seed dormancy be broken. (4 marks)
7. a) Discuss gaseous exchange in alveoli. (8 marks)
- b) Describe the process of exhalation in mammals. (8 marks)
- c) Discuss the characteristics of gaseous exchange sites in an animal. (4 marks)
8. Define

-
- i) Chewing evolution. (2 marks)
 - ii) Organic evolution. (2 marks)
 - b) Giving examples give and account for any five pieces of evidence for organic evolution. (16 marks)

KANGEMA/MATHIOYA FORM FOUR JOINT EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/3

July/August 2015**Time:** 1 $\frac{3}{4}$ hours

1. You are provided with two specimens K1 and K2. The two specimens are similar except that they are at different stages of development.
- a) i) Name the plant part represented by the specimens. (1 mark)
 ii) Give one reason for your answer. (1 mark)
- b) i) State two differences between K1 and K2. (1 mark)
 ii) Name the hormone responsible for the differences in b(i) above. (1 mark)
- c) Cut a 20mm disc of K1 and place it in a pestle. Chop it into pieces and add 100ml of distilled water. Continue crushing and add a further 5ml of distilled water. Using a strainer, filter off the solution and label the filtrate as solution K1. Rinse the mortar and pestle thoroughly. Repeat the same procedure with K2 and label the resultant solution as K2. In K1 filtrate add some particles. (10 marks)

FOOD SUBSTANCE	PROCEDURE	SOLUTION	OBSERVATIONS	CONCLUSION

- 2.a) Construct a dichotomous key to key out the following organisms using the following steps (8 marks)



Step 1: Body covering

Step 2: Animal with 3pairs of walking limbs or more

Step 3: Animals with four pairs of legs

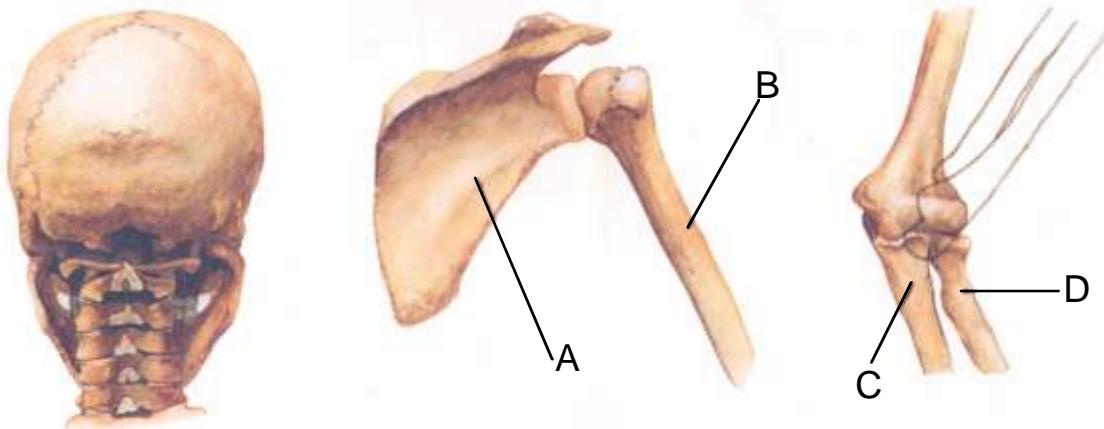
Step 4 : Number of walking limbs per segment.

b) With reasons state the class to which the organisms belong.

- i) S. gregaria
- ii) S. coleopata

(2 marks)

3. Use the photographs below to answer the question which follow.



- a) Name four types of joints found in the photographs. (4 marks)
- b) Name the bones labelled A, B and C. (4 marks)
- c) Name the cavity where
 - i) bone B fits into bone A. (1 mark)
 - ii) bone B fits into bone C and D. (1 mark)
- d) i) Name the fluid which is found in the joint area of two bones. (1 mark)
 - ii) State the function of the fluid named above. (1 mark)

KANGEMA/MATHIOYA FORM FOUR COMMON EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/1

July/August 2015**Marking Scheme**

1. a) Monera; 1mk
 b)
 - They are prokaryotic;
 - Have few organelles which are not membrane bound;
 - Have no mitochondria;
 - Have cell wall which is not made up of cellulose; ***1 × 2 = 2 marks***
2. a) Nitrogen; **1mark**
 b) Form haemoglobin for oxygen transport;
 - Form antibodies to protect the body;
 - Farm hormones to regulate body process;
 - Form enzymes which control reactions in the body; ***1 × 2 = 2 marks***
3. a) Move back and forth to help in the movement of materials; 1 mark
 b) - Trachea ;
 - Oviduct ;
 - Nasal cavity ; ***1 × 2 = 2 marks***
4. i) - Fits in the neural canal of the atlas to form a joint which allows for the rotation / turning of the head from side to side; ***1 mark***
 ii) Passage of the spinal cored ; ***1 mark***
 iii) For the passage of vertebral artery ; ***1 mark***
5. a) Dark stage ; ***1 mark***
 b) At night, plants carry out respiration oxygen is used up in the process while carbon (IV) oxide is given out; carbon (IV) oxide produced can cause suffocation to the occupants of the house;
6. Organ K - pancrease; ***1 mark***
 Substance P - insulin; ***1 mark***
7. a) Apical dominance; ***1 mark***
 b) Auxin ; ***1 mark***
8. A - double circulatory system ; ***1 mark***
 B - double circulatory system; ***1 mark***
 C - single circulatory system ; ***1 mark***
9. a) Connective tissue ; ***1 mark***
 b) Blood tissue ; ***1 mark***
 c) - Skeletal muscle tissue ; ***1 mark***
10. a) Oxygen gas; ***1 mark***
 b) $\text{hydrogen peroxide} \xrightarrow{\text{Catalase}} \text{Oxygen} + \text{water}$ ***1 mark***
11. a) Nucleotide ; ***1 mark***
 b) The practice increases chance of homozygosity of recessive / undesirable / lethal genes; leading to expression of such phenotypes in the offspring. This may lead to poor adaptation and survival of the offsprings; ***3 marks***
12. a)
$$\frac{Diameter\ of\ the\ field\ of\ view(\mu m)}{No.\ of\ cells}$$

$$\frac{6 \times 1000}{8} = \frac{6000}{8} = 750\ \mu m;$$

b)

<table border="1"> <tr> <td style="padding: 5px;">Electron microscope</td><td style="padding: 5px;">Light microscope</td></tr> <tr> <td style="padding: 5px;">-higher magnification</td><td style="padding: 5px;">lower magnification;</td></tr> <tr> <td style="padding: 5px;">-high resolving power</td><td style="padding: 5px;">lower resolving power;</td></tr> <tr> <td style="padding: 5px;">- uses a beam of electrons to illuminate the specimen;</td><td style="padding: 5px;">uses light to illuminate the specimen;</td></tr> <tr> <td style="padding: 5px;">- uses electromagnetic lens</td><td style="padding: 5px;">uses glass lens;</td></tr> </table> <p>13. - Calcium phosphate; 1 mark - Calcium carbonates; 1 mark</p> <p>b) i) Dental carries ; 1 mark ii) Periodontal disease ; 1 mark</p> <p>14.a) - Short sightedness (myopia); - Long sightedness (hyper metropia); - Astigmatism; - Squintedness; - Old sight / presbyopia; - Colour blindness ; - Cataracts ; 1 x 3 = 3 marks</p> <p>b) i) Semi-circular canal ; 1 mark ii) Cochlea; 1 mark</p> <p>15. Used for sucking small animals from rock surfaces/ tree barks for study. 1 mark</p> <p>16. a) To prevent them from consuming the oxygen they carry ; 1 mark b) To create room for haemoglobin packing ; 1 mark c) - have thin membrane to reduce distance covered by diffusing gases; 1 mark - have haemoglobin which has high affinity for oxygen; 1 mark - are flexible / can bend and twist to be able to pass through the capillary lumen any two marks</p> <p>17. The cell cytoplasm is hypotonic to the salt solution; the cell loses water by osmosis into the salt solution through the cell membrane ; it then shrinks and the cell (membrane) becomes crenated. 3 marks</p> <p>18. During condensation a water molecule is lost; leading to the loss of 2 hydrogen atoms / ions and an oxygen atom from the resultant disaccharide 3 marks</p> <p>19.- Receives hydrogen ions / atoms which reduces carbon (IV) oxide. - Receives adenosine tri-phosphate that provides energy rej ATP 1 x 2 = 2 marks</p> <p>20. a) $\frac{64}{2} + \frac{62}{2} = 32 + 31 = 63$ chromosome s ; 2mk</p> <p>b) No pairing of homologous chromosomes will take place during meiosis due to the odd number of chromosomes ; 1 mark</p> <p>21. - Deamination; - Detoxification; - Blood sugar regulation; 1 x 3 = 3 marks</p> <p>22. 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. any one 1 mark</p> <p>23. a) X - guard cell; W - stoma Rej stomata; 1 x 2 = 2 marks b)- have chloroplast that help in the process of photosynthesis; - have thin outer wall and thick inner wall to enhance bulging during opening of stoma 1 x 2 = 2 marks</p> <p>24. a) Alveoli ; 1 mark b) Highly vascularized to provide a large surface area for transportation of respiratory gases. (rej. one gas only) - Numerous to provide a large surface area for gaseous exchange. 1 x 2 = 2 marks</p> <p>25. a) Eutrophication - it is the process through which algae bloom due to presence of nitrates and phosphates in water bodies; 1 mark b)- Reduces oxygen concentration in water bodies hence killing aquatic animals; - reduces light penetration in water bodies; - makes fishing difficult max 2 marks</p> <p>26. i) Insect 1 x 1 = 1 mark ii) Epigynous 1 mark iii) Heterostyly - shorter stamens than pistils renders it impossible for the pollen grains from stamens to reach the stigma 1 mark</p> <p>27. - movement of ovum along the oviduct - contractions and relation of uterine wall / cervix to expel the foetus rej baby 1 x 2 = 2 marks</p>	Electron microscope	Light microscope	-higher magnification	lower magnification;	-high resolving power	lower resolving power;	- uses a beam of electrons to illuminate the specimen;	uses light to illuminate the specimen;	- uses electromagnetic lens	uses glass lens;
Electron microscope	Light microscope									
-higher magnification	lower magnification;									
-high resolving power	lower resolving power;									
- uses a beam of electrons to illuminate the specimen;	uses light to illuminate the specimen;									
- uses electromagnetic lens	uses glass lens;									

KANGEMA/MATHIOYA FORM FOUR COMMON EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/2

July/August 2015**Marking Scheme**

- 1.a) - have suckers for attachment;
 - has two hosts, water snail and human.
 - cercariae larvae have glands which secrete lytic enzyme to soften tissue of host and therefore allow for penetration;
 - some larval forms encyst and remain dormant and viable for a long time.
 - adult worm produce chemicals which protects it against host's defence mechanism

 $1 \times 4 = 4 \text{ marks}$ b) Schistosomiasis / bilharzia ; **1 mark**

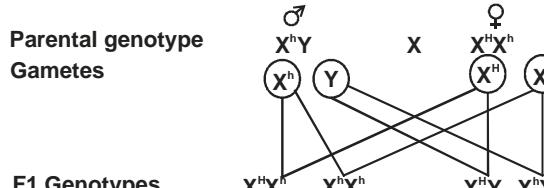
- c) i) Plasmodium; **1 mark**
 ii) Vibrio cholerae; **1 mark**
 iii) Amoeboid dysentery; **1 mark**

2.

- a) Mutation is a sudden / spontaneous change in the genetic make up of an organism; **1 mark**
 b) Bacteria that survive the drug will undergo mutation to produce bacteria which are resistant to the prevailing condition / drug **2 marks**

c) Reject if no cross (x)

Parental phenotype	Haemophilic man	Carrier woman
--------------------	-----------------	---------------



F1 Genotypes	$X^H X^h$	$X^h X^h$	$X^H Y$	$X^h Y$
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F1 Phenotypes	Carrier Male	Haemophilic Male	Normal Male	Hemophiliac Female
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d) Phenotypic ratio

1 normal male : 1 haemophiliac male : 1 haemophilic female : 1 carrier female.

3. a) Fresh water fish - osmotic influx of water in the fish causing dilution of protoplasm bursting of cells; **1 mark**Marine fish. Osmotic extraction of water from the body tissues leading to dehydration.; **1 mark**

b)

Fresh water fish

- High glomeruli filtration rate
- Numerous and large glomeruli
- Excrete large amount of dilute urine
- Nitrogenous waste very toxic e.g. Ammonia which need a lot of dilution
- Chloride secretory cells in the gills take up salts actively

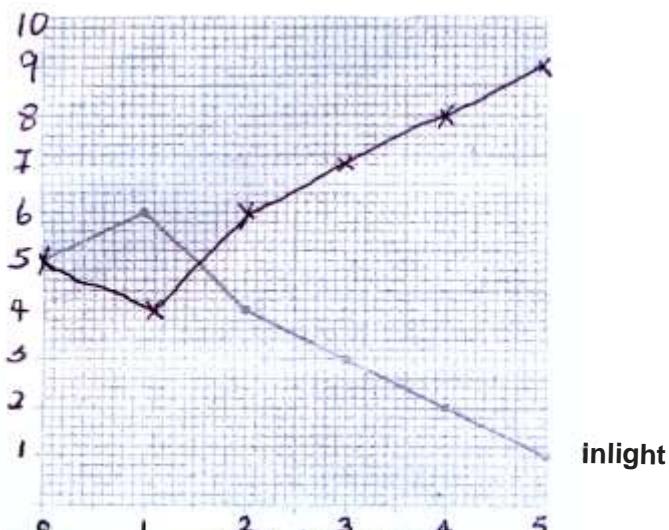
Marine fish

- Low glomeruli filtration rate
- Fewer and smaller glomeruli
- Excrete small amount of concentrated urine
- Nitrogenous waste less toxic which require less water for removal
- Chloride secretory cells excludes salts

c) When environmental temperature are low, water loss through sweating is reduced leading to increase in urine output; in high temperatures alot of water is lost through sweating leading to low urine output;

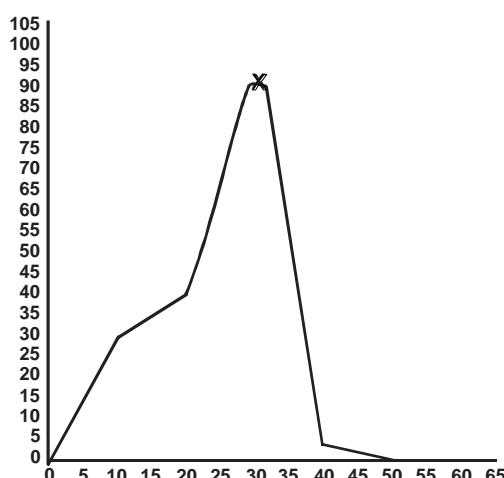
4. a) Tube 1 - Enzyme specify; **1 mark**Tube 2 - effect of pH on enzyme reactions ; **1 mark**b) Tube 3 - Enzyme amylase converted starch to reducing sugars ; hence no change **1 mk**Tube 4 - enzymes are denatured by high temperature; hence starch not hydrolysed ; **1 mark**c) Would turn blue black. Enzyme would be inactive at low temperatures hence starch not hydrolysed ; **1 mark**d) - Pancreatic amylase ; **1 mark**- Trypsin; **1 mark**- Pancreatic lipase; **1 mark**5.a) i) Positive phototropism allows plant shoots to obtain optimum light for photosynthesis **1 mark**

- ii) Light causes lateral migration of auxins to the darker side; the darker side has a higher auxin concentration than the light side, cells on the darker side grow and elongate faster causing the curvature towards light; **2 marks**
- b) i) to allow time for random distribution / uniform distribution of the woodlice; **1 mark**



- ii) Correct line graph drawn **1 mark**
- iii) Woodlice are negative phototactic; **1 mark**
- d) i) Put equal number of woodlice in dark and light compartments which are interconnected. **1 mark**
- iii) temperature **1 mark**

6. GRAPH SHOWING PERCENTAGE GERMINATION OF SEEDS AT DIFFERENT TEMPERATURES



1. labelled axes @ $1 \times 2 = 2$ marks
 2. Correctly scales - @ $1 \times 2 = 2$ marks
 3. Correctly plotted points **1mark**
 4. Smooth curve **1 mark**
- b) i) At 0°C all the enzymes are inactive; no hydrolysis of food in endosperm hence no germination; **2 marks**
- ii) At 30°C is the optimum temperature for enzyme action; all enzymes are active and enough food is hydrolysed to provide energy for germinating seeds; **2 marks**
- iii) At 50°C enzymes are denatured. No hydrolysis of food hence no germination; **1 mark**
- c) Ability of seeds to undergo germination; due to presence of a live embryo; **2 marks**
- d) Enzyme stratus of seeds;
Maturity of embryo;
Health status of seeds ;
Presence of germination inhibitors ; **4 marks**
- e) Allowing embryo to grow to maturity; scarification / break / wearing of seed coat; removal of germination inhibitors; provisions of moisture/ soaking ; **4 marks**
- 7.a) Gaseous exchange in alveoli **8 marks**

Lungs have numerous alveoli to increase S.A for diffusion of gases; Alveoli have thin membrane which minimize resistance against diffusion of gases.;

Blood flowing in the capillaries contains less oxygen and more carbon (IV) oxide since it is from the body tissues; Alveoli are supplied with air through bronchioles which link them to the trachea; Alveoli are supplied with many capillaries containing blood to transport gases; Air in the alveoli contains more oxygen and combines with haemoglobin, forming oxyhaemoglobin.;

Carbon(IV) oxide diffuses out of the blood into the alveoli; from where it is exhaled.

b) Process of exhalation in mammals **8 marks**

Internal intercostal muscles contract as external intercostal muscles relax; The ribcage moves downwards and inwards; Diaphragm muscles relax; diaphragm assumes its dome-shape; Volume of the thoracic cavity decreases; resulting in decrease in lung volume. Pressure in the lungs increases; Air is then forced out of the lungs; **8 marks**

c) Discuss the characteristics of gaseous exchange site in an animal (4 marks)

Thin membrane and epithelial lining for easy diffusion of respiratory gases; Highly folded surfaces to provide large surface area for the efficient diffusion of gases; Moist surfaces for dissolving the gases before they diffuse; Highly vascularised surface for sufficient transport of gases to maintain a high concentration gradient;

- 1.a) i) Chemical evolution maintains that chemicals like water vapour, oxygen, ammonia, hydrogen and methane were heated by catalytic effect of lightning during the cooling of the earth to form first life **2 marks**
 ii) Organic evolution refers to gradual, continuous and irreversible change in organisms over long periods of time that results in formation of new species from pre-existing simple forms **2 marks**

b) Fossil records;

Remains of organisms preserved in rocks for many years reveal gradual changes of structure from simple to more complex ones; e.g. evolution of man's teeth and skull, forelimb of horse etc.

Comparative anatomy;

Comparison of form and structure reveals remembrances of structures performing the same function e.g. nervous, digestive and reproductive system; homologous structures like pentadactyl limbs in vertebrates are similar although they perform different functions, analogous structures which are morphologically different but perform the same functions e.g. wings of insects and birds and the eyes of insects and mammals suggest common origin;

Comparative embryology;

Embryos of vertebrates show great structural similarity suggesting a common ancestor; they have long tails, and similar circulatory systems. The closer the resemblance between two organisms the closer their phylogenetic relationship;

Cell biology;

Structure and functioning of cells are similar; They have similar organelles, nucleic acids, ATP and membranes; closely related organisms have similar blood proteins suggesting similar origins e.g. man and apes; similar blood groups also suggest similar origin;

Geographical distribution;

Organisms originated from a common dispersal centre when the present continents were joined together. Continental drift occurred isolating the organisms which brought different patterns of evolution due to the need to adapt to the new conditions; e.g. Galapagos finches, Jaguars in Amazon and camels in Africa.

Comparative serology;

Analysis of blood proteins and the antigens; also reveal phylogenetic relationships. Species which are more phylogenetically related contain more similar blood proteins. During serological tests, the greater the amount of precipitate formed, the closer the phylogenetic relationship between the animal and the human being.

KANGEMA/MATHIOYA FORM FOUR COMMON EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/3

July/August 2015**Marking Scheme**

1. a) i) Fruits (1 mark)
ii) Have 2 scars **1 mark**

K1	K2
- Has green epicarp	- Yellow / yellow green epicarp
- Is hard	- Soft to feel
- Produces sap from epicarp	- Has no sap on epicarp
- No smell	- Has an aromatic smell

2 marks

- ii) Ethylene / ethene

- b) Food test

FOOD SUBSTANCES	PROCEDURE	SOLUTION	OBSERVATION	CONCLUSION
Starch	To a little /2cm ³ solution in a test tube add drops of iodine solution and shake	K1	Colour turns blue black	Starch present
		K2	Colour iodine remains	Starch absent
			Accept (slight) blue black	Little/traces of starch present
Reducing sugars;	To a little /2cm ³ of the solution and drops of Benedict's solution and heat in a hot water bath	K1	Colour of Benedict's solution remains	Reducing sugars absent
		K2	Colour turns orange /yellow	Reducing sugars present

2. 1. a) Body covered with exoskeleton go to 2
b) Body covered with feathers P. velatus
2. a) Animal with wings S. gregaria
b) Animals without wings..... go to 3
3. a) Animals with 4 pairs of legs C. Sapidus
b) Animal with 4 more than 4 pair of legs go to 4
4. a) Animals with 2 pairs of legs per segment S. gifan
b) Animals with 1 pair of legs per segment S. Coleopata

8 marks**NB:-**

- Order of steps should be followed
- Numbering in right format as above

- b) i) Class - insecta **1 mark**

Reason - 3 body parts **1 mark**

3 pairs of walking limbs

- ii) Class - chilopoda **1 mark**

Reasons - 1 pair of legs per segment **2 marks**

- 1 pair of antennae
- 2 body parts (head and trunk)
- Body dorsal - ventrally flattened (either 2)

3. - Immovable joint ; **1 mark**

- Ball and socket ; **1 mark**

- Hinge joint ; **1 mark**

- Gliding joint ; **1 mark**

- b) A - Scapula; **1 mark**

B - Humerus ; **1 mark**

C - Ulna ; **1 mark**

D - Radius ; **1 mark**

- c) i) Glenoid cavity; **1 mark**

ii) Sigmoid notch; **1 mark**

- d) i) Synovial fluid ; **1 mark**

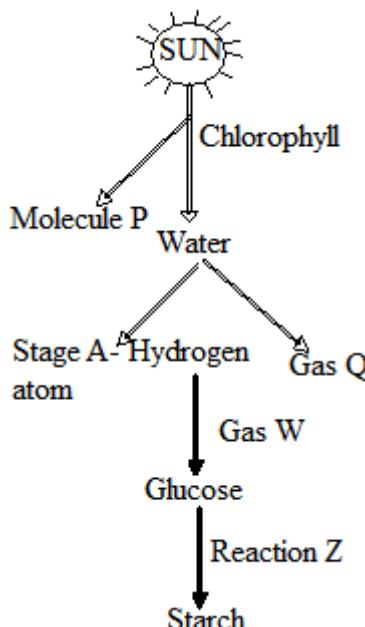
ii) Reduce friction as the bones move; **1 mark**

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015
KENYA CERTIFICATE OF SECONDARY EDUCATION

231/1
BIOLOGY
PAPER 1
FORM FOUR
JULY / AUGUST 2015
2 HOURS.

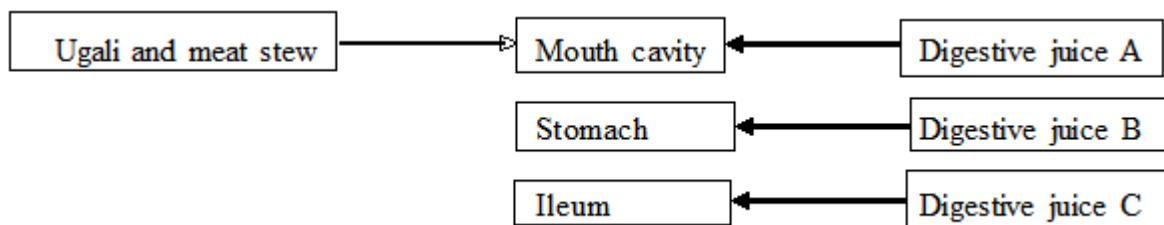
Answer all questions.

1. (a) Name the cell organelle which forms spindle fibres during cell division. (1 mark)
(b) Other than the function given in (a) above, state one other function of the organelle. (1 mark)
2. (a) State **three** characteristics of a wind pollinated flower. (3 marks)
(b) Explain why sexual reproduction is important to organisms. (2 marks)
3. Name the disease caused by the following parasite.
(i) Salmonella typhi (1 mark)
(ii) Entamoeba histolytica (1 mark)
4. The equation below represents a type of respiration.
 $C_6H_{12}O_6 \longrightarrow 2C_3H_6O_3 + \text{Energy}$
(a) Identify the type of respiration. (1 mark)
(b) Suggest **one** industrial application of the process named in (a) above. (1 mark)
5. Below is a diagrammatic summary of the main biochemical events in photosynthesis. Study it carefully and answer the questions that follow.



- (a) Suggest the identity of molecule P. (1 mark)
(b) Name the gas represented by letter W. (1 mark)
(c) Name the specific site for the reactions in stage A. (1 mark)
(d) Name reaction Z. (1 mark)
6. The reaction represented by the equation below occurs in the body.
 $\text{Hydrogen peroxide} \xrightarrow{\text{Enzyme Y}} \text{Oxygen} + \text{Water}$
(a) Name enzyme Y. (1 mark)
(b) Name an organ in the body where the reaction mainly occur. (1 mark)
(c) What is the significance of the reaction? (1 mark)
7. (a) Name **two** disorders in man that occur through gene mutation. (2 marks)
(b) Give **two** advantages of polyploidy in plants. (2 marks)
8. Define the terms.
(i) Organic evolution. (1 mark)
(ii) Vestigial structures. (1 mark)
(iii) Natural selection. (1 mark)

9. The diagram below represents passage of a metal through the human digestive system
Study the diagram and answer the question that follow.

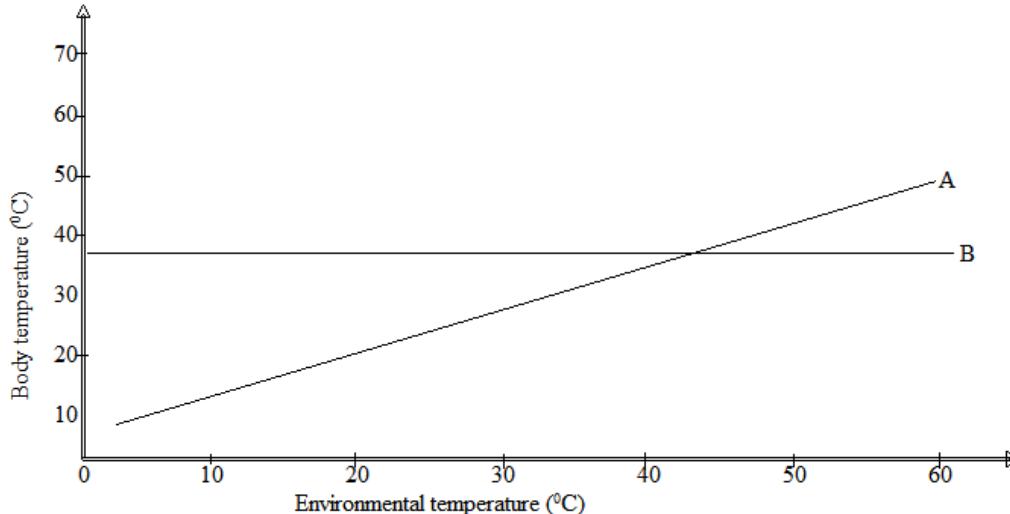


- (a) Name the physical process that will occur in the mouth cavity. (1 mark)
 (b) Name the digestive juice C. (1 mark)
 (c) Name the gland that secrete digestive juice B. (1 mark)
10. State **three** external differences between Chilopoda and diplopoda. (3 marks)
11. State the name given to;
 (a) Study of chemical compounds and the reaction they take part in. (1 mark)
 (b) Study of micro-organisms. (1 mark)
12. The table below shows the energy use per day in kilojoule.

Age (years)	Males	Females
2	5,500	5,500
5	7,000	7,000
8	8,800	8,000
11	10,000	9,200
14	12,500	10,500
18	14,200	9,600
25	12,100	8,800

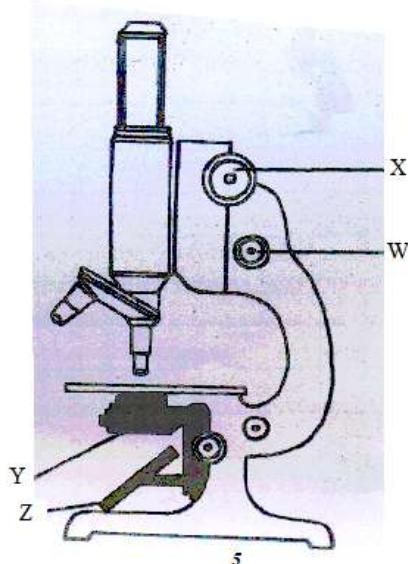
- (a) From the table, explain why after age 8 males require more energy than females. (1 mark)
 (b) Other than sex and age, name three other factors that determine energy requirements in human being. (3 marks)
13. What is meant by the following terms?
 (a) Habitat. (1 mark)
 (b) Ecosystem. (1 mark)

14. The graph below shows the relationship between environmental temperature and the body temperature in two different animals A and B.

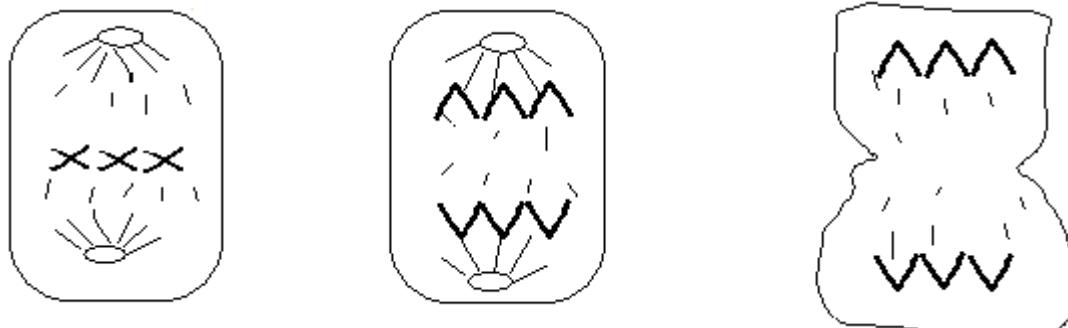


- (a) State the relationship between the body temperature of animal A and external environmental temperature. (1 mark)
 (b) Give the term used to describe;
 (i) Animals of type shown by graph A. (1 mark)
 (ii) Animals of type represented by graph B. (1 mark)

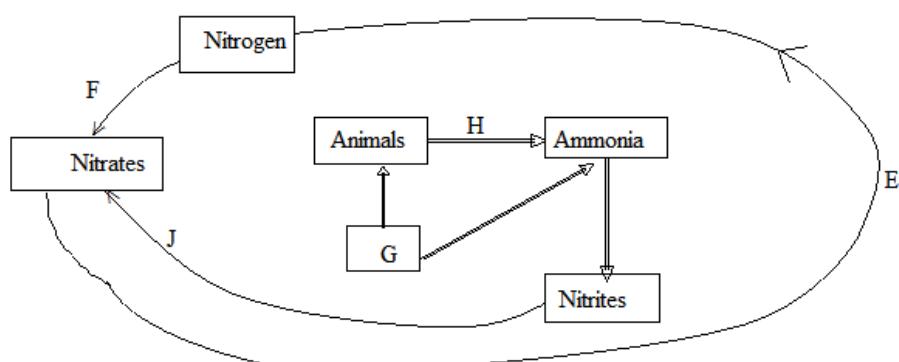
15. The diagram below represents a common laboratory equipment.



- (i) Identify the equipment. (1 mark)
- (ii) What is the function of part labelled W? (1 mark)
- (iii) Using arrows show how the object is illuminated. (2 marks)
- 16. State **three** differences between osmosis and active transport. (3 marks)
- 17. In the body cells of all organisms chromosomes occur in pairs. Members of each pair have a characteristic length and shape.
 - (a) What is the scientific name of such chromosome pair? (1 mark)
 - (b) What name is given to a cell that contains one member of each pair of chromosomes? (1 mark)
 - (c) Name the part in human females where meiosis take place. (1 mark)
- 18. The diagram below represents some stages in mitosis.

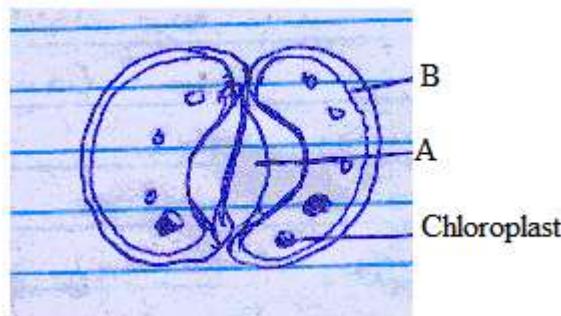


- (a) Name the stages represented by the diagrams labelled A, B and C. (3 marks)
- (b) Name **one** region in higher plants where cells actively undergo mitosis. (2 marks)
- 19. The diagram below represents a simple nitrogen cycle.

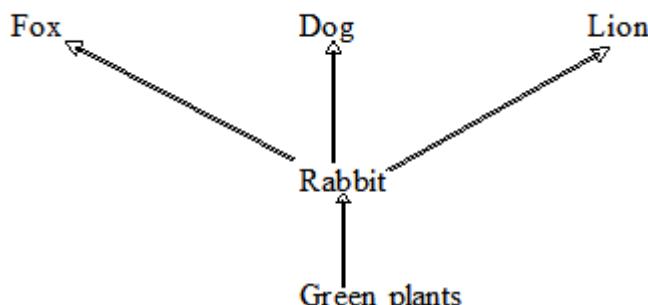


- (a) Name the organisms that cause process E and J. (2 marks)
- (b) Name the process represented by F and H. (2 marks)

20. What is meant by the terms;
 (i) epigynous flower (1 mark)
 (ii) staminate flower. (1 mark)
21. In an experiment, it is observed that when maggots are exposed to light, they move to dark areas. On the other hand, Euglena and Chlamydomonas move towards light.
 (i) Name the type of response exhibited by the maggots. (1 mark)
 (ii) state one advantage of the response shown by Euglena and Chlamydomonas. (1 mark)
22. (a) When corpus luteum breaks down prematurely during pregnancy, miscarriage is likely to result. Explain. (2 marks)
 (b) State the role of the following hormones during lactation in mammals. (2 marks)
 (i) Oxytocin.
 (ii) Prolactin.
23. Explain the absence of fibrinogen in urine yet it is present in blood plasma. (1 mark)
24. (a) State **two** roles of water in seed germination. (2 marks)
 (b) Define apical dominance. (1 mark)
25. Use the diagram of the stoma below to answer the questions that follow.



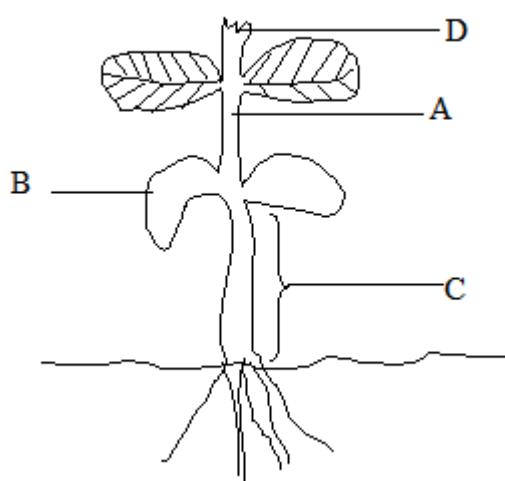
- (a) Identify parts labelled A and B. (2 marks)
 (b) State the functions of the structure shown in the diagram above. (1 mark)
26. The diagram below shows part of a food relationship in an ecosystem.



- (a) Name the food relationship above. (1 mark)
 (b) How many trophic levels are shown in the diagram above. (1 mark)
 (c) Name one primary consumer in the food relationship above. (1 mark)
 (d) State the main source of energy in the ecosystem. (1 mark)
27. State **one** way by which plants compensate for lack of locomotion. (1 mark)

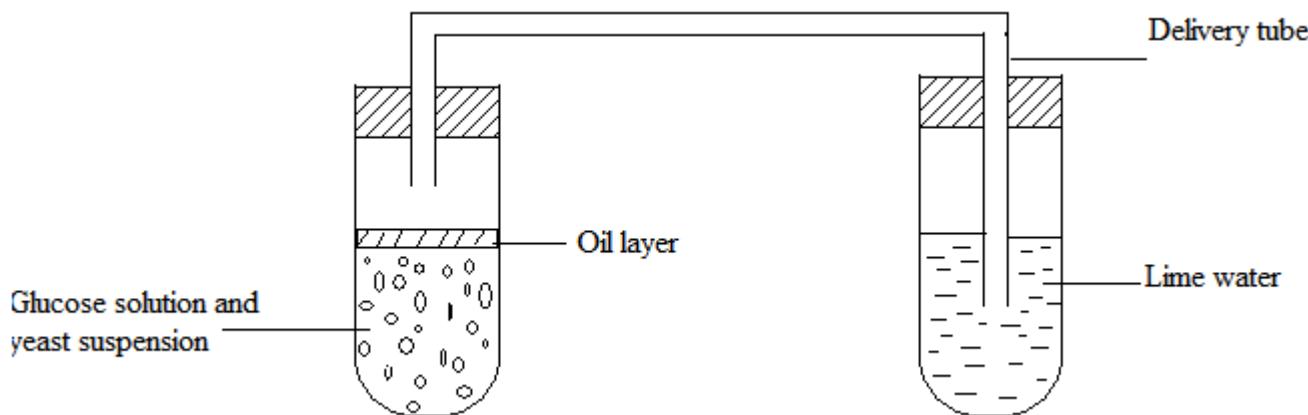
MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015**KENYA CERTIFICATE OF SECONDARY EDUCATION****231/2****BIOLOGY****PAPER 2****JULY / AUGUST 2015****2 HOURS.****SECTION A (40 marks)****Answer all questions in this section.**

1. Haemophilia is a sex linked disorder due to a recessive gene. A carrier woman married a normal man. Let H represent gene for normal condition and h to represent gene for haemophiliac condition.
 - (a) State the genotypes of ; (2 marks)
 - (i) Man.
 - (ii) Woman
 - (b) (i) Using a punnet square, show the genotypes of the children resulting from this marriage. (3 marks)
 - (ii) State the probability of getting a carrier daughter. (1 mark)
 - (c) Give an explanation why haemophilia is more common in males than in females. (2 marks)
2. The figure below shows a germinating seedling.



- (a) Name the parts labelled. A, B C (3 marks)
- (b) Give **three** important environmental conditions that are necessary for seed germination and state why they are important. (3 marks)
- (c) The part labelled D was removed from the above seedling three months later. After a few days the plant became bushy with several lateral branches.
 - (i) What is this phenomenon called? (1 mark)
 - (ii) Why did the removal of the stem tip result in a shorter plant with bushy growth? (1 mark)

3. The diagram below shows a set-up that was used to demonstrate fermentation.

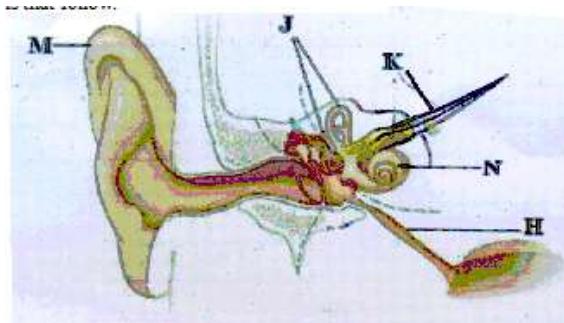


The glucose solution was boiled; then allowed to cool before adding the yeast suspension.

Oil was then added on top of the mixture.

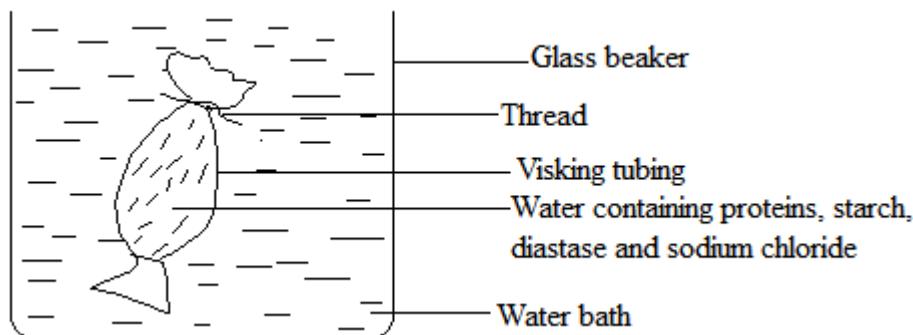
- (a) Why was the glucose solution boiled before adding the yeast suspension? (1 mark)
- (b) What was the importance of cooling the glucose solution before adding the yeast suspension? (1 mark)
- (c) What was the use of the oil in this experiment? (1 mark)

- (d) Give **two** reasons why accumulation of lactic acid during vigorous exercise lead to an increase in heart beat. (2 marks)
 (e) Other than carbon (IV) oxide, name the other products of anaerobic respiration in plants. (2 marks)
 (f) Suggest a control for this experiment. (1 mark)
4. The diagram below represents a section through the mammalian ear. Study it and answer the questions that follow.



- (a) Name the structures labelled H and J. (2 marks)
 (b) State how the structures labelled H, M and N are adapted to their functions. H,M,N (3 marks)
 (c) State what would happen if the structure labelled K was completely damaged? (1 mark)
 (d) Name the fluid contained in structure N. (1 mark)
 (e) Apart from hearing, state the other role performed by the human ear. (1 mark)

5. In a physiological experiment, starch, protein, diastase and sodium chloride (common salt) were added to water and put inside a visking tubing. The visking tubing was then placed in a water bath maintained at a temperature between 35°C and 40°C . The set-up was as shown in the diagram below.



The following observations were made after the procedures indicated.

Contents In	At the start of experiment	After 1 hour
Visking tubing	(i) Solution tastes salty (ii) Visking tubing is not firm (iii) After boiling with Benedict's solution, solution remains blue (iv) On addition of sodium hydroxide followed by copper(II) sulphate solution to the solution, the colour changed purple	Solution tastes salty Visking tubing firm. After boiling with Benedict's solution, the solution turns brown. On addition of sodium hydroxide followed by copper (II) sulphate solution to the solution, the colour changes to
Beaker	(i) Water is tasteless (ii) After boiling solution with Benedict's solution, blue colour remains. (iii) On addition of sodium hydroxide followed by copper sulphate, solution, colour remains blue.	Solution tastes sweet / salty After boiling solution with Benedict's solution, colour turns brown. On addition of sodium hydroxide followed by copper sulphate solution, colour remains blue.

- (a) Name the process by which salt moved into the water in the beaker from the visking tubing. (1 mark)
 (b) (i) Name the food substance responsible for the brown colour observed after one hour both in the beaker and visking tubing when solutions were boiled with Benedict's solution. (1 mark)
 (ii) Account for the observation in b(i) above. (3 marks)
 (c) (i) Name the food substance tested with sodium hydroxide followed by copper sulphate solutions. (1 mark)
 (ii) Account for the absence of the food substance named in c(i) above in the beaker after 1 hour. (1 mark)
 (d) After one hour, the visking tubing was firm. State the term used to describe this state. (1 mark)

SECTION B (40 marks)

Answer questions 6 (compulsory) on the spaces left after each question and either question 7 or 8 on the spaces provided after question 8.

6. In an experiment to investigate the effects of light intensity on the rate of photosynthesis, a shoot of Elodea (water weed) was used. The shoot was immersed in 2% sodium hydrogen carbonate solution maintained at 15°C in an apparatus which allowed for collection of a gas evolved from the shoot. The gas given off was collected for five minutes at each light intensity and its volume recorded as shown below.

Light intensity (arbitrary units)	1	2	4	7	12	18	26	37	46
Gas evolved (cm ³ /5 min)	0.45	0.70	0.95	1.40	1.75	1.82	1.90	1.90	1.90

- (a) Using the data given in the table, plot a graph of gas evolved against light intensity. (6 marks)
 (Graph on the next page)
- (b) Account for the rate of gas evolved between;
- (i) 1 - 18 arbitrary units. (3 marks)
 - (ii) 26 - 46 arbitrary units. (2 marks)
- (c) Explain why a green leaf is normally tested for the presence of starch instead of glucose. (2 marks)
- (d) How is the dry mass of a leaf determined? (3 marks)
- (e) Describe how the chloroplast is adapted to its function. (4 marks)
7. (a) State **four** characteristics of gaseous exchange surfaces. (4 marks)
- (b) Explain the starch-sugar interconversion theory of opening and closing the stomata in plants. (16 marks)
8. Discuss the various evidences which show that organic evolution has taken place. (20 marks)

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015*Kenya Certificate of Secondary Education***CONFIDENTIAL****BIOLOGY 231/3****Each candidate should have:-**

- Starch suspension labelled liquid X.
- Iodine solution.
- Benedict's solution.
- 2 M hydrochloric acid (1 ml)
- 2 droppers.
- Measuring cylinder (10 ml size)
- Means of heating / Bunsen burner.
- 5 test-tubes.
- Water in a small beaker
- Thermometer
- Test-tube holder
- Thermometer
- 3 boiling tubes
- Tripod stand and gauze
- 3 labels
- White tile
- Water bath
- Diastase / amylase enzyme (0.5 g per student) labelled substance Q.
- Twine of freshly picked *passiflora edulis* (passion fruit) with 2 -3 leaves and long coiled tendrils.

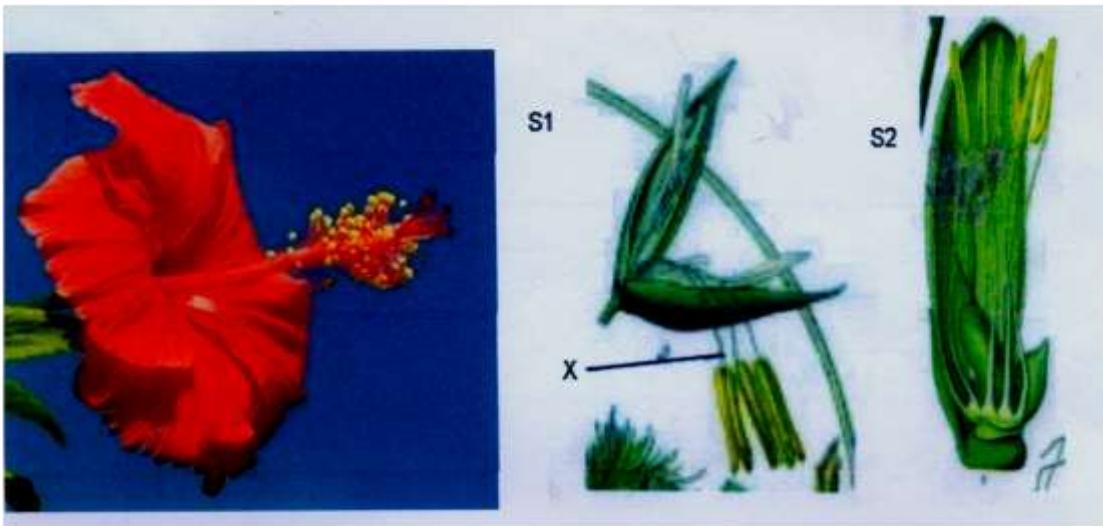
NB: Liquid X is prepared by dissolving 1 g of soluble starch in 50 ml of distilled water.

Thorough stirring is required whenever it is being used.

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015*kenya certificate of secondary education***231/3****BIOLOGY****PAPER 3 (PRACTICAL)****JULY / AUGUST 2015****1 $\frac{3}{4}$ HOURS.****Answer all questions.**

1. You are provided with liquid X and substance Q.
 - (a) Place three drops of liquid X onto a white tile, Add four drops of iodine solution and record your observation. (1 mark)
 - (b) Pour 2 ml of liquid X into a test-tube. Add equal amount of Benedict's solution and boil the mixture. Record your observation. (1 mark)
 - (c) Label three boiling tubes as set-ups A, B and C. Place 3 ml of liquid X into each of the set-ups. Divide substance Q into three equal portions.
 - To set-up A, add one portion of substance Q and shake.
 - Place the second portion of substance Q into a test tube. Add 1 ml of water to it and boil for two minutes. Add it to set-up B and shake.
 - To set-up C, add the third portion of substance Q. Add 8 drops of 2 M hydrochloric acid and shake.
 Place the three set-ups in a warm water bath maintained at 37°C for 40 minutes.
 Cool the set-ups by dipping the boiling tubes in cold water.
 Place 2 ml of the contents of each set-up into three separate test tubes. Add equal amount of Benedict's solution to each of three test-tubes and boil. Record your observation.
 Set-up A. (1 mark)
 Set-up B (1 mark)
 Set-up C (1 mark)
 (d) Account for your observations in the set-ups;
 Set-up A. (1 mark)
 Set-up B (1 mark)
 Set-up C (1 mark)
 - (e) Suggest the identity of substance Q. (1 mark)
 - (f) Give a reason why the temperature of the water bath was maintained at 37°C . (2 marks)

2. Below are photographs of specimens obtained from plants. Examine the photographs.



- (a) For each of the specimens, name the mode of pollination and the features that adapt the spacements to the mode of pollination.

Specimen R

- Mode of pollination. (1 mark)

- Adaptive features. (2 marks)

Specimen S1

- Mode of pollination. (1 mark)

- Adaptive features. (2 marks)

(b) Label any **four** parts on specimen R. (2 marks)

(c) Name the structure labeled X on specimen S1. (1 mark)

(d) Using observable features only state two differences between R and S1. (2 marks)

(e) With a reason, name the class of the spermatophyta to which specimen R and S2 belongs.

Specimen R.

Class (2 marks)

Reason

Specimen S2.

Class (2 marks)

Reason

3. You are provided with specimen P.

(a) Classify the specimen into kingdom and class giving reasons in each case,

Kingdom. (1 mark)

Reason (1 mark)

Class. (1 mark)

Reasons (2 marks)

(b) Describe the external features of one of the leaves of specimen P. (2 marks)

(c) Identify the prominent string-like structure on one of the axils.

(i) Give the identity of the structure (1 mark)

(ii) How is the structure identified in c(i) above suited to its function? (2 marks)

(d) Name the type of response exhibited by the structure above. (1 mark)

(e) Explain why the tip of the structure named in c (i) above appears as it is under its natural ecosystem. (3 marks)

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015**KENYA CERTIFICATE OF SECONDARY EDUCATION****231/2****BIOLOGY****PAPER 2****JULY / AUGUST 2015****2 HOURS.**

1. (a) Centriole ;
(b) Formation of cilia and flagella ;
2. (a) Inconspicuous petals, ;
Large anthers loosely attached to filament ; Long feathery stigmaSmall / smooth and light pollen grains ;*any three*
(b) Cause exchange in genetic materials which lead to variation that enable organism to exploit new environment / resistant to diseases.
3. (i) Typhoid ;
(ii) Amoebic dysentery / amoebiasis ;
4. (a) Anaerobic respiration in animals ;
rej. Anaerobic respiration only.
(b) Beer brewing
Bread baking / leavening of bread
Processing of dairy products *acc correct example*
Manufacture of wines and spirits
Production of organic acids.
mark any correct
5. (a) ATP (adenosine triphosphate) ;
(b) W - carbon ((V) oxide ;
(c) Stroma ;
(d) Condensation ;
6. (a) Catalase ;
(b) Liver ;
(c) Detoxify hydrogen peroxide which is toxic ;
7. (a) Haemophilia, colourblindness, sickle cellanaemia ;Albinism *any two*
(b) Early maturity ; Resistance to pests / diseases / drought ;High yield ; *any two*
8. (i) emergence of present organisms from pre-existing forms gradually over a long period of time ;
(ii) Structures that have stopped being functional due to dis-use and hence reduced in size or become rudimentary.
(iii) Nature selects those individuals which are sufficiently / well adapted and allow them to reproduce ; and rejects / select against those that are poorly adapted by wiping them out ;
9. (a) Mastication / chewing / grinding ;
(b) Intestinal juice / succus entericus
(c) gastric glands
10. Chilopoda Diplopoda
- A pair of walking legs per segment ; - 2 pairs of walking legs per segment (except in thoracic segment) ;
- Body flattened dorso ventrally ; - Body cylindrical in shape ;
- Body divided into head and trunk - Body divided into head, thorax and trunk
- Has poison claws - Lack poison claws
- Has long antennae - Has short antennae *First 3 correct*
11. (a) Biochemistry ;
(b) Microbiology ;
12. (a) males are more muscular than females who have more fat ;
(b) Basal metabolic rate rej BMR
Occupation
Body size
13. (a) Place / environment in which (specified) organism live ;
(b) A natural unit with abiotic and biotic factors ;
14. (a) an increase in external environmental temperature (linearly) increases the body temperature of animal A.
(b) (i) Poikilotherms / exotherms ;
(ii) Homiotherms / endotherms ;
15. (i) Light microscope ; rej microscope alone
(ii) Raises or lowers the body tube for small distance to bring the image into sharp focus.
(iii) Show arrows representing light rays from outside to the mirror ; and then reflected to the stage through condenser ;

- 16. Osmosis**
- | - | Active transport |
|---|---|
| - Does not require energy | - Require / use energy |
| - No carrier molecules | - Carrier molecules are involved. |
| - Involves movement of solvent molecules | - Involves movement of solute particles |
| - Solvent molecules move along concentration gradient | - Solute molecules move against concentration gradient. |
- 17.** (a) Homologous chromosomes ;
 (b) gamete ;
 (c) Ovaries ;
- 18.** (a) A - Metaphase
 B - Anaphase
 C - Telophase
 (b) - Cambium / vascular cambium / cork cambium / phellogen ;
 - Apical meristem / shoot tip / root tip ; *any one correct*
- 19.** (a) E - denitrifying bacteria
 J - Nitrobacter bacteria
 (b) F - Nitrogen Fixation
 H - Decomposition, ammonification, death, decay
- 20.** (a) Flower with floral parts above ovary ;(inferior ovary)
 (b) A flower having stamens but lacking pistil ; (produce only pollen grains)
- 21.** (i) Negative phototaxis.
 (ii) The organism move towards area with high light intensity for photosynthesis.
- 22.** (a) Progesterone hormone will not be secreted; this prevents thickening of endometrium ; hence miscarriage.
 (b) (i) Stimulate milk let-down
 (ii) Prepare mammary glands for production of milk;
- 23.** Molecule too large to pass through capillary pores and pores in Bowman's capsule ;
- 24.** (a) Activate germination enzymes ; Hydrolyse starch stored in cotyledons ; Soften seed coat ; medium of transporting hydrolysed products. *any 2 correct*
 (b) Suppression of lateral buds development by apical bud ;
- 25.** (a) A - Stoma rej stomata
 B - Outer wall
 (b) gaseous exchange ; loss of water in form of water vapour ;
- 26.** (a) Food web ;
 (b) Three ;
 (c) Rabbit ;
 (d) Sun ;
- 27.** Have ability to pollinate their flowers ;
 Have ability to photosynthesis ;
 Have ability to disperse seeds and fruits ;
 Have ability to absorb water and mineral salts ;

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015**BIOLOGY 231/2****MARKING SCHEME****FORM 4**

- 1.(a)(i) Man - $X^H Y$;
(ii) Woman - $X^H X^h$;

(b)(i) Parental phenotypes Female carrier Normal male

Parental genotypes $X^H X^h$ X $X^H Y$

$\checkmark 1$

Gametes



$O \rightarrow$ gametes	X^H	$Y \checkmark 1/2$
Q gametes		
$X^H \checkmark 1/2$	$X^H X^H$	$X^H Y$
X^h	$X^H X^h$	$X^h Y \checkmark 1$

Children's genotypes $X^H X^H$, $X^H X^h$, $X^H Y$, $X^h Y$

Children's phenotypes Normal Normal Normal Haemophiliac

Q Q carrier $O \rightarrow$ male

(ii) Probability of a carrier child ? = $1/4$ or 25%

c) Males have only one X chromosome which if it carries the single recessive allele, it will express itself fully ; Females can only express the gene in the homozygous recessive state ; thus reducing their chances

2. (a) A - Epicotyl ;

B - Cotyledon ;

C - Hypocotyl ;

- (b) (i) Oxygen

- For oxidation of stored food substances releasing energy needed for cell division and growth ;

- (ii) Water

- Activate enzymes ; hydrolyses and dissolves food substances ; softens testa for emergence of embryo ; medium of enzymatic reactions ; Transports nutrients to the developing embryo;

- (iii) Optimum temperature - Activates enzymes of hydrolysis for the breakdown of stored food substances into simple soluble products ;

rej temp alone

- (c) (i) Apical dominance ;

(ii) Removal of apical bud removes source of auxins/reduces /lowers concentration of auxins.

Low concentration of auxins stimulates development of lateral buds into side branches;

3. (a) To expel air / remove air ;

- (b) Not to denature enzymes of yeast / Not to kill the yeast.

- (c) To prevent entry of air ; into glucose and yeast mixture.

- (d) To supply oxygen more faster ; to break down the lactic acid ; (to $CO_2 +$ water and energy)

- (e) Alcohol / Ethanol; Energy / ATP;

- (f) Use of boiled yeast ; Use of yeast without glucose ; / Use of glucose without yeast ; mark any 1

4. (a) H - Eustachian tube ;

J - Semi - circular canals ;

- (b) H - Opens during swallowing, yawning, chewing and vomiting to equalise air pressure in the middle ear with the atmospheric air pressure since it is open on both ends ; Acc converse.

M - Curved / funnel shaped to receive or collect and concentrate / direct sound waves into the auditory meatus ;

N - long / highly coiled / spiral to increase surface area for attachment of sensory cells that bring about hearing ;

- (c) Total deafness

- (d) Endolymph

- (e) Maintains body balance and posture ; acc any 1

5. (a) Diffusion ;

- (b) (i) Reducing sugars / simple sugars / glucose ;

- (ii) Diastase converts starch to reducing sugars ; So present in visking tubing. Due to their small size and semi-permeability of the visking tubing ;the molecules moved across the semi-permeable wall of visking to the beaker ; so present in the beaker. *Rej. Second mark if size and semi-permeability are not indicated*
- (c) (i) Proteins rej amino acids.
 (ii) Proteins are large molecules / big size molecules so cannot pass through the pores of the visking tubing ;
 (d) Turgid ; Acc turgidity .
6. (a) Labelling axes @ 1 mk - 2
 Correct scales @ 1 mk - 2
 Plotting @ 1 mk - 1
 Smooth curve @ 1 mk - 1
 Total 6 mks
- (b) (i) Gas evolved increases with increase in light intensity ; increased light intensity leads to more splitting of water molecules into hydrogen atoms/ions and oxygen ; hence increase in rate of photosynthesis ;
 (ii) Amount of gas evolved remained constant ; as the rate of photosynthesis is constant due to other limiting factors ;
 (c) Glucose formed is converted into starch ; which is osmotically inactive hence stored ;
 (d) By heating the leaves in an oven at 110^0 C and weighing them ; then heating and weighting several times ; till a constant weight is obtained ;
 (e) - Has stroma with enzymes ; where CO_2 fixation occurs ;
 - Has grana containing chlorophyll ; which traps light energy from the sun for photosynthesis ;
 - Has intergrana lamellae ; that hold the grana in position ;
7. (a) - Highly vascularised / Dense network of capillaries ;
 - Large surface area ;
 - Thin membrane / epithelium / one cell thick/ Thin lining rej thin walls.
 - Moist lining / surface
 (b) During the day in the presence of light ; photosynthesis occurs in the guard cells ; because they have chloroplasts ; This reduces the concentration of CO_2 (used as a raw material) ; thus reducing the acidity of the guard cells). Lowered acidity / increased pH ; favours conversion of starch into glucose ; which is osmotically active ; thus increasing the osmotic pressure of guard cells ; compared to the neighbouring epidermal cells ; water is drawn from the neighbouring cells into the guard cells by osmosis ; causing them to expand thus becoming turgid ; The outer walls which are thinner than inner walls stretch more ; causing the guard cells to bulge outwards ; making the stomata to open; *For opening max 10*
 At night when there is no light; photosynthesis does not take place in the guard cells ; CO_2 accumulates in the guard cells causing an increase in acidity (lowered pH). This low pH/ increased acidity favours the conversion of glucose into starch ; which is osmotically inactive ; thus reducing the osmotic pressure of the guard cells ; Guard cells then lose water to the neighbouring cells by osmosis ; becoming flaccid ; making the stomata to close ; *(max 6 mks)*
8. 1. Comparative anatomy :
 - Organism have common embryonic origin ; but structures become modified differently to perform different functions ; These are called homologous structures ; others have different embryonic origin ; but structures become modified and adapt in the same environment thus perform similar functions ; such structures are called analogous structures ; Others have become reduced in size due to disuse in the environment ; These are called vestigial structures ; mark any correct example in each case ; *max 5*
2. Fossil records / palaeontology :
 Fossils are remains of organisms that became preserved in naturally occurring materials many years ago ; They show morphological changes of organisms over a long period of time ; *max 2*
3. Comparative embryology ; Study of embryo development ;Different vertebrate groups have a lot of similarities during their embryonic stage ; suggesting their common origin / ancestry ; *max 3 acc - any 2 named embryos of vertebrates* ;
4. Geographical distribution :
 Present continents are thought to have been one large land mass (pangea) ; As a result of continental drift ; Isolation occurred bringing about different patterns of evolution ; of related organism e.g llamas in the amazon resemble the camel ;
acc Jaguars, Panthers with their counterparts etc max 4
5. Comparative serology / cell biology :
 - Similarities of cell structures in different organisms; indicate evolutionary relationship between them ; while differences in cellular reactions indicate different ancestry ; *max 3*
6. Taxonomy / classification :
 Organisms with common features are grouped together suggesting a common ancestry; Differences between them indicate no phylogenetic relationship ; *max 3 Total 20 mks*

MURANG'A SOUTH SUB-COUNTY MULTILATERAL EXAMINATION 2015**BIOLOGY**

231/3

MARKING SCHEME**FORM 4**

1. (a) Blue black / dark blue colour is formed ;
 (b) No colour change / blue colour of Benedict's remains ;
 rej no change ; No observation
 (c) Set up A - Colour changes from blue to green, yellow then orange ;
 Set up B - No colour change / Blue colour of Benedict's solution remains.
 Set up C - No colour change / colour of Benedict's solution remains.
 (d) Set up A - Enzyme amylase / diastase / invertase ; digests / converts / breakdown starch (in liquid X); to reducing sugars / maltose ;
 Set up B - Boiling denatures / destroys enzyme amylase / diastase / invertase ; hence starch is not converted to reducing sugar / maltose ;
 Set up C - HCl provides unfavourable pH for enzyme amylase / diastase / invertase, hence starch is not converted to reducing sugar / maltose ;
 (e) Enzyme amylase / diastase / invertase ;
 (f) To provide optimum temperature: for reaction of enzyme amylase / diastase / invertase ;

2.(a) Specimen RMode - insect pollination ;Adaptive features :

- Large petals to make it conspicuous ;
- Brightly coloured petals to attract insects.

Specimen S₁Mode - Wind pollination ;Adaptive features:

- Anthers are large and attached to long filaments to be easily swayed by wind to disperse the pollen grains.
- Stigma is large / feathery and hangs outside the flower to increase surface area for trapping pollen grains in the air.

(b) Label any of these parts on the photograph R.

- Petal(s)
- Stigma
- Anther
- Sepal

(c) Filament :**(d) R****S₁**

- | | |
|---|---|
| <ul style="list-style-type: none"> - Large (and conspicuous) - Brightly coloured petals - Regular shaped / funnel shaped. - Stigma enclosed / within the flower | <ul style="list-style-type: none"> - Small (and inconspicuous) - Not brightly coloured petals - No particular shape. - Stigma hanging outside the flower. <i>any 2</i> |
|---|---|

(e) Specimen R

Class - Dicotyledonae ; rej wrong spelling

Reason - Presence of 4 stigmas / petals

Specimen S₂

Class - Monocotyledonae ; rej wrong spelling

Reason - Presence of (6) six anthers

3.(a) Kingdom plantae

rej Plant / pants / plantae kingdom

Reasons - green hence has chlorophyll;

Class - Dicotyledonae

Reasons - The leaves are broad ;

The leaves have network veins ;

(b) - Lamina has 3 lobes ;

- Has serrated margin ;
- Is a simple leaf ;
- Is shiny ;

*mark first two correct***(c) (i) Tendril :**

(ii) Long and flexible to coil easily round support objects ; Its green to carry out photosynthesis ;

(d) Thigmotropism / haptotropism ; rej wrong spelling

(e) When the structure comes into contact with solid objects, auxins migrate towards the outer side; causing more growth on the outer side than in the inward side; leading to the coiling round solid object;

KIMA JOINT EVALUATION TEST - 2015

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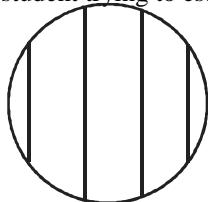
BIOLOGY

Paper - 231/1

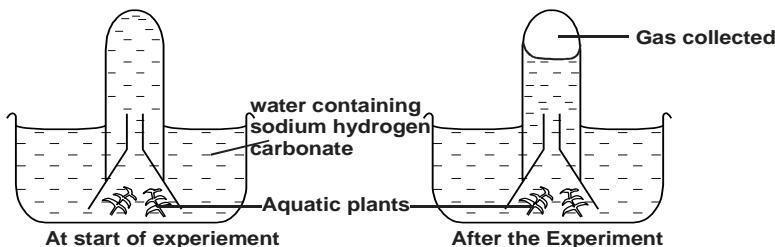
July/August 2015**Time:** 2 hours

1. State the importance of the following processes to living organisms.
 - a) Locomotion. (1 mark)
 - b) Irritability (1 mark)
2. Distinguish between taxon and taxonomy. (2 marks)
3. a) State the functions of the following organelles.
 - i) Centriole (1 mark)
 - ii) Nucleolus. (1 mark)

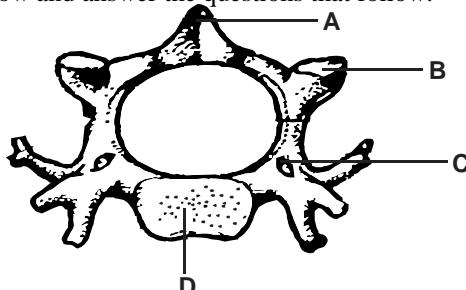
- b) A form one student trying to estimate the size of onion cells observed the following on the microscope field of a view.



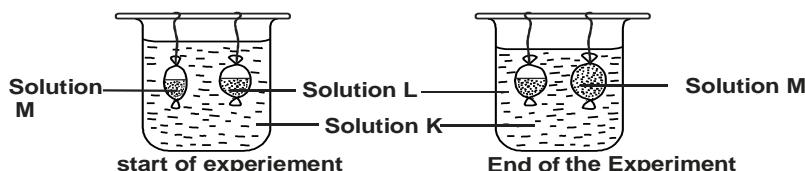
- i) Define the term resolving power. (1 mark)
- ii) If the student counted 20 cells across the field of view, calculate the size of one cell in micrometers. (2 marks)
4. a) State **two** disadvantages of fossil records as an evidence of evolution. (2 marks)
- b) What is adaptive radiation. (1 mark)
5. A potato cylinder measuring 100 mm was placed in a concentrated salt solution for 30 minutes. Describe its texture and appearance after 30 minutes. (3 marks)
6. In a family with four children, the father had blood group A while the mother had blood group B. One of the children had blood group O.
 - a) What are the genotypes of the parents (2 marks)
 - b) What was the genotype of the child with blood group O? (1 mark)
7. Explain why a cross-circuit athlete pants heavily after sprint race. (3 marks)
- 8.a) Distinguish between homologous and analogous structure as used in evolution. (2 marks)
- b) i) What are vestigial structures. (1 mark)
- ii) Give an example of a vestigial structure in humans. (1 mark)
9. a) Name a respiratory substrate usually available for energy release during starvation. (1 mark)
- b) What is respiratory quotient. (1 mark)
10. a) Give the difference between pyramid of biomass and pyramid of numbers. (2 marks)
- b) Why is pyramid of biomass a better method of representing ecological relationships in habitats. (1 mark)
11. Name the types of joints formed by each of the following pairs of bones.
 - i) Axis and Atlas (1 mark)
 - ii) Humerus with clavicle and scapula. (1 mark)
 - iii) Tibia and fibula with femur. (1 mark)
12. a) How does each of the following structures in the mammalian skin adapted to perform its function?
 - i) Cornified layer. (1 mark)
 - ii) Sebaceous gland. (1 mark)
- b) Explain why protein is absent in urine of a normal person. (1 mark)
13. Name the part of the brain responsible for:
 - a) Maintaining balance and posture of the body. (1 mark)
 - b) Controls heart, breathing and involuntary responses. (1 mark)
14. Give a reason for each of the following:
 - a) Wind pollinated flowers produce large quantities of pollen grains. (1 mark)
 - b) Flowers of certain plants show heterostyly. (1 mark)
15. The set-up below shows an experiment to investigate photosynthesis.



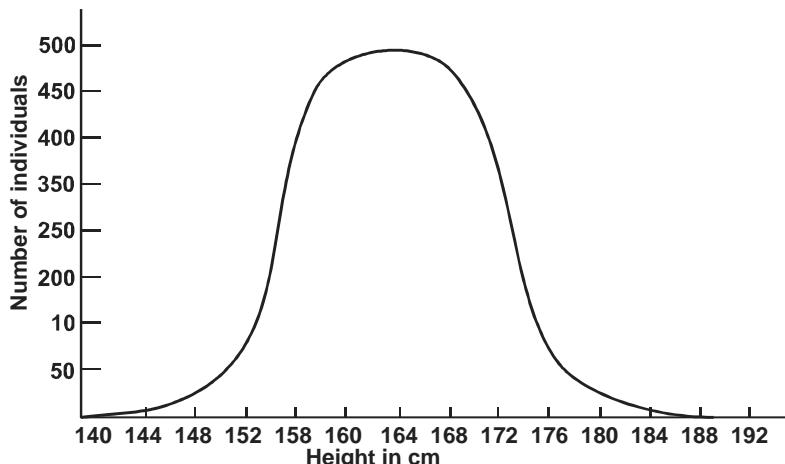
- a) What gas was collected in the test-tube. (1 mark)
 b) What two environmental conditions are necessary for the experiment? (2 marks)
 c) What was the role of sodium hydrogen carbonate in the experiment? (1 mark)
16. State **THREE** ways in which schistosoma species is adapted to parasitic mode of life. (3 marks)
17. Study the diagram below and answer the questions that follow.



- a) Identify the diagram above. (1 mark)
 b) State **one** reason for your answer in (a) above. (1 mark)
 c) Name the parts labelled A and B. (2 marks)
18. Name the mineral element obtained from insects by insectivorous plants. (1 mark)
19. In an experiment, two equal volumes of solutions L and M were placed into visking tubings. The two visking tubings were suspended as shown below.



- Explain the results that were obtained in the visking tubings at the end of the experiment. (4 marks)
20. Give a reason why primary productivity in an aquatic ecosystem decrease with depth. (1 mark)
21. In an experiment to observe some variations in lengths of leaves of Jacaranda, the following curve was obtained.



- i) Identify the type of variation illustrated by the curve. (1 mark)
 ii) Explain the cause of the variation you have named in (i) above. (1 mark)
22. a) What is a drug? (1 mark)
 b) How does drug abuse expose one to the dangers of HIV/AIDS (1 mark)
23. Explain what happens when diaphragm muscles contract during breathing in mammals. (3 marks)
24. Give **two** reasons why potato tubers become sweeter after boiling. (2 marks)
25. Give **two** adaptive features the make a predator efficient in capturing prey. (2 marks)
26. List **three** ways in which the proximal convoluted tubule is adapted to its functions. (3 marks)
27. Briefly explain the meaning of the following terms as used in ecology. (3 marks)
 - i) Carrying capacity
 - ii) Habitat
 - iii) Community**28.** Briefly **outline** the function of the following parts of the human brain. (2 marks)
 - i) Cerebrum
 - ii) Hypothalamus

29. a) State the **function** of a tendon in mammalian skeleton. (1 mark)
 b) Outline **three** differences between smooth muscles and skeletal muscles. (3 marks)

KIMA JOINT EVALUATION TEST - 2015

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BIOLOGY

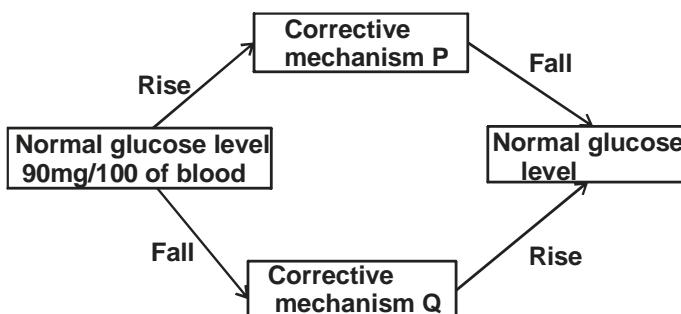
Paper - 231/2

July/August 2015

Time: 2 hours

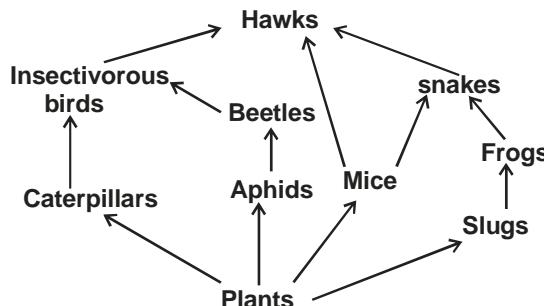
SECTION A : (40 marks)**Answer ALL the questions in this section in the spaces provided.**

1. A woman with normal skin pigmentation was married to a man with normal skin pigmentation. They had two children, one with normal skin colour, genotype AA, while the other one was an albino.
 a) State the couple's genotypes. (1 mark)
 b) Using a genetic cross, show how they were able to produce an albino and a normal skinned child. (4 marks)
 c) What is the percentage of their third child being an albino? (2 marks)
 d) State one way one could easily identify an albino. (1 mark)
2. The diagram below shows how blood glucose in mammalian body is regulated.



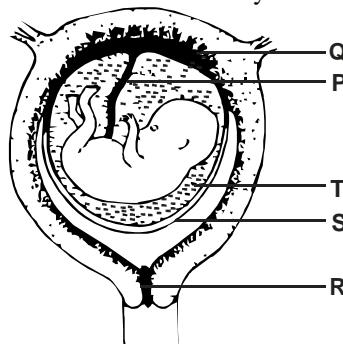
- a) Explain what happens during corrective mechanism P. (3 marks)
 b) Name **two** organs involved in corrective mechanisms P and Q. (2 marks)
 c) State **two** reasons why glucose level should be maintained constant. (2 marks)
 d) What is osmoregulation? (1 mark)

3. The diagram below represents a food web in a certain ecosystem.



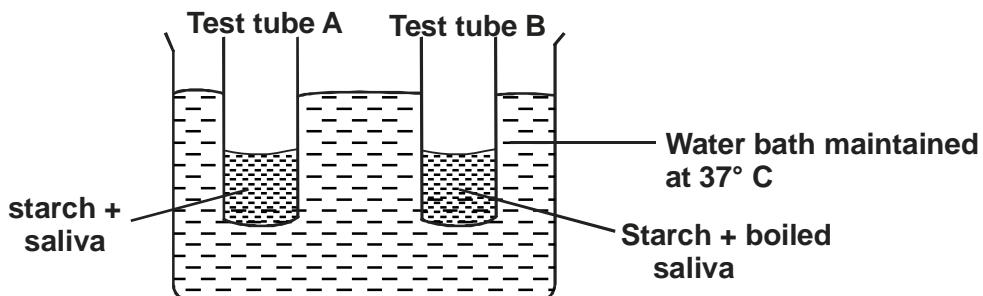
- a) i) Name the group of organisms that would have the largest biomass (1 mark)
 ii) Give a reason for your answer in a(i) above. (1 mark)
 b) Construct food chain ending with
 i) Tertiary consumer (1 mark)
 ii) Quaternary consumer (1 mark)
 c) State **two** short term effects on the ecosystem if there were prolonged droughts. (2 marks)

4. The diagram below represents a mammalian embryo and associated maternal structures.



- a) Name the parts labelled R and S. (2 marks)
 b) State **THREE** adaptations of part Q to its functions. (3 marks)
 c) i) Name the part labelled T. (1 mark)
 ii) What is the function of part T? (1 mark)

5. In an experiment to investigate an aspect of digestion, two test tubes A and B were set up as shown in the diagram below.



The test tubes were left in the bath for 30 minutes. The contents of each test tube was then tested for starch using iodine solution.

- a) What was the aim of the experiment? (1 mark)
- b) What results were expected in test tube A and B. (2 marks)
- c) Account for the results you have given in (b) above in test tube A and B. (2 marks)
- d) Why was the set up left at 37°C? (1 mark)
- e) State two functions of bile juice in digestion. (2 marks)

SECTION B (40 MARKS)

Answer question 6 (COMPULSORY) and either Q 7 or Q 8.

6. In a practical lesson, the following data of results was obtained of growth measurement of organism over a period of 24 days during its development.

Day	Width of head (mm)	Length of hind femur (mm)
1	3.0	7.0
3	4.0	8.0
5	4.0	8.0
7	4.0	9.2
9	4.7	12.0
11	5.0	12.0
13	5.0	12.0
15	5.0	12.0
17	5.7	14.8
19	7.0	18.0
21	7.6	18.0
23	7.6	18.0

- a) Using a suitable scale, draw graphs of width of head and length of femur against time on same axis. (7 marks)
- b)
 - i) Name the growth pattern represented by the graphs. (1 mark)
 - ii) With reference to the graph, identify the phylum to which the organism belongs. Give reason. (2 marks)
- c) Account for the length of hind femur between i) 3 and 7 day. (3 marks)
 - ii) 7 and 10 day (3 marks)
- d) State **TWO** hormones involved in the growth pattern represented above. (2 marks)
- e) What is the width of the head and length of femur on day 18? (2 marks)
- 7.
 - a) Describe how water reaches the xylem tissue of the root in a plant from the soil. (8 marks)
 - b) Describe the adaptations of the following components of blood to its functions.
 - i) Red blood cell. (8 marks)
 - ii) White blood cells (4 marks)
- 8.
 - a) Explain the conditions necessary for germination in seeds. (12 marks)
 - b) Describe **four** adaptive characteristics features of respiratory surfaces. (8 marks)

KIMA JOINT EVALUATION TEST - 2015

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Paper - 231/3

July/August 2015**Time:** 1 $\frac{1}{4}$ hours

- 1.** You are provided with a specimen labelled P. Study it carefully.

a) With observable features only identify specimen P (2 marks)

i) Identity

ii) A reason

- b) Make a transverse section of specimen P.

i) Use one half of the cut section of specimen P to draw a well labelled diagram. (4 marks)

ii) Show your magnification. (2 marks)

- c) Take another half of specimen P. Press it into the beaker to make an extract.

Use part of the extract and 2cm³ of DCPIP solution in a test tube to complete the table below. (2 marks)

TEST	OBSERVATIONS	CONCLUSION
DCPIP test		

- d) Use the reagents provided to carry out various food tests.

i) Benedict's test.

Procedure.

(1 mark)

Observations

(1 mark)

Conclusion

(1 mark)

ii) Iodine solution test

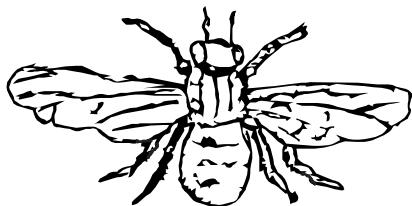
Observations.

(1 mark)

Conclusion

(1 mark)

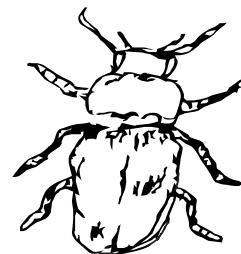
2. Below are drawings of some organisms belonging to the same phylum. Examine them carefully.



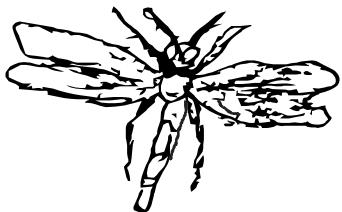
Diptera



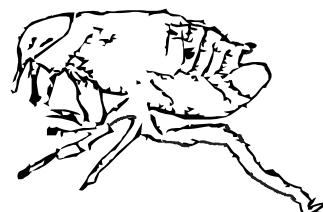
Anoplura



Coleoptera



Odonata



Siphonoptera



Anoplura

- a) i) Name the phylum to which the organism represented by the drawings belong. (1 mark)
 ii) Give two reasons for answer in a(i) above. (2 marks)
- c) Using the features in the order given below, construct a dichotomous key that can be used to identify the specimens. (10 marks)
- Presence or absence of wings.
 - Shape of the body
 - Length of antennae
 - Type of wings
 - Number of wings.

3. a) Study the photography below to enables you answer the questions that follow.



- i) Use arrows to show on the photograph the direction from which the light was coming. (1 mark)
ii) What was the aim of the experiment? (1 mark)
iii) Suggest a control experiment for this set up. (1 mark)
iv) Explain the mechanism of response shown in the photograph. (4 marks)

- b) Study the photograph below. The specimen had been placed in adequate light at a horizontal position for one week.



- i) What was the aim of this experiment? (1 mark)
ii) What would be the result if seedling is placed on a working klinostat? (1 mark)
iii) Explain how the results at the point shown by the arrow occurred. (3 marks)

KIMA JOINT EVALUATION TEST - 2015

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/1

July/August 2015

Marking Scheme

1. a) Enable animals to search for food and water ; escape from predators and hostile environment; look for mates and breeding ground ;
 - b) Enhance survival of organism ;
2. Taxon is unit of classification while taxonomy is the scientific study of classification;
3. a) i) Spindle fibres formation;
 - Formation of cilia and flagella;
 - ii) Formation of ribosomes;
 b) i) Ability to distinguish two close parts / structures as separate entities;
 - ii) Diameter of field of view = 3mm
Number of cells = 20 cells.
$$1 \text{ mm} = 1000 \mu\text{m}$$
$$3\text{mm} = (3 \times 1000)\mu\text{m}$$
$$= 3000\mu\text{m}$$
$$\text{Size of cell} = \frac{3000}{20} = 150\mu\text{m}$$
4. a) - several missing links;
 - Distortion of parts during sedimentation.
 - Destruction of fossils by geographical activities e.g. earthquakes, mass movement.
 b) Ability of organisms to develop adaptations to survive in various ecological niches;
5. The potato cylinder was soft / limp / flaccid; it had lost water to the solution; by osmosis;
6. a) AO - mother
BO - father
b) OO
7. Incurs shortage of oxygen during the race; a lot of oxygen required to oxidize lactic acid produced ; (during strenuous exercise)
8. a) Homologous structures have similar embryonic origin but adapted to perform different functions while analogous structures have different embryonic origin but adapted to perform similar functions; (mark as a whole)
 - b) i) Structures which have ceased to be functional and are reduced in size / rudimentary ;
ii) Tail (coccyx), appendix;
9. a) Protein;
b) Ratio between the volume of carbon (IV) oxide produced and oxygen consumed ;
10. a) Pyramid of biomass represents the dry mass of organisms at each trophic level; pyramid of numbers represent the number of organisms at each trophic level ;
 - b) Pyramid of biomass illustrates the true flow of energy from one trophic level to another in a habitat;
11. i) pivot ;
ii) ball and socket ;
iii) Immovable ;
12. a) i) Made of Keratin which protects skin against invasion of bacteria / reduces water loss by evaporation ;
ii) Secrete sebum which contains antiseptic substances for protection against bacteria ;
b) Protein has large molecular size; hence cannot pass via capillary walls / glomerulus;
13. a) Cerebellum ;
b) Medulla oblongata
14. a) To increase chances of pollination ;
b) Hinders self-pollination hence encouraging cross-pollination.
15. a) Oxygen
b) Light ; carbon (IV) oxide ;
c) Decomposes / dissociates in water to give out carbon (IV) oxide; (necessary for photosynthesis)
16.
 - The egg have hook-like structure which raptures walls of intestines or bladder.
 - Lays large number of eggs to ensure survival;
 - Larva has tail for swimming in search of host in water ;
 - Larva has a sucker for attachment on human skin which it digests.
 - Have two hosts to increase chances of survival;
 - Adult worm can tolerate low oxygen concentration (in animal tissues)

17.

- a) Cervical vertebra;
- b)- has broad and branched transverse processes for neck muscle attachment;
- has a short neural spine;
- has prezygapophysis and postzygapophysis;
- c) A - neural spine;
B - facet ;

18. Nitrogen ;

19. Solution M - increased in volume because solution M is hypertonic to solution K; therefore solution K moved into visking tubing by osmosis;

Solution L - remained the same volume because it was isotonic to solution K, osmosis did not occur ;

20. Light intensity decreases with depth which leads to decrease in photosynthesis;

21. i) Continuous;

ii) Interaction of genes with environmental factors ;

22. a) Any chemical substance which when taken into the body has psychological and physiological effects ;
b) Impaired judgement ; reduced nervous co-ordination and brain activity; hence high predisposition to HIV/AIDS infections ;

23. Diaphragm flattens; increase in volume of thoracic / chest cavity ; pressure decreases ; **3 marks**

24. Boiling hydrolyzes starch to sugars / glucose; which are soluble and sweet tasting ; **2 marks**

25. Strong jaws / talons / beaks ; mimicry / camouflage ; acute eyesight ; fast running **first 2**

26.

- Numerous mitochondria in the cell of the tubule for more energy production;
- Presence of a numerous micro-villi to increase S.A. ;
- Well supplied with blood vessels for efficient absorption;
- Coiling reduces speed of flow for efficient absorption ; **first 3 points = 3 marks**

27.

- i) Carrying capacity - Maximum / total number of organisms a given area can support sustainably without depleting resources ;
- ii) Habitat - home or specific place where an organism lives ;
- iii) Community - Different populations that interact in a given area;

28. i) Cerebrum - controls learning / reasoning / intelligence, judgement ;

ii) Hypothalamus - controls sleep / wakefulness; feeding / drinking ; body temperature ; osmotic pressure ; **any 1st one**

29. a) Attaches muscle tissue to a bone ;

Smooth muscles	Skeletal muscles
- Spindle shaped	- Cylindrical shaped;
- Uninucleated	- Multinucleated;
- Involuntary	- Voluntary
- In visceral organ	- Located on skeleton

KIMA JOINT EVALUATION TEST - 2015

Kenya Certificate of Secondary Education

BIOLOGY

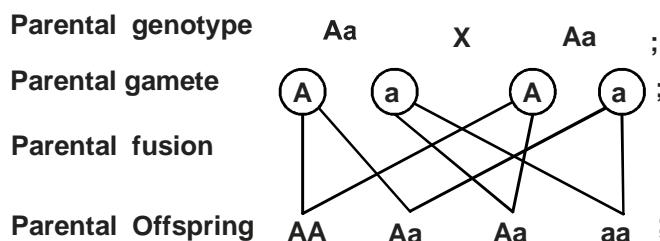
Paper - 231/2

July/August 2015

Marking Scheme

1. a) Both Aa / Aa or man Aa and woman Aa. **1 mark**

- b) **Parental phenotype**



- c) $\frac{1}{4} \times 100, = 25\% ;$ **2 marks**

- d) pink eyes/ white hair / light skin ; **1 mark**

2. a) - Excess glucose converted the glycogen and stored in liver / muscle cells;

- Glucose oxidised to release energy;

- Some glucose converted to fats and stored in a dipose tissue;

- b) - Pancrease;

- Liver ; **2 marks**

- c) - To avoid fluctuation in osmotic pressure; affecting normal functioning of the cells;

- For glucose to be enough for respiration; **2 marks**

- d) Maintenance of constant internal osmotic pressure ; **1 mark**

- 3.a) i) Plants ;

1 mark

- ii) They are producers / manufacture food for themselves and all other organisms in the ecosystem;

- b) i) Plants → mice → snakes → hawks

- ii) Plants → Aphids → Beetles → insectivorous bird → hawks;

- c) Plants will dry / reduce ;

- shortage of food for caterpillars / aphids / mice / slugs;

- Emigration of snakes / mice due to food shortage;

- d) i) Decomposers;

- ii) Breakdown remain of dead organisms / recycle nutrients ;

- 4.a) R - cervix

S - chorion

- b)

- Highly vascularized;

- Has villi which offer a large surface area;

- Has secretory cells / grandular cells for secreting hormones;

marks

- c) i) Amniotic fluid;

- ii) Cushions foetus against shock / provides suitable medium for embryo to grow / allows movement of foetus / reduces friction / lubricate ;

5. a) To investigate the effect of saliva on starch;

- b) A - brown colour / colour of iodine persists;

- B - Blue black ; **2 marks**

- c) A - Starch has been digested / starch has been broken down / amylase hydrolyses starch to maltose hence starch absent; (no colour change)

- B - Enzyme / salivary amylase denatured ;

- d) Optimum temperature for enzyme amylase activity;

- e)- Contains sodium taurocholate and glycocholate that) emulsifies fats / emulsification.

- Contains sodium bicarbonate which neutralizes the acid from the stomach;

6. a) Graph Scale - 2 marks

Axes - 1 marks

Plotting - 2 marks

Curve - 1 mark

Lab - 1 mark

Total	7 marks
b) i)	Intermittent;
ii)	Arthropoda;
	The intermittent growth curve is a characteristic growth curve characterized in insects.
c) i)	Between day 3 and 5 there is no growth; days 5 to 7 the instar stage is complete; ecdysone is produced then ecdysone hormone causes moulting accompanied by increased number of cells leading to growth;
ii)	Rapid growth in length to day 9; Hardening of exoskeleton which does not allow further growth; low levels of ecdysone and high levels of juvenile hormone.
d)	Ecdysone;
	Juvenile;
e)	Width of head 6.2 mm Length of femur 16.4mm

7.a) Soil contains film of water ; cell sap of root hair cell is more concentrated than soil water; concentration gradient is created; water enters into the root hair cell through cell wall; cell membrane into cell vacuole; by osmosis; The cell sap becomes more dilute than that of adjacent cell; similarly water passes into the neighbouring cells; the process is repeated until water is actively pumped into the xylem of the root; **8 marks**

- b) i) - Red blood cells have respiratory pigment for transport of oxygen.
 - Have biconcave shape to increase surface area for diffusion of respiratory gases (oxygen and carbon (IV) oxide;)
 - Are pliable to be able to squeeze within narrow blood capillaries.
 - Lack nucleus and some other organelles for packaging of more haemoglobin;
 - Have thin epithelium for easy diffusion of respiratory gases;
 - Are many per unit volume for transport of more oxygen;
 - Have enzyme carbonic anhydrase which speeds loading and offloading of carbon (IV) oxide.
 - Have a relatively long life span for efficient transport of oxygen; **8 marks**
- ii) White blood cells.
 - Have nucleus to regulate cell activities as they destroy pathogens;
 - Are able to change shape to be able to engulf and destroy pathogens; / are phagocytic to destroy pathogens;
 - Are produced in small numbers to prevent them from destroying other cells;
 - Produce opsonins / lysins /antitoxins / agglutinins which destroy pathogens / microbes **4 marks**

8.a) Conditions necessary for germination in seeds.

- i) Water / moisture;
 - Activate germination enzyme; breaks seed dormancy.
 - Provide medium for transport of dissolved food;
 - Is a medium for transport of dissolved foods;
 - Soften seed coat which burst open to allow emergence of radicle and plumule;
 - Hydrolysis of food during germination
 ii) Oxygen ;
 - Oxidation of food during respiration to provide energy for germination; cell division and formation of new tissues ;
 iii) Optimum temperature;
 - Suitable for action of germination enzymes (which hydrolyses stored food);
 - Low temperature below 0°C inactivates germination enzymes slowing down germination;
 - High temperatures above 40°C denature germination enzymes stopping germination;
 iv) Enzymes;
 - Breaks down food by oxidation;
 v) Viability;
 - Only seeds with live and healthy embryos will germinate and grow;
 - Seeds stored for a long time lose their viability.
 vi) Hormones;
 - Stimulates certain metabolic processes in germination.

NB:-

Every condition identified $1 \times 6 = 6$ marks

Every explanation identified $1 \times 6 = 6$ marks

Total = 12 marks

- b)- Have a thin epithelium; rapid diffusion of gases;
 - Have large surface area; for rapid diffusion of gases ;
 - Well vascularised; for efficient transport of the diffusing gases;
 - Have a moist surface; to enhance diffusion of gases in solution ; **8 marks**

KIMA JOINT EVALUATION TEST - 2015

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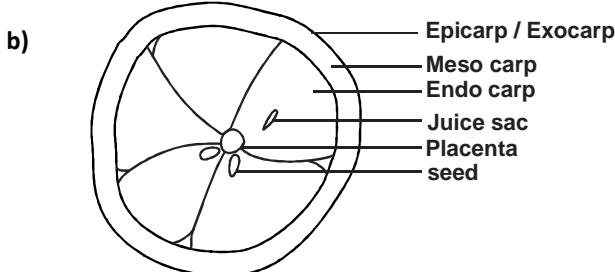
BIOLOGY

Paper - 231/3

July/August 2015

Marking Scheme

- 1.a) i)** A fruit / fruit Rj. an orange;
ii) Presence of two scars / pericarp / endocarp / placenta / seed (s) **2mks**

**L = 2mks****D = 2mks****4mks**

- ii)** Magnification = $\frac{\text{Drawing length}}{\text{object / actual length}}$
 $\times 0.5 - \times 1.0$ **2 marks**

c)

Test	Observations	Conclusion
DCPIP	The blue colour of DCPIP solution disappears / is decolourised	the extract contains vitamin C / ascorbic acid

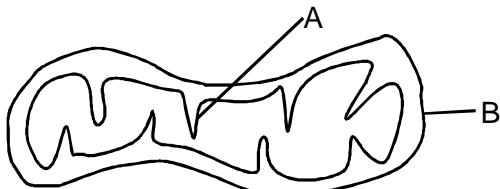
- d) i)** **Procedure:** Place 2cm³ of extract into a test tube, add 2cm³ Benedict's solution to the extract, heat to boil. **1 mark**
Observation: Colour changes to orange / brown. **1 mark**
Conclusion - extract contains a reducing sugar **1 mark**
- ii)** **Observation:** colour of iodine remains / brown colour of iodine solution persists; **1mk**
Conclusion: starch absent in the extract; **1mk**
- 2. a) i)** Athropoda;
ii) Jointed legs / jointed appendages;
- Segmented body ;
- b)**
1. a) Wings present go to 4;
 - b) Wings absent go to 2;
 2. a) Body dorso-ventrally flattened ... go to 3;
 - b) Body laterally flattened siphonoptera;
 3. a) Long antennae Anopura;
 - b) Short antennae Anopoura;
 4. a) Hardened wings Coleoptera;
 - b) Membranous wings go to 5;
 5. a) Two pairs of wings Odonata;
 - b) One pair of wings Diptera;
- 3. a) i)** arrows from right pointing left, on the side where the shoot bends to ; **1 mark**
ii) To investigate / show phototropism;
iii) Put the set up in a dark room without unidirectional light ;
iv) Due to unidirectional light; auxins move to / diffuse to non-illuminated / dark side; promoting faster growth / rapid elongation on the dark side; (hence bends towards light direction) **4mks**
- b) i)** To investigate geotropism;
ii) The plant would not bend / plant will continue to grow horizontally;
iii) Auxins move to / diffuse and accumulate on the lower side; promoting faster growth / elongation; hence the upward bending ; the shoot is positively Geotropic ;

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION****Kenya Certificate of Secondary Education**

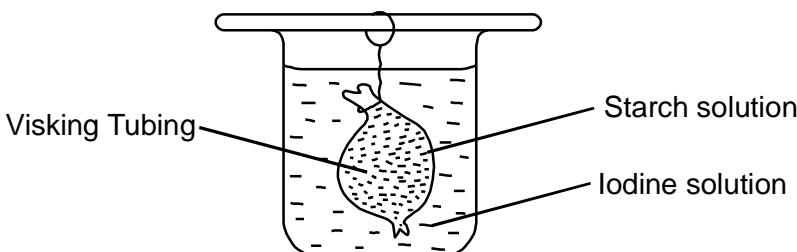
231/1

BIOLOGY**Paper 1****(Theory)****July/August 2015**

- 1.** The diagram below represents a cell organelle.



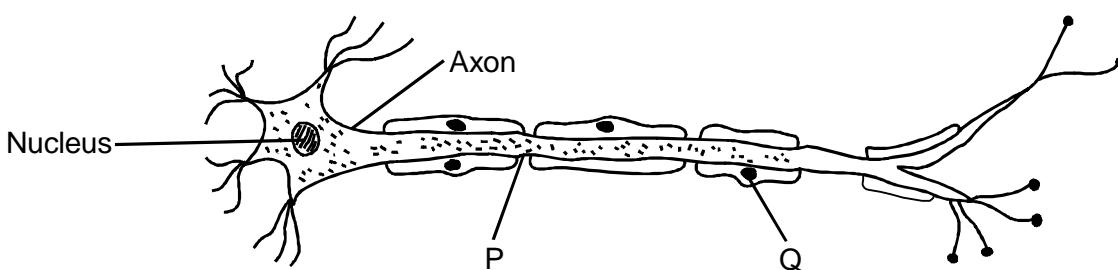
- a) Name the part labelled B. (1 mark)
 b) State the function of the part labelled A. (1 mark)
- 2.** Name the part of a flower that develops into:
 a) A fruit. (1 mark)
 b) A seed. (1 mark)
- 3.** a) Name **one** strengthening tissue in plants. (1 mark)
 b) How is support attained in plants that lack the named tissues above? (1 mark)
- 4.** a) Name the fluid that is produced by sebaceous glands. (1 mark)
 b) Explain the importance of sweat on the human skin. (1 mark)
- 5.** State **one** way in which floating leaves of aquatic plants are adapted to gaseous exchange. (1 mark)
- 6.** a) State **three** characteristics of monera that are not found in other kingdoms. (3 marks)
 b) Name the class to which the tick belongs. (1 mark)
- 7.** a) Name **one** disease of the circulatory system in humans. (1 mark)
 b) Name **two** forms in which carbon (IV) oxide is transported in blood. (2 marks)
 c) Give a reason why red blood cells have no nucleus. (1 mark)
- 8.** State the role of vitamin A in humans. (2 marks)
- 9.** a) State **two** processes which occur during prophase 1 of meiosis. (2 marks)
 b) What is the significance of mitosis? (1 mark)
- 10.** State the type of response exhibited by the following:
 a) Sperm cell as it swims towards the ovum. (1 mark)
 b) Feeding in insectivorous plant. (1 mark)
- 11.** State the role of glycogen in the human body. (1 mark)
- 12.** An experiment was set up as shown in the diagram below.



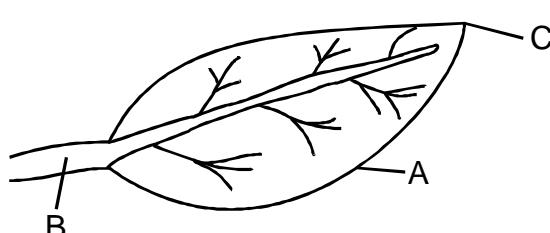
The set up was left for 30 minutes.

- a) State the expected results from the starch solution. (1 mark)
 b) Explain your answer in (a) above. (3 marks)
- 13.** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 36ATP$
- a) Identify the type of respiration illustrated in the equation above. (1 mark)
 b) Explain why lactic acid was not produced in the reaction illustrated in the equation above. (2 marks)
- 14.** a) State **two** advantages of metamorphosis to the life of insects. (2 marks)
 b) During germination and early growth, the dry weight of endosperm decreases while that of the embryo increases. Explain. (1 mark)

15. a) Explain how the process of evolution may result to the formation of a new species. (2 marks)
- b) What is meant by
 i) Organic evolution. (1 mark)
 ii) Continental drift (1 mark)
16. a) State how excessive use of pesticides may affect soil fertility. (2 marks)
- b) State **two** measures that can be taken to control infection of man by protozoon parasites. (2 marks)
17. What is the importance of the following in an ecosystem? (2 marks)
- a) Decomposers
 b) Predation
18. A certain animal has no incisors, no canines, 6 premolars and 6 molars in its upper jaw. In the lower jaw there are 6 incisors, 2 canines, 6 premolars and 6 molars. Write its dental formula. (1 mark)
19. a) State the function of co-factors in the cell metabolism (1 mark)
- b) Give an example of a metallic co-factor. (1 mark)
- c) Give a reason why lack of roughage in the diet often leads to constipation. (1 mark)
20. a) Name **two** mechanisms that prevent self-pollination in the flower that have both male and female parts. (2 marks)
- b) After four months of pregnancy, the ovaries of a woman can be removed without terminating pregnancy. However, during the first four months of pregnancy, the ovaries must remain intact if pregnancy is to be maintained. Explain these observations. (3 marks)
21. The diagram below represents a motor neurone.



- a) With an arrow, indicate on the diagram the direction of the impulse through the neurone. (1 mark)
- b) State the function of parts labelled P and Q. (2 marks)
22. State **three** biological importances of tactic responses to plants. (3 marks)
23. a) State **two** functional differences between the rods and cones in the human eye. (1 mark)
- b) State the function of ciliary muscles in the human eye. (1 mark)
24. a) Name the cartilage between the bones of the vertebral column. (1 mark)
- b) State the function of the cartilage named in (a) above. (1 mark)
- c) State how the skeletal muscle fibres are adapted to their function. (1 mark)
25. a) State the function of the following parts of a mammalian ear:
 i) Tympanic membrane
 ii) Eustachian tube
 iii) Ear ossicles
 b) Explain how the semi-circular canals perform their functions. (3 marks)
26. Describe the path taken by carbon (IV) oxide released from the tissue of an insect to the atmosphere. (3 marks)
27. The diagram below show a part of a plant.



- a) Identify the plant part. (1 mark)
- b) Give a reason for your answer in (i) above. (1 mark)
- c) Name the parts marked A and B. (2 marks)
28. State the form in which carbohydrates are stored in
 i) Plants. (1 mark)
 ii) Animals (1 mark)

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION****Kenya Certificate of Secondary Education**

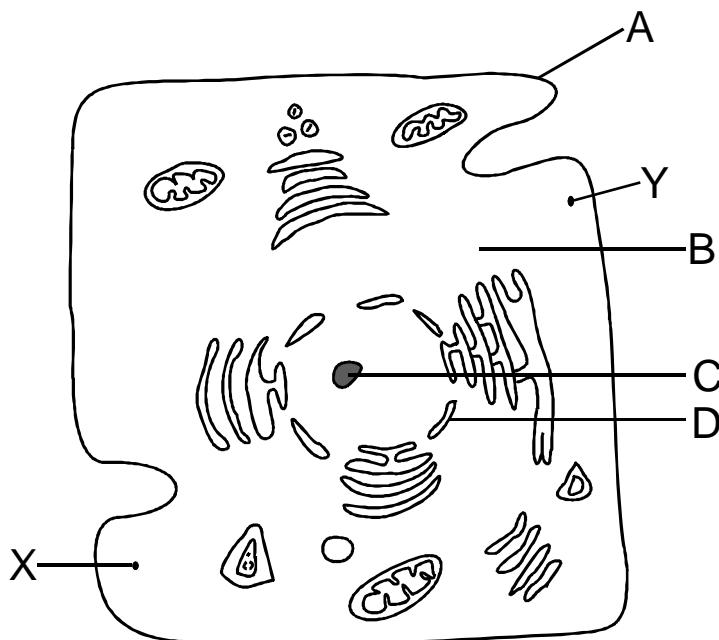
231/2

BIOLOGY**Paper 2****(Theory)**

July/August 2015

SECTION A : (40 marks)**Answer ALL the questions in this section in the spaces provided.**

1. The diagram below shows a certain cell. Use it to answer questions that follow.

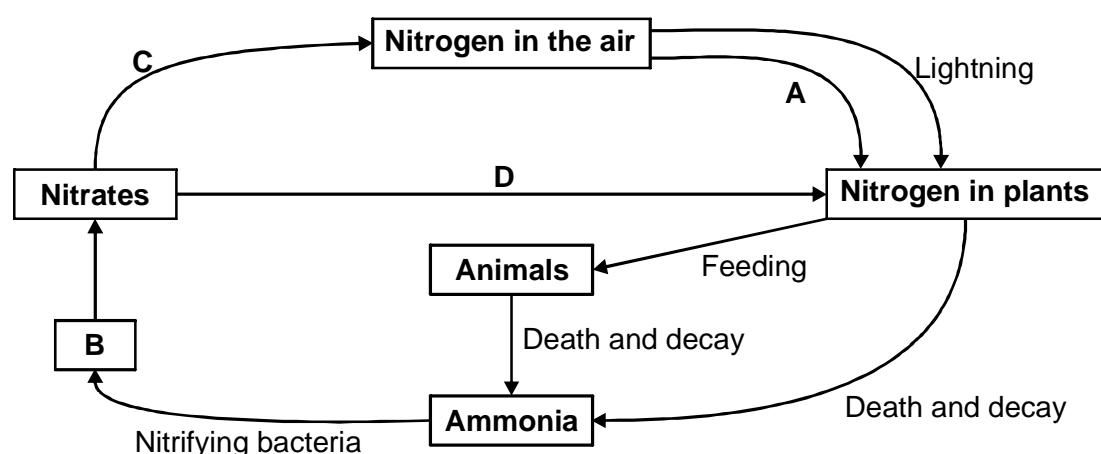


- a) Identify the structures labelled A, B, C and D (4 marks)
 b) Measure the length of the distance between point X and Y. If the magnification of the above cell is $\times 10,000$. Calculate the actual diameter of the cell between points XY in micrometers. Show your working. (2 marks)
 c) With a reason identify the kingdom from which the cell was obtained. (2 marks)

Kingdom.....

Reason.....

2. The diagram below represents the nitrogen cycle.



- a) State the process labelled. (2 marks)
 A
 D
- b) Name the compound represented by B. (1 mark)
- c) Name the group of organisms labelled C. (1 mark)
- d) i) Name the group of plants which promote process A. (1 mark)
 ii) State the part of the plant where process A takes place. (1 mark)
- e) How would excess pesticides in the soil interfere with process A. (2 marks)
3. In humans, haemophilia is sex linked, caused by recessive gene, which exerts its effect when in homozygous state. A man whose mother was haemophilic marries a normal woman whose father was haemophilic. If H represents non-haemophilic, h represents haemophilic gene.
- a) What are the possible genotypes of
 i) The man (1 mark)
 ii) The woman (1 mark)
- b) Showing your working, find out the possible genotypes of their F_1 generation. (3 marks)
- c) What is the probability of the first born son being haemophilic. (1 mark)
- d) Why are sex linked traits more common in males than in females? (1 mark)
- e) Name any other one sex linked trait in human beings. (1 mark)
4. a) The diagram below represents a mature fruit from a dicotyledonous plant. Observe it and answer questions that follow.



- i) To what group of fruits does the specimen belong? (1 mark)
- ii) Suggest the possible agent of dispersal of the fruit..... (1 mark)
- b) State two ways in which male parts of a wind pollinated flower are adapted to their mode of pollination. (2 marks)
- c) Differentiate between Monoecious and Dioecious plant. (2 marks)
- d) State any two differences between an ovum and a sperm. (2 marks)

5. The photograph below shows an animal organ. Examine it and answer the questions that follow.

- a) Identify the part labelled L..... (1 mark)
- b) Name the class of the animal from which the organ was obtained. (1 mark)
- c) State three ways in which part L is adapted to its functions. (6 marks)

SECTION B (40 marks)

Answer question 6 (COMPULSORY) and EITHER question 7 or 8 in the spaces provided after question 8

6. An investigation was carried to show the effect of antidiuretic hormone (ADH) on urine production in a mammal. The rate of urine production was measured over a period of 30 minutes. Five minutes after measurements began; ADH was injected into a vein of the mammal. The results are shown in table below.
- a) Plot a graph of rate of urine production against time. (7 marks)
- b) Name the gland that releases ADH..... (1 mark)
- c) Describe the effect of injection of ADH on the rate of urine production in the mammal in this investigation.(3 marks)
- d) Describe the mechanism by which ADH produces the effect seen in this investigation. (4 marks)
- e) In a similar investigation, an injection of sodium chloride (salt) solution was given after five minutes instead of ADH. This injection was observed to affect urine production in a similar way to ADH. Suggest how the sodium chloride brought about this effect. (5 marks)
7. Describe the various evidences which support the theory of organic evolution. (20 marks)
8. Describe the functions of the main blood components in mammals. (20 marks)

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION****Kenya Certificate of Secondary Education****231/3****BIOLOGY****Paper 3****(Practical)****July/August 2015**

- 1.** You are provided with specimen labelled K1.

Examine the specimen

- a) i) Given that the specimen K1 is a modified stem, draw and label a diagram of the specimen showing observable features which support this view. (3 marks)
- ii) How does this specimen obtain oxygen from the soil for respiration? (1 mark)
- b) Cut four rectangular strips of specimen K1 each strip should be of 5mm wide by 20mm long. Place two stripes into solution Q and another two into solution T. Allow the experimental set ups to stand for 10 minutes.
- i) Using your fingers feel the texture of the strips in each solution. Record your observations from each solution, below
 Solution T (1 mark)
 Solution Q (1 mark)
- ii) Measure the strips from each solution and record your measurement in the table below. (4 marks)

Initial length	Final length	Change in length
Solution T 1 2		
Solution Q 1 2		

- iii) Account for the results in each of the solution.

Solution T (1 mark)
 Solution Q (1 mark)

- c) i) Substance K2 has been obtained from specimen K1. (Cut small pieces of K1 and crush them using a mortar and pestle. Add water and decant to obtain K2). Use the substance and procedure provided to carry out the following experiments. (3 marks)

	Procedure	Observation	Conclusion
i)	Put a sample of substance K2 on a white tile. Add two drops of iodine solution		
ii)	To another portion in a testtube add 2cm ³ of Benedict's solution and heat		
iii)	Put another portion in a testtube. Add solution L and heat gently for one minute cool. Add drops of sodium hydrogen carbonate until effervescence stops. Add 2cm ³ of Benedict's solution and heat		

- ii) Account for your results in c(i)iii above (1 mark)
 iii) Suggest the identity of solution L. (1 mark)

- 2.** Refer to the photograph of insects provided below. Examine them and answer the following questions.

- a) Use the dichotomous key below to identify the specimens. Write down in correct order the steps (number and letter) that you followed to arrive at your answer.

Dichotomous key.

1. a) Animal with wings..... go to 2
 b) Animal without wings go to 7
2. a) With two pairs of wings..... go to 3
 b) With one pair of wings Diptera
- 3 . a) With membranous wings..... go to 4

- b) Hard pair of membranous wings go to 6
4. a) With long abdomen Odonata
- b) Medium-sized abdomen go to 5
5. a) Wings with coloured scales Lepidoptera
- b) Wings without scales Hymenoptera
6. a) Forewings hard and shell-like Coleoptera
- b) Forewings hard but not shell-like Orthoptera
7. a) Body horizontally flattened Isoptera
- b) Body laterally flattened Siphonoptera

3. You are provided with specimen M and N obtained from the same animal. Examine them carefully.

	M	N
i)		
ii)		
iii)		

a) Identify the specimens and in each case name the region of the body from which it was obtained.(4 marks)

Specimen M

Region

Specimen N

Region

b) State three features of specimen N which adapts it to its functions. (3 marks)

c) State three differences between specimens M and N (3 marks)

d) Draw the anterior view of specimen M, Label any two parts. (3 marks)

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION****Kenya Certificate of Secondary Education****BIOLOGY****Paper 231/1****July/August- 2015****MARKING SCHEME**

1. a) Outer membrane; acc - membrane.
b) Attachment of respiratory enzymes; / have respiratory enzymes;
2. a) Ovary ;
b) Ovule;
3. a) Xylem;
b) Turgidity of their (Parenchyma) cells;
4. a) Sebum;
b)- Evaporation of water in sweat leading to cooling effect; /
- Provide a means of exertion ;
5. Have aerenchyma cells for buoyancy;
6. a) i) Prokaryotic; / (Nuclear material not enclosed within a nuclear membrane)
ii) Have few organelles; / lacks mitochondria.;
iii) Most of them are heterotypic;
iv) Unicellular and microscopic;
v) Reproduction is through binary fission.;
b) Arachnida; reject spelling mistakes.
7. a) Arteriosclerosis ; / Antheroma; / Varicose vein; / Thrombosis; (**accept one**)
b) i) As a Weak carbonic acid;
ii) Inform of hydrogen carbonate ions;
iii) As a dissolved carbon (IV) oxide in blood plasma.;
c) No give / provide more room for the package of haemoglobin ;
8. i) Improves vision especially in dim light / night;
ii) Protects skin and cornea from drying and becoming scaly;
iii) Essential for normal growth in children and bone development;
9. a) i) Nucleolus disappears;
ii) Chromosomes becomes more visible;
iii) Chiasmata formation;
iv) Homologous chromosome. (bivalents / synapsis occurs) **accept any two correct**
b) Growth of an organisms;
10. a) Chemotaxis;
b) Haptotropism; / Thigmotropism
11. Hydrolysed into glucose (that is further broken down) to release energy;
12. a) The starch solution turned blue black;
b) Iodine molecules diffused; across the microscopic pores; (in the visking tube) into the starch solution; (resulting to be blue black colouration)
13. a) Aerobic respiration;
b) The glucose is completely broken down; (into carbon (IV) oxide, water and energy)
- Presence of oxygen; (gas)
14.
- Enables dispersal of organisms hence reduced overcrowding.;
- Enables organism to survive unfavourable environmental conditions, through the pupal stage;
- Adults and larval stages exploit different ecological niches hence no competition for food;
b) Stored food is hydrolysed (broken down) and transported to form new protoplasm / used in cell division / new cellular material is synthesized.;
15. a) Organisms with beneficial / favourable mutations are able to pass them onto their offsprings (during reproduction).;
Accumulation of such favourable characteristics over successive generations lead to the formation of new species;
b) i) States that all plants and animals arose from ancient simpler ancestral forms through gradual series of small changes that took many millions years, to their present complex form;
ii) Refers to the continuous movement of continental land masses away from each other; (resulting to separation of species)
16. a) Kill microorganism; in the soil that enables aeration / fixation ; of soil thus affecting the fertility.
b) Drain stagnant water ;
- Clearing of bushes ;

- Drugs;
17. a) Helps into breakdown of organic matter, thereby setting nutrient free into the soil;
b) Helps to maintain the carrying capacity of an ecosystem at a constant level;
- 18.
- $i \frac{0}{6}, C \frac{0}{2}, pm \frac{6}{6}, m \frac{6}{6};$
19. a) Activate the enzymes;
b) Iron / magnesium / zinc / copper(**accept one of the above**)
c) Roughages promote peristalsis;
20. a) Self sterility or incompatibility;
- Heterostyly;
- Protandry;
- Protogyny;
acc any two
b) During the first four months of pregnancy the ovaries secretes progesterone; until the maturity of the placenta; that take over the role, hence the ovary cannot be terminated before the placenta is formed;
- 21.
- a) (Arrow from the cell body to the effector dendrites) Arrow shown award 1 mark
b) P - to propagate and speed up transmission of an impulse;
Q - Secretes the myelin sheath;
- 22.- Enables organism to escape from harmful stimuli;
- Enables organisms to seek favourable habitats;
- Enables organisms to acquire resources; e.g. Nutrients, mate
- Enable fertilization to take place; chemotaxis. **mark the first 3 correct**
23. a)
- | Rods | Cones |
|---|---|
| - Have rhodopsin that perceive light of low intensity | -Have iodopsin that perceives light of high intensity |
| - Do not perceive colour; | - Helps perceive colour |
- mark only 1 correct difference**
- b) Helps to alter the length of suspensory ligaments;
24. a) Intervertebral disc ;
b) To absorb shock / reduce friction;
c) Striated ;
25. a) i) Receives and magnifies / (the sound waves);
ii) Equalise air pressure between the middle ear and outer ear to prevent distortion of ear drum;
iii) Amplifiers and transmits vibrations from tympanic membrane to oval window;
b)The canals are fluid filled; the displacement ; (of the fluid) leads to restoration of the body balance;
- 26.
- Carbon(IV) Carbon (IV) Carbon (IV) Spiracle open
 oxide In oxide in oxide in to
 the the the atmosphe
 the tracheole trachea; re;
 tissue s;
27. a)
Leaf
b) (Acc reasons for the presence of any one leaf feature) **1 mark**
c) A - leaf margin / smooth margin / margin;
B - leaf stalk / stalk / petiole ;
28. i) Starch
ii) Glycogen;

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION**

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/2

July/August 2015

Marking Scheme

1. a) A cell membrane ; / plasma lemma ; /plasma membrane ;

B Cytoplasm ;

C Nucleolus;

D Nuclear membrane ;

b)

- c) Kingdom Animalia;

Reason:

Absence of cell wall

Irregular shape;

Centralised nucleus

Absence of chloroplast;

Presence of centrioles; **1 × 1**

2. a) A - nitrogen fixation by symbiotic bacteria ; (E.g. Rhizobium)

D - Absorption ;

b) B - nitrites ;

c) C - Denitrifying bacteria ; / denitrifier;

d) i) Leguminous plants ; / legumes;

ii) Root nodules (s) ;

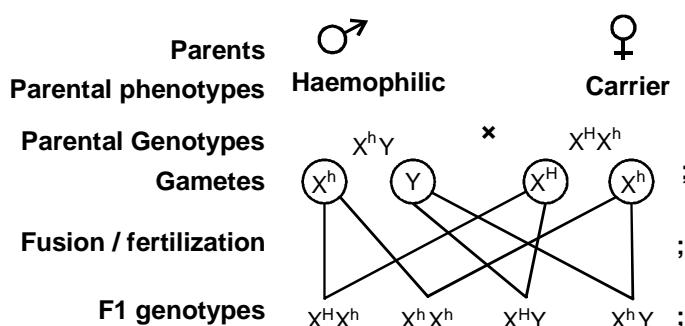
e) -Killing / reduction of nitrogen fixing bacteria / nitrogen fixing micro-organisms;

-Destruction of leguminous plants;

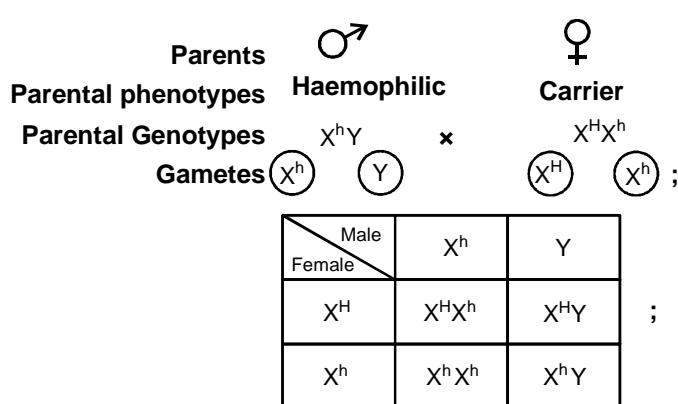
3. a) i) Man X^hY ;

ii) Woman X^HX^h ;

b)



OR

F1 Genotypes X^HX^h , X^hX^h , X^HY , X^hY ;

- c) $\frac{1}{4}$; / 0.25; / 25%

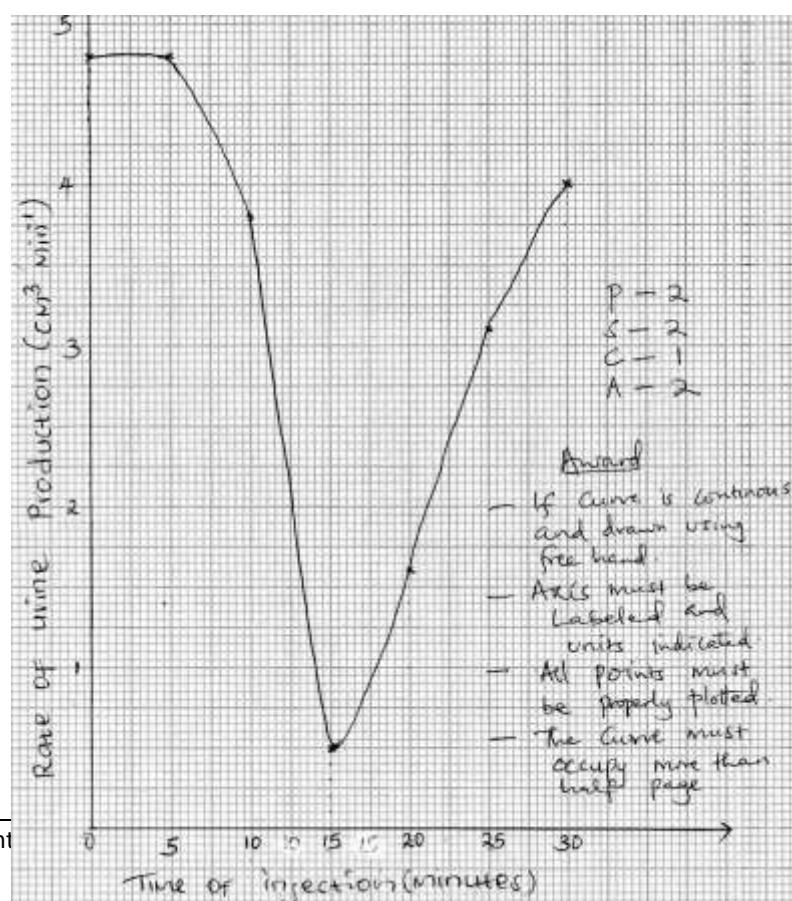
- d) Most are located in the X chromosomes and thus males have only one X chromosomes and thus require only one recessive allele to be defective while females require two recessive alleles to be defective ; /
 Most male victims die young and hence miss the opportunity to pass on the genes to their daughters, for the defects are harmful / lethal;
- e) Colour blindness;
 Pre mature baldness;
 Tufts of hair in nose; Pinna; / porcupine man ;
4. a) i) Cypsela ; (Rej: Crypsela)
 ii) Animal;
 b) Pollen grains are light, small and powdery to be easily blown by the wind;
 Large anthers loosely attached to a flexible filaments to ensure that pollen grains are released when blown by wind;
Features and function must be indicated.
 b) Monoecious plants have male and female flowers borne on separate plants ; while Dioecious plants have male and female flowers borne on the same plant;

Ovum	Sperm cell
Spherical in shape ;	Long with tail and head;
Bigger in size;	Small in size;
Immobile;	Mobile;
Has more food store;	Less food store;
No acrosome;	Has acrosome;

5. a) L lung;
 b) Class mammalia ;
 c)
 - made of spongy elastic tissues; that expand to accommodate a large volume of air;
 - Made of numerous alveoli; to provide a large surface area for gaseous exchange;
 - Supplied with numerous blood capillaries; to maintain a high concentration gradient for quick transportation of gases;

SECTION B

6. a) Refer to the graph



- b) (Posterior) pituitary; (Reject pituitary)
- c) Decrease in urine production; / urine production inhibited; in the first 10 minutes after injection; increase in urine production in the next 15 minutes;
- d) ADH increases the permeability of the collecting duct and distal convoluted tubule to water; more water is reabsorbed ; into the blood from collecting duct / distal convoluted tubule; by osmosis; (into the body cell) (OWTTE)
- e) Sodium chloride increases the (salt) concentration in blood; detected by chemoreceptors; (in the hypothalamus) this stimulates the secretion of ADH leading to increased levels of ADH in the blood (plasma); This increases the permeability of collecting duct and distal convoluted tubule to water more water is reabsorbed into the blood by osmosis into the body cells;

7. Fossil records / palaeontology;

- Fossils (remains of ancestral forms that were accidentally preserved in some naturally occurring material such as se rocks) ; give direct evidence of the type of organisms that existed in a certain area at a certain geological time;
- Fossils show gradual increase in complexity or morphological changes of organisms over a long period of time; The lower /older strata contains fossils showing simple structures while the young / upper strata contains fossils showing more complex structures;

Geographical distribution of organisms;

- This is the dispersion and location of organisms in specific geographic regions;
 - Present day continents are thought to have been one large land mass long time ago;
 - Continental drift which is slow movement of continents away from each other, isolated animals, with a common ancestry leading to different patterns of evolution; Thus although certain climatic conditions are similar their flora and fauna are not identical;
- Example: Llamas of South America resemble the Camel of Africa and Asia and are thought to have originated from North America; Marsupials such as Kangaroos are unique to Australia because they are thought to have been the first continent to drift;
- Geographical barriers; (such as mountains, oceans, deserts and rivers) here influenced distribution of species. These barriers have isolated populations of organisms hence preventing them from interbreeding as a result, over time, isolated species underwent separate change or evolution;

Comparative embryology;

- Study of the differences and similarities among embryos of different animals;
- Vertebrate embryos are morphologically similar during their early stages of development; suggesting that they have a common ancestry / origin;
- Close resemblance between embryos show closer phylogenetic relationship between organisms;

Comparative anatomy

- Comparative anatomy is the study of structural similarities and differences between organisms;
- Members of the same group / phylum show similarities in structures and organs performing the same functions. For example: Digestive system, urinary system, chambered heart in vertebrates.
- Fore limb of selected organisms differ in form and structure in different animals such as bats, whales and birds;
- The forelimbs perform various functions like swimming and running but the basic pentadactyl structure is retained;
- Beaks of birds are examples of homologous structures. There are structures of same origin but perform different functions leading to divergent evolution/ adaptive radiation;
- Structures having different embryonic origin; (hence different in form and structure) can evolve to perform same function; due to exploitation of the same kind of environment. Example: wings of insects, bats and birds are termed as analogous structures since they have different origin and structure but they have similar function of flying because of convergent evolution;

Cell biology / cytology;

The study of cell organelles reveals similarities and differences in cells of different organisms.

- Cells of higher organisms show basic similarities in their structures and functions. Organisms that share similar cell organelles such as mitochondria, endoplasmic reticulum, Golgi bodies and biological chemicals like Adenosine triphosphate (ATP) and deoxyribonucleic acid (DNA) have a common evolutionary origin;

Comparative serology;

- Analysis of blood proteins, antigens, rhesus factors, blood groups and haemoglobin structure; reveal phylogenetic relationship among various organisms;
- Those species that are more phylogenetically related contain more similar blood proteins.
- Antigen - antibody reactions, serological tests and experiments with serum reveal phylogenetic relationship or common ancestry among organisms;

Total marks 36 maximum 20

8. Red blood cell;

- Red blood cells contain haemoglobin ; which has a high affinity for oxygen. Haemoglobin combines with oxygen in areas of high oxygen concentration to form oxyhaemoglobin which is transported to cells in areas of low oxygen concentration;
- Haemoglobin also combines with carbon (IV) oxide forming carboxyhaemoglobin; hence transporting it to the lungs for removal out of the body;
- Red blood cells are bincave in shape; to increase surface area for diffusion of oxygen and carbon (IV) oxide;
- Mature red blood cells lack a nucleus; and other cell organelles. This creates adequate space for packing of haemoglobin;
- Red blood cells contain enzyme carbonic anhydrase with catalyses the reaction between water and carbon (IV) oxide to form carbonic acid;
- Haemoglobin reacts with hydrogen ions from the dissociation of carbonic acid thus buffering the plasma pH;
- Red blood cells are numerous to ensure efficient transport of oxygen to the respiring tissues and carbon IV oxide from the tissues.

White blood cells;

- They fight infections; Neutrophils and monocytes destroy pathogens by phagocytosis; eosinophils attack antigen-antibody complexes by phagocytosis and allergens; Basophils release histamine which promotes blood flow to injured tissues; while lymphocytes are involved in antibody production;

Platelets;

Release enzyme thrombokinase that starts the process of blood clotting after a tissue injury;

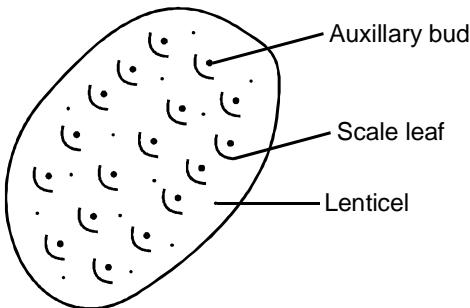
Plasma;

- Blood plasma contains water which maintains blood volume in the body;
- Blood plasma transports digestion products such as amino acids and glucose to the cells and storage organs;
- Dissolved salts in plasma maintain osmotic pressure and pH of blood while aiding metabolism.
- Blood plasma transports hormones and enzymes from secretory glands to the tissues where they are required;
- Blood plasma transports carbon (IV) oxide to the lungs and urea from tissues to the kidneys;
- Plasma distributes heat throughout the body.

Total 26 marks maximum 20 marks

KANDARA SUB COUNTY SECONDARY SCHOOLS**FORM FOUR 2015 JOINT EXAMINATION****Kenya Certificate of Secondary Education****BIOLOGY****Paper - 231/3****July/August 2015****Marking Scheme**

1. a) External features of K1 **3 marks**



D = 1

L = 1(for 2 labels)

Mg = 1

Rej: If pair of compass is used.

-If diagram is shaded

-If broken outline.

ii) Intake through the lenticels; (from the soil) **1 mark**

- b) i) Solution T
Firm ; Turgid; / Stiff;
Solution Q
Flabby; / soft; / flexible; / flaccid; / tender; / limp ;
ii)

Initial length	Final length	Change in length
Solution T 1 - 20mm 2 - 20mm	(21 - 23)mm;	(1 - 3)mm;
Solution Q 1 - 20mm 2 - 20mm	(19 - 17)mm;	(1 - 3)mm;

Accounting for the results (2 marks)

Solution T - Hypotonic / less concentrated than cell sap water drawn into the cells by osmosis; (hence strip becomes turgid.)

Solution Q

Hypertonic / more concentration (than the cell sap water lost from the cells by osmosis; (hence strip becomes flaccid.)

- c) i)

Experiment	Observation	Conclusion
1	Turns - blue black;	Starch present ;
2	Blue colour persist ; Acc. No observable colour change	Reducing sugars absent;
3	Effervescence occurs; colour changes to yellow, or to orange;	Reducing sugars present;

NB: Mark observation and conclusion as a whole.

- ii) Accounting
Starch hydrolysed / converted to simple sugars by L / dilute hydrochloric acid.;
- iii) Identity of L
Hydrochloric acid ;
Accept : Acid alone.

2.

10 marks

Specimen	Order	Steps followed
A	1b, 7a;	Isoptera;
B	1a, 2a, 3a, 4b, 5a;	Lepidoptera;
C	1a, 2a, 3b, 6a;	Coleoptera;
D	1a, 2a, 3a, 4b, 5b;	Hymenoptera;
E	1a, 2a, 3a, 4a;	Odonata;

3. M identity :

Lumbar vertebrate

Region Abdominal; **2 marks**

N identity

Cervical vertebrae

Neck region ; **2 marks**

b) Neural canal for passage of spinal cord ;

- Transverse process for attachment of neck muscles;

- Facets for articulation with other vertebrae;

- Vertebrarterial canal for the passage of blood vessels and nerves ;

- Neural arch / centrum for protecting the spinal cord ;

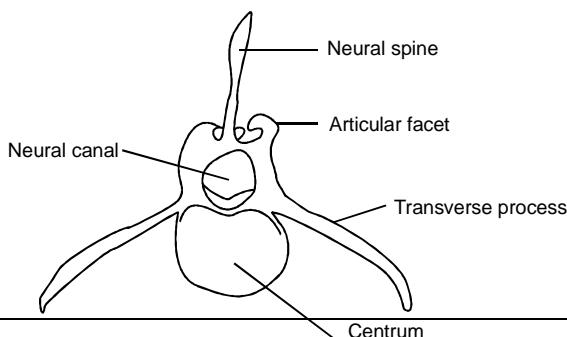
- Neural spine for attachment of neck muscles;

mark first two

c)

M	N
i) Has vertebral canals	- Vertebrarterial canal absent;
ii) Wide neural spine;	- Narrow or no neural spine;
iii) Longer transverse process;	- Divided transverse process; acc winged / branched / forked
iv) Metaphyses and anapophyses present;	- Metaphyses and anapophyses absent
v) Narrow neural canal;	- Wide neural canal;
vi) Lacks cervical ribs;	- Cervical ribs present;

d)

Drawing - 1**Labelling (at least 3 parts) = 1****Mg = 1x (1 - 2)**

KISII CENTRAL FORM FOUR JOINT EVALUATION

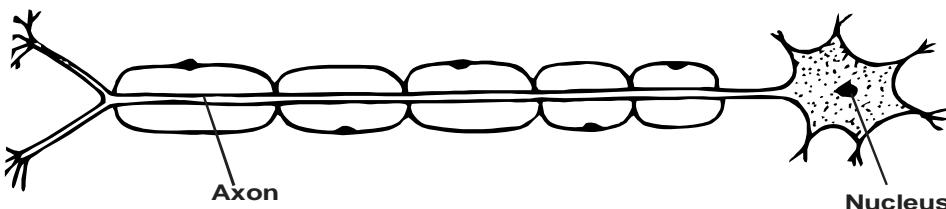
Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/1

July/August 2015**Time:** 2 hours

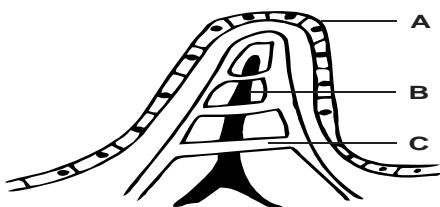
1. a) Define the term 'adaptive radiation'
b) Give an example of adaptive radiation in animals. (2 marks)
2. Other than diffusion and transpiration, name two methods by which Angiosperms excrete. (2 marks)
3. Antheridia and Archegonia are male and female producing gametes respectively.
a) Name the plants in which they are found.
b) Name the division to which these plants belong. (1 mark)
4. a) What is carapace?
b) State two ways in which the exoskeleton has helped in the success of Arthropods life in terrestrial habitats. (2 marks)
5. A certain plant was found to have 22 chromosomes in its calyx cells. State the number of chromosomes present in its embryo sac nucleus.
a) Embryo sac nucleus
b) Primary endosperm nucleus. (2 marks)
6. The table below shows the percentage composition of inspired and expired air.
- | Gases | Inspired % | Expired % |
|-------------------|------------|-----------|
| Oxygen | 21 | 16 |
| Carbon (IV) oxide | 0.04 | 4 |
| Nitrogen | 79 | 79 |
- a) What percentage of inspired oxygen is taken up by lung capillaries? (1 mark)
b) Account for the difference in composition of carbon (IV) oxide between inhaled and exhaled air. (3 marks)
7. Distinguish between the terms ecosystem and ecological niche. (2 marks)
8. The diagram below represents a type of neurone.



- a) i) Identify the neurone above.
ii) Give a reason for your answer in a(i) above. (1 mark)
- b) With an arrow, indicate on the diagram the direction of an impulse through the neurone. (1 mark)
9. What is the necessity of support in plants? (2 marks)
10. State two importance of DNA molecule. (2 marks)
11. Describe how osmotic pressure develops. (3 marks)
12. Name the two stages of photosynthesis and state where each stage occurs. (4 marks)

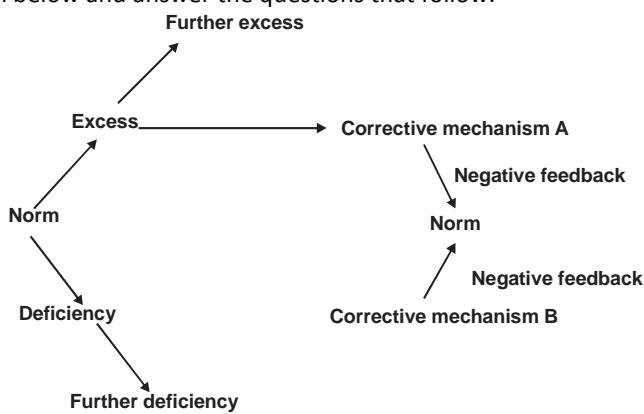
	Stage of photosynthesis	Where it occurs
i)		
ii)		

13. The diagram below represents part of alimentary canal.

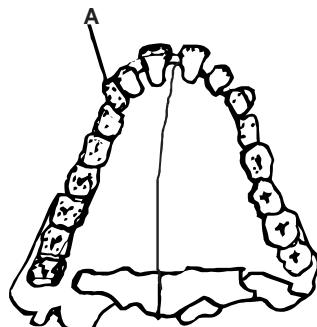


- a) Name the structure represented above.
b) Identify the part labelled A.
c) State the products that diffuse into part labelled B and C. (1 mark)
14. State TWO similarities between members of class Aves and class Reptilia. (2 marks)

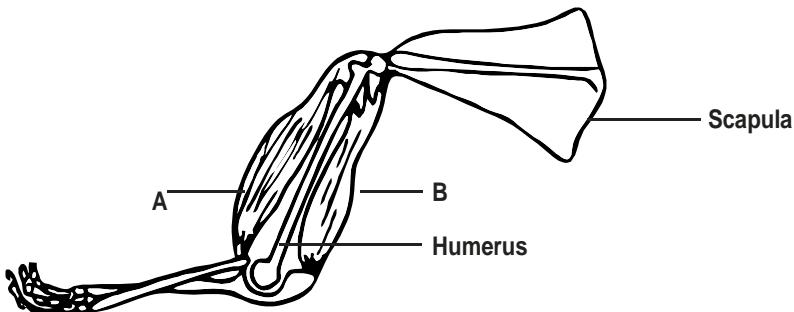
15. Account for the loss in dry weight of cotyledons in a germinating bean seed. (1 mark)
16. State **TWO** applications of the knowledge gained in biology in controlling the spread of HIV and AIDS. (2 marks)
17. A fresh wound bleeds more in hot weather than in cold weather. Explain. (2 marks)
18. Give reasons why plants in cold desert e.g. Arctic and Antarctic regions show xerophytic characteristics. (1 mark)
19. Study the diagram below and answer the questions that follow.



- a) Name the principle labelled X. (1 mark)
- b) If the above diagram represented blood sugar regulation.
- State the corrective mechanisms carried out at A. (1 mark)
 - The condition that may result from the further excess. (1 mark)
 - The hormone that would be responsible for correcting the deficiency. (1 mark)
20. The diagram below shows the arrangement of teeth in the lower jaw of a human being.

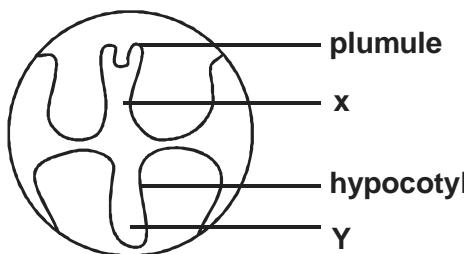


- a) Write the dental formula. (1 mark)
- b) From the dental formula determine the total number of teeth. (1 mark)
- c) How is tooth A adapted to its functions. (1 mark)
21. a) Study the diagram below and answer the questions that follow.



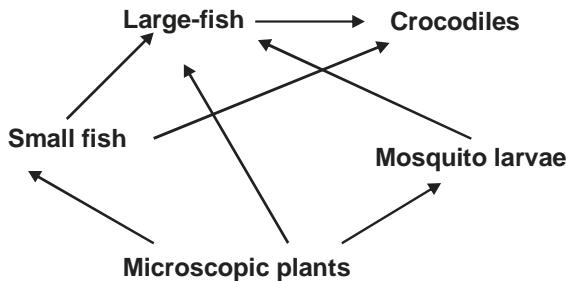
- i) Name the muscles labelled A and B. (2 marks)
- ii) What happens to each muscle as the arm is stretched. (2 marks)
22. Plants of a particular species growing in certain habitat flower at the same time. What is the importance of this adaptation. (1 mark)

23. The diagram below represents the internal structure of a bean seed.



- a) Name the parts the seed embryo represented by letter X and Y. (2 marks)
- b) What type of germination would result if the hypocotyl elongates faster. (1 mark)
- c) What is the significance of the part labelled Y emerging first during germination. (1 mark)

24. The following diagram shows a feeding relationship in an ecosystem.



- a) From the diagram, write down a food chain with crocodile as the tertiary consumer. (1 mark)
- b) Which of the above organism would you expect to have the highest population. (1 mark)
- c) Give reason for your answer in (b) above. (1 mark)

25. Below is an equation of a reaction that takes place in the liver.

- a) Identify the above reaction. (1 mark)



- b) Which enzyme is required in the reaction? (1 mark)

26. Name the causative agent for Vaginal thrush. (1 mark)

27. What is used to achieve the following in an electron microscope?

- a) Magnification. (1 mark)
- b) Illumination. (1 mark)

28. State the survival value of the following responses.

- i) Euglena swimming towards a region with bright light. (1 mark)
- ii) Pollen tube growing towards the embryo sac. (1 mark)

29. State one disadvantage of using quadrant method in population estimation. (1 mark)

30. Name the cell organelles that are responsible for the formation of the following organelles. (2 marks)

- i) Lysosomes
- ii) Ribosomes

31. What is the meaning of the following terms?

- i) Fermentation. (1 mark)
- ii) Oxygen debt. (1 mark)

32. a) Haemophilia is a sex - linked disorder caused by a recessive gene located on the x - chromosomes. Give the genotype of a male haemophiliac individual. (1 mark)

- b) State ONE cause of variations in organisms that take place during gametogenesis. (1 mark)

33. a) State TWO processes which occur during anaphase of mitosis. (2 marks)

- b) What is the significance of meiosis? (1 mark)

KISII CENTRAL FORM FOUR JOINT EVALUATION

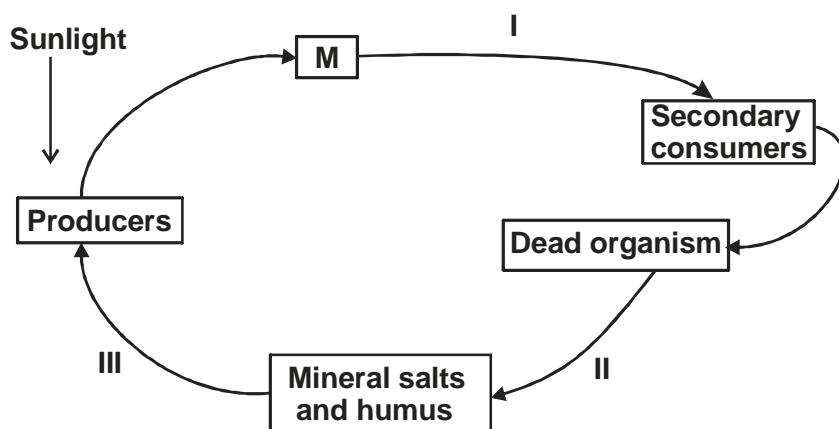
Kenya Certificate of Secondary Education

BIOLOGY

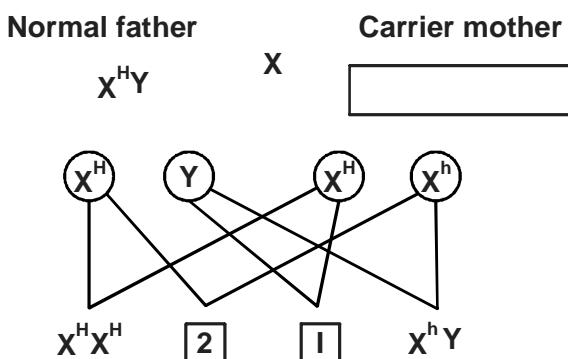
Paper - 231/2

July/August 2015**Time:** 2 hours**SECTION A : (40 marks)****Answer ALL the questions in this section in the spaces provided.**

1. The diagram below represents recycling of nutrients in a certain ecosystem.

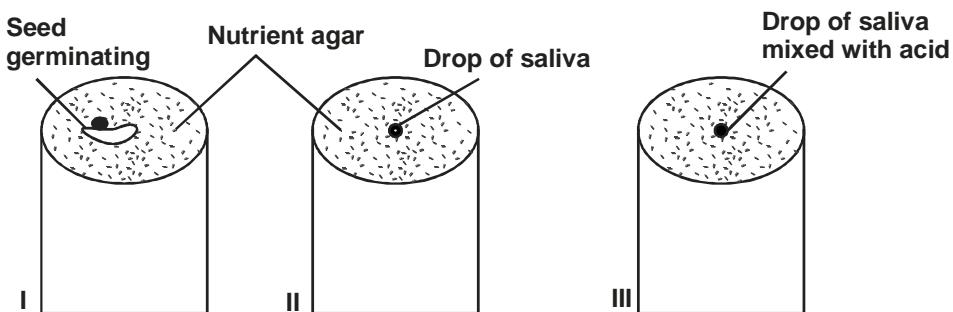


- a) Name the trophic level represented by M. (1 mark)
 b) Name the processes represented by I, II, III (3 marks)
 c) Name the organisms involved in process II. (1 mark)
 d) What would happen within the ecosystem if all secondary consumers were eliminated? (3 marks)
2. Haemophilia is a bleeders disease. The disease is caused by a recessive gene which is carried in the X chromosome. X^H stands for normal gene whereas X^h stands for haemophilia gene. The figure below shows a family tree.

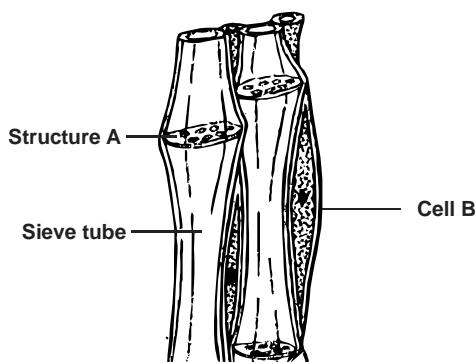


- a) What is the genotype of
 i) Mother (1 mark)
 ii) Son marked 2 (1 mark)
 iii) Daughter marked 1 (1 mark)
- b) If the haemophilia son marries a girl who has no history of haemophilia in her family, what will be the genotype of the offspring ? (Show your working) (4 marks)
- c) What is sex linkage? (1 mark)
3. 50cm³ of 10% glucose solution was boiled and allowed to cool. The solution was then poured into a vacuum flask and about 5cm³ of groundnut oil added to it. 10% yeast solution was introduced into the glucose solution using a pipette. A thermometer was placed in the flask and supported with a cotton wool plug. A second flask was set up as above, but containing cooled boiled water instead of 10% glucose solution. The temperature of each flask was recorded at the beginning and thereafter at hourly intervals for several hours.
- a) Why was a vacuum flask used in this experiment? (1 mark)
 b) What was the purpose of the second flask? (1 mark)
 c) Write a word equation to summarize the reaction that took place in the first flask. (2 marks)
 d) Why was groundnut oil added to the flask? (1 mark)
 e) Why was it necessary to boil the glucose and the water before they were poured into the flask? (1 mark)

- f) Distinguish between obligate and facultative anaerobes. (2 marks)
4. Three sterilized petri dishes I, II and III were half filled with sterilized nutrient agar jelly and then treated as shown below. The petri dishes were then kept in an oven at 36°C. After 2 days the three petri dishes were flooded with iodine solution.



- a) Yellow spots were noted in set up I and II while set up III turned blue black. (1 mark)
- What was the importance of sterilization in the experiment? (1 mark)
 - Mention TWO ways by which sterilization could have been achieved. (2 marks)
- b) Explain the results obtained in each of the three petri dishes after 2 days. (5 marks)
5. The diagram below represents phloem tissue from the stem of a plant.



- a) i) Name the structure labelled A. (1 mark)
 ii) State TWO substances transported in the phloem. (1 mark)
 iii) Give the function of cell B. (1 mark)
- b) State TWO features of the endodermis. (2 marks)
- c) Explain the process by which water moves from the soil into the root hairs. (3 marks)

SECTION B

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

6. In an experiment, 900 viable seeds of a certain plant species were divided into groups of 100 seeds each. Each group of seeds was placed at different temperatures but same conditions of air and moisture. The percent germination was determined after 10 days. The table below shows percent germination at the various temperatures.

Temperature °C	0	5	10	15	20	25	30	35	40
Percent germination	0	0	2	5	16	50	84	30	2

- a) Using a suitable scale, draw a graph of percent germination against temperature. (6 marks)
- b) Account for percent germination at :
- 50° (3 marks)
 - 30°C (3 marks)
 - 40°C (3 marks)
- c) Explain the role played by each of the following factors in the germination of seeds.
- Water. (3 marks)
 - Air. (2 marks)
7. a) Explain how a finned fish such as tilapia is adapted to swimming. (10 marks)
- b) Describe an experiment to investigate the effects of unilateral source of light on growth of seedlings. (10 marks)
8. a) Describe the economic importance of bacteria. (10 marks)
- b) Describe how semi-circular canals perform their functions. (10 marks)

KISII CENTRAL FORM FOUR JOINT EVALUATION

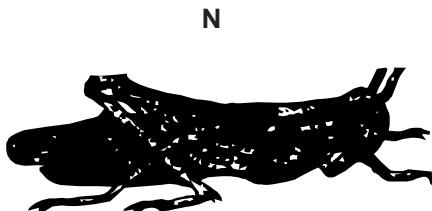
Kenya Certificate of Secondary Education

BIOLOGY

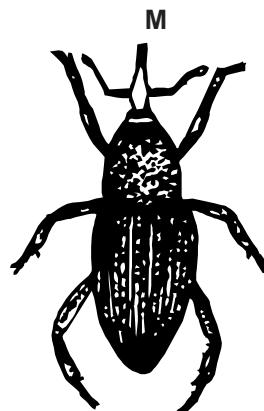
Paper - 231/3

July/August 2015**Time:** 2 hours

- 1.** Study the photographs below carefully and answer the questions that follow.



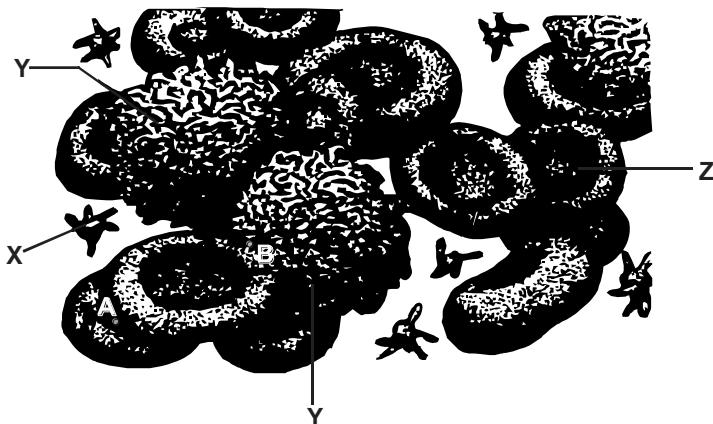
N



M

- a) Suggest the type of life cycle displayed by organism N. (1 mark)
- b) Explain the disadvantages of the life cycle displayed by organism N. (2 marks)
- c) Name the type of growth pattern shown by the organisms. (1 mark)
- d) i) Give the hormone responsible for the growth pattern stated in (c) above. (1 mark)
ii) State the gland responsible for the production of the hormone above. (1 mark)
- e) i) Name the phylum to which organism N and M belong. (1 mark)
ii) Other than the skeleton, state two features common in the members of the phylum identified above. (2 marks)
- f) Giving two reasons, name the class to which organism M belongs.
Class (1 mark)
Reasons: (2 marks)
- g) State two functions of exoskeleton. (2 marks)

- 2.** The diagram below represents an animal tissue.



- a) Identify the name of the tissue giving reason. (2 marks)
Tissue.....
Reason.....
- b) Identify the structures labeled X and Y. (2 marks)
- c) State the functions of X and Y. (2 marks)
- d) Using an observable feature on the diagram, state how structure Z is adapted to its function. (2 marks)
- e) i) Measure the diameter of structure labeled Z from point A to B in millimeters. (1 mark)
ii) Calculate the actual size of the diameter of the structures in micrometers. (2 marks)
- f) Suggest two changes that will occur to structure Z if an athlete from a low altitude area trains in a high altitude area. (2 marks)
- g) Name a mineral ion and vitamin required in the process brought about by structure labeled X. (2 marks)

3. You are provided with specimen G. Using a pestle and mortar, crush the specimen with distilled water to make a suspension.
 a) Using reagents provided, carry out food tests. Record your observation and results in the table below. (9 marks)

Food substance	Procedure	Observation	Conclusion

- b) Name the enzymes, which act on the following foods in the duodenum
 i) Proteins . (1 mark)
 ii) Starch. (1 mark)

KISII CENTRAL FORM FOUR JOINT EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/1

July/August 2015

Time: 2 hours

MARKING SCHEME

- 4.a) - A hard dorsal (upper) shell of a turtle / Crustacean / Arachnid; description plus atleast one correct example given
11. When a cell is separated from a hypotonic solution by selectively permeable membrane; It develops a force known as osmotic pressure; which draws water molecules from the hypotonic solution by osmosis;
- 12.
- | | Stage of photosynthesis | Where it occurs |
|-----|-------------------------------------|-----------------|
| i) | Light stage/light dependent stage | Grana/Granum |
| ii) | Dark stage/ light independent stage | Stroma |
- NB: Stage and where it occurs are tied. Reject where it occurs when stage is wrong.
- b) i) Excess Glucose:- is converted to glycogen; - Excess Glucose is taken up by the liver and broken down to release energy, CO₂ and water; excess glucose is converted into fats and stored around body organs;
 ii) Diabetes mellitus; acc. Glytonuria;
22. Encourages cross pollination and fertilization /Hinders self pollination and fertilization; leading to variations which may be useful to overcome some environmental pressures; thus continuity of species.
23. a) X - Epicotyl;
 Y - Radicle; rej Radical
 b) Epigeal germination;
 c) Provides anchorage; to growing seedling / absorb water/ mineral salt; form the soil
24. Microscopic plants → Small fish → large fish → crocodile
 OR
 Microscopic plants → mosquito larvae → large fish → crocodile **mark only one**
29. Accuracy reduces with large populations;
30. i) Golgi bodies / Golgi apparatus;
 ii) Nucleolus;
31. i) Anaerobic respiration in plants;
 ii) Amount of O₂ needed to breakdown accumulated lactic acid;
32. a) X^hY
 b) Crossing - Over / Non - disjunction;
33. a) Sister chromatids separate; sister chromatids move to opposite poles. Accept chromatids separate at the centromere.
 b) - Gametes formation (accept formation of sex cells);
 - Source of variation ;

KISII CENTRAL FORM FOUR JOINT EVALUATION

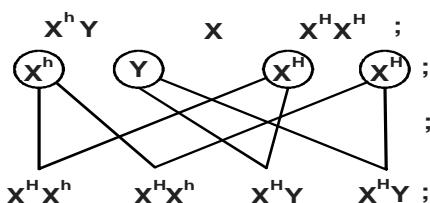
Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/2

July/August 2015**Time:** 2 hours**MARKING SCHEME****SECTION A (40 marks)**

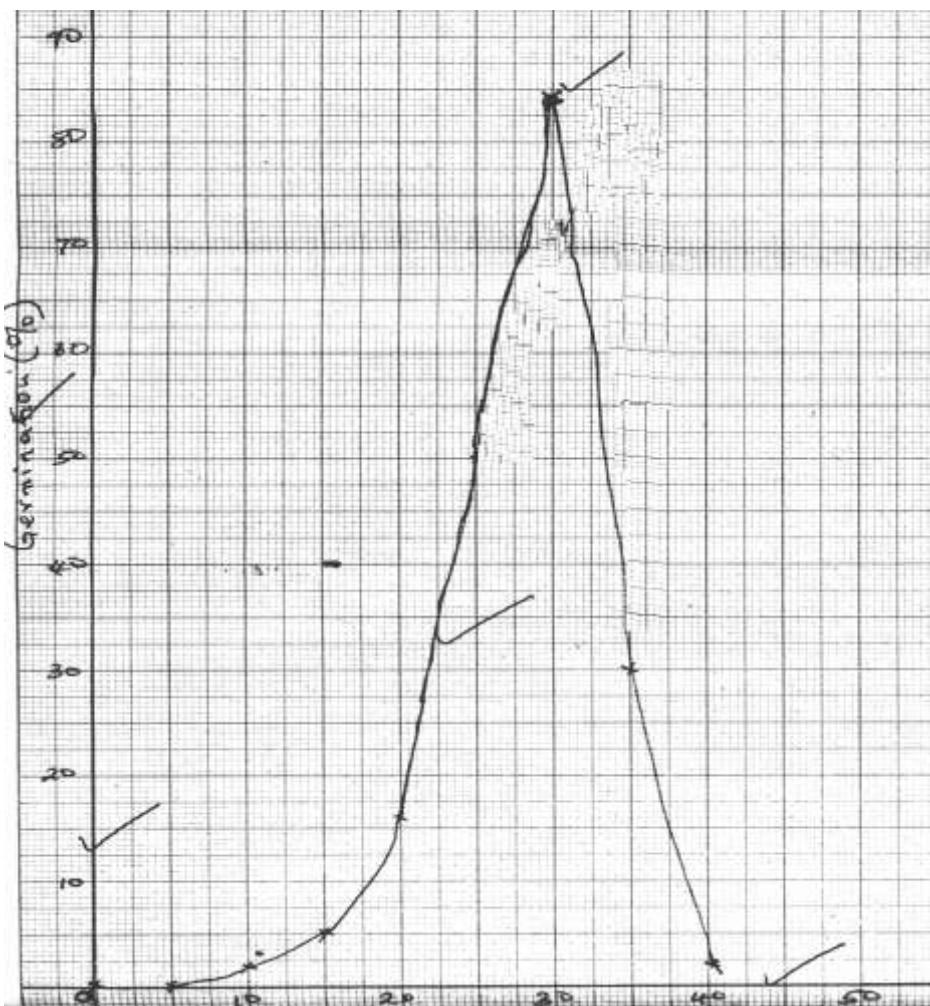
1. a) Primary consumer; **1 mark**
 b) i. Predation / feeding;
 ii. Decomposition / putrefaction / decay ;
 iii. Absorption ; **3 marks**
 c) Bacteria / fungi / decomposers ; **1 mark**
 d) Primary consumers will increase in number ; leading to overgrazing; which will lead to reduction in numbers of primary consumers; Number of producers decrease; **3 marks**
2. a) i) $X^H X^h$;
 ii) $X^H Y$;
 iii) $X^h X^h$; **3 marks**
 b) $X^h Y \times X^H X^h$;

**4 marks**

- i) This is where traits are transmitted together with genes located on sex chromosomes; **1 mark**
3. a) To avoid loss of any heat generated in the flask; **1 mark**
 b) Control set up; **1 mark**
 c) Glucose $\xrightarrow{\text{Yeast}}$; alcohol + carbon (IV) oxide + Energy; **2 marks**
 d) To avoid infiltration of oxygen; **1mark**
 e) To expel any oxygen dissolved in the glucose;
 f) Obligate - respire in complete absence of oxygen; **1 mark**
 Facultative - can respire in presence or absence of oxygen; **2 marks**
4. a) i) Kill microorganisms; **1 mark**
 ii) Flame heating ; use of disinfectant;
2 marks
- b) I - enzyme diastase in germinating seed hydrolysed / digested starch in nutrient agar; forming simple sugars;
 II- Salivary amylase converted starch in nutrient agar into maltose;
 III-Enzyme maltase is inactivated; by pH / acidic medium ; **5 marks**
5. a) i) Sieve plate; **1 mark**
 ii) Sucrose; hormones; vitamins ; **Rej glucose First 2 x ½ = 1mark**
 iii) Has mitochondria that provide energy for translocation; **1 mark**
- b) Has caspary strip;
 Has starch grains ; **2 marks**
- c) Root hair cell sap is hypertonic to surrounding soil solution; osmotic pressure of root hair cell sap overcomes the water holding / retention capacity of the soil; water is drawn from the soil solution into the root hair cell sap by osmosis; through cell wall and cell membrane;
3 marks

SECTION B (40 marks)

6. Graph



- a) Suitable scale - horizontal; **1mk**
 - vertical ; **1mk**
 Labelling - Horizontal ; **1mk**
 - vertical ; **1mk**
 Plotting (all points) ; **1mk**
 Curve (smooth, through all points ; **1mk** 6 marks
- b) i) 50°C
 Enzymatic / metabolic activities / rate of respiration too slow; due to too low temperature; hence no germination. **3 marks**
 ii) 30°C
 Optimum temperature; therefore maximum enzymatic / metabolic activity / respiration rate; hence maximum germination;
 iii) 40°C
 Enzymes denatured / destroyed; due to high temperature; hence low germination; **3 mks**
- c) i) Water
 Medium for enzyme activity; hydrolysis of stored food into simpler substances; medium for transport; softening the seed;
 acting as solvent; (any correct three) **3 marks**
 ii) Air
 Contains oxygen; used for oxidation of food to release energy; **2 marks 20 marks**
7. a) The vertebral column consists of a series of vertebrae; held together loosely so that it is flexible;
 Myotomes / muscles ; associated with vertebral column produce movement;
 The sideways and backwards thrust of the tail and body against water; results in resistance of the water pushing the fish sideways and forwards in a direction opposed to thrust;
 Head not flexible; so as to maintain the forward thrust; Body streamlined ; to reduce resistance (to swim smoothly);
 Presence of fins ; help in propulsion / balance / paired fins (pectoral and pelvic) ; for controlling pitch and slow down movement; / unpaired fins (dorsal, ventral anal) for yawing and rolling;
 Presence of swim bladder; makes fish buoyant;

- Scales tip towards the back; to provide smooth surface; **any 5 factors and function = 10 marks**
- b) Two potted seedlings; of same species; and similar stages of growth; are watered; one is placed in a box with a window cut in one side; to let in light from one direction only; the other control / potted plants; is placed in an identical situation but with light from all directions /clinostat;
 Result
 After some days shoots / plants grow / bend towards source of light; **10 marks** **20 marks**
8. a) Economic importance of bacteria.
 Bacteria are important in the manufacture of antibiotics ; formation of silage / butter/ cheese/ fermentation of milk / yoghurt / curing of tea / tobacco / retting flax;
 Formation of vitamin B₁₂ / Vitamin K;
 Enzymes such as amylase / invertase / hormone e.g. insulin;
 Vinegar / acetic acid / lactic acid / citric acid;
 Septic tanks / modern sewage works make use of bacteria in the treatment of sewage/biogas production;
 (Saprophytic) bacteria are used in compost decomposition / causing decay;
 (Symbiotic) bacteria in ruminants / herbivores help in digestion;
 (Some) bacteria cause diseases to humans / animals / plants; (Accept correct bacterial disease)
 (Many) bacteria destroy / decay / spoil food; Accept correct named example
 Nitrifying bacteria / nitrogen fixing bacteria increase soil fertility / make nitrate available / denitrification / denitrifying bacteria reduce soil fertility / convert nitrates into nitrogen / reduce nitrates;
any 10 = 10 marks
- b) There are three semi circular canals; arranged in planes; at right angles to each other; at the end of each canal is a swelling; called ampulla which contains receptors; The movements of the head cause movement of fluid / endolymph in at least one canal; the fluid movement / deflection displaces the cupulae; thus stimulating receptors / sensory hairs; This way the impulses / sensory impulse is transmitted to the brain; by auditory nerve; about the movement of the head / body in relation to gravity; **any 10 = 10 marks** **20 marks**

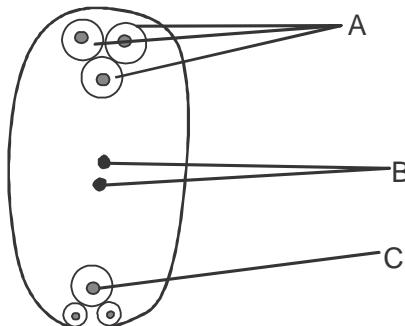
NYERI COUNTRY JOINT ASSESSMENT*Kenya Certificate of Secondary Education***BIOLOGY**

Paper 1

July/August 2015

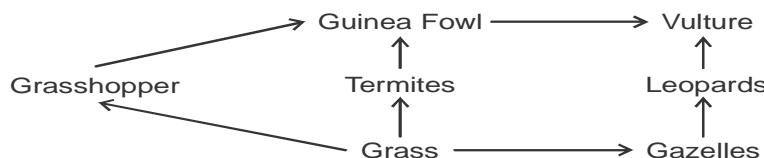
Time: 2 Hours

1. How does movement in plants differ from that of animals ? (1 mark)
2. State **one** function of DNA molecule. (1 mark)
3. a) What is the function of the objective lens in a light microscope ? (1 mark)
b) Give **one** advantage of using a light microscope over that of the electron microscope. (1 mark)
4. Akol observed and drew an amoeba using a light microscope. If the total magnification of the amoeba was X450 and that of the objective lens was X30. What was the magnification of the eyepiece lens ? Show your working. (2 marks)
5. State **three** functions of cuticle found in plant leaves. (3 marks)
6. a) Name the clinical condition that results due to deficiency of insulin in human body. (1 mark)
b) How can one find out from a sample of urine whether a person is suffering from the condition named in (a) above. (2 marks)
7. a) Which kingdom does each of the following organisms belong ?
i) Paramecium (1 mark)
ii) Liverwort (1 mark)
b) Name the taxon that has closely related interbreeding organisms. (1 mark)
8. a) State **two** ways in which meiosis is important during sexual reproduction. (2 marks)
b) At what stage do chromatids separate during meiosis ? (1 mark)
9. Why is locomotion important to animals ? (3 marks)
10. a) Where does glycolysis take place in a cell ? (1 mark)
b) Name the compound formed during glycolysis. (1 mark)
c) If oxygen is absent in a cell, what products are obtained in :
i) Animals (1 mark)
ii) Plants (1 mark)
11. Which part of the brain is responsible for :
a) Controlling the rate of breathing (1 mark)
b) Detecting changes in internal temperature (1 mark)
12. Explain why the following characteristics are essential to living organisms:
a) Respiration (1 mark)
b) Reproduction (1 mark)
13. The diagram below shows the structure of a mature embryosac.



- a) Name the structures labelled : A ,B (2 marks)
- b) What does structure C transforms after fertilization ? (1 mark)
14. a) What prevents blood in veins from flowing backwards ? (1 mark)
b) State **three** ways in which the red blood cells are structurally adapted to their function. (3 marks)
15. i) Give **two** examples of sex linked trait in humans on Y-chromosome. (2 marks)
ii) Colour blindness is a sex linked trait that is more common in males than in females. Explain. (2 marks)

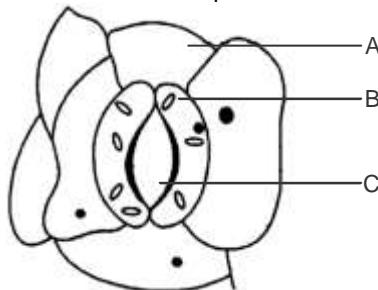
16. The diagram below shows a feeding relationship in an ecosystem. Study it and answer the questions that follow.



- a) Name the organisms through which natural energy enters the ecosystem. (1 mark)
- b) In what trophic level are the leopards ? (1 mark)
- c) What would be the short term effect of introducing caterpillars and locusts in the ecosystem ? (1 mark)
- d) Explain why excessive use of pesticides may affect soil fertility. (1 mark)
- 17. a) Name the tissue that is responsible for secondary thickening in plants. (1 mark)
- b) Explain how the tissue named in (a) above gives rise to secondary xylem and secondary phloem. (3 marks)
- 18. a) Birds have beaks which are structurally modified to different modes of feeding.
i) What is the name given to such structures in evolution ? (1 mark)
ii) What is the name given to the evolution of the beaks of birds ? (1 mark)
- b) State the roles of Lamarck's theory of evolution. (2 marks)
- 19. In an experiment, a seedling was placed horizontally in the dark for three days as shown in the diagram below.
- a) Draw the diagram of the same seedling at the end of the experiment. (1 mark)



- b) Explain the response exhibited by the shoot in the diagram you have drawn in (a) above. (3 marks)
- 20. State **two** adaptations of xylem vessels to their function. (2 marks)
- 21. a) Give the main functions of muscles found along the gut. (2 marks)
b) Give the function of roughage in a human body. (1 mark)
- 22. Name the tissue that carries out the following function in mammals.
i) Transports oxygen throughout the body. (1 mark)
ii) Supports the animal's body off the ground. (1 mark)
iii) Transmits impulses from one part of the body to another. (1 mark)
- 23. a) Name the process by which urea is removed from the blood in the kidney. (1 mark)
b) Name **three** excretory products released by human skin. (3 marks)
- 24. Study the diagram and answer the questions that follow.



- i) Name cells **A** and **B**. (2 marks)
- ii) Name two ways in which cell **B** is adapted to its function. (2 marks)
- 25. a) Name **two** membranes that materials from outside the cell will have to pass through before they enter into a sap vacuole. (2 marks)
- b) Explain why the number of red blood cells decreases when placed in a hypotonic solution. (2 marks)
- 26. a) What is the importance of the following in an ecosystem ?
i) Decomposers (1 mark)
ii) Predation (1 mark)
- b) Give a reason why two species in an ecosystem cannot occupy the same niche. (1 mark)
- c) Name the bacteria found in root nodules of leguminous plants. (1 mark)

NYERI COUNTRY JOINT ASSESSMENT*Kenya Certificate of Secondary Education***BIOLOGY**

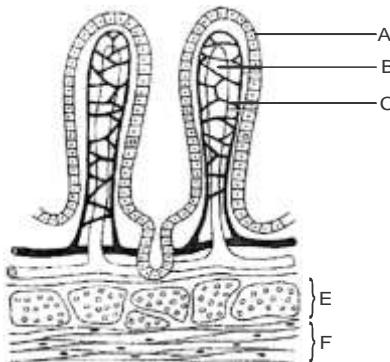
Paper 2

July/August 2015

Time: 2 Hours

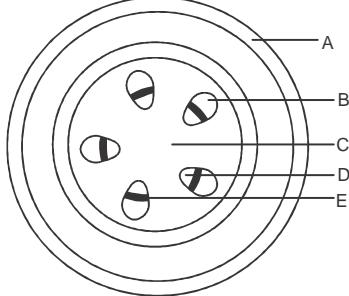
1. a) What is meant by the term sex linked genes ? (1 mark)
- b) Haemophilia is a sex linked genetic condition transmitted through a recessive gene on X-chromosome. The normal gene may be represented by X^H .
What is the genotype of haemophiliac female ? (1 mark)
- i) A woman who is a carrier for haemophilia gene marries a haemophiliac man. Work out the probability that their daughter will be haemophiliac. (4 marks)
- c) Give **two** reasons why *Drosophila melanogaster* (Fruit fly) are considered suitable organisms for use in genetic experiments. (2 marks)

2. The diagram below is a cross section through a part of human ileum.



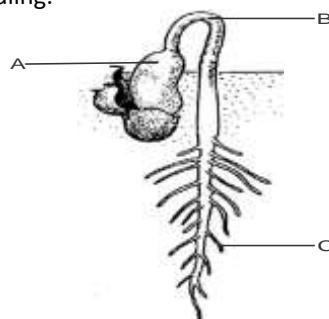
- a) i) Identify the structure drawn above. (1 mark)
ii) State the significance of the structure shown above. (1 mark)
- b) Name the parts labelled **A**, **B** and **C** (3marks)
- c) Give the functions of the part labelled **B** and **C**. (2 marks)
- d) State the function of goblet cells. (1 mark)

3. The diagram below represents a transverse section of a young stem.

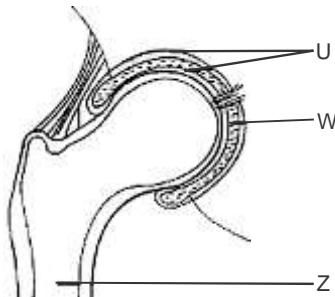


- a) Name the parts labelled **A** and **C** on the diagram. (2 marks)
- b) State the functions of the parts labelled **B**, **D** and **E** (3 marks)
- c) List **three** differences between the section shown above and one that would be obtained from the root of the same plant. (3 marks)

4. The diagram below represent a seedling.



- a) Name the structure labelled **B** (1 mark)
 b) State the functions of the parts labelled **A** and **C** (2 marks)
 c) Name the type of germination exhibited by the seedling. (1 mark)
 d) State **three** conditions within the seed necessary for germination. (3 marks)
 e) What is the importance of optimum temperature in seed germination ? (1 mark)
5. The diagram below represents one of the joints in the mammalian skeleton.



- a) Name the type of joint shown in the diagram. (1 mark)
 b) Name the parts labelled **Z** and **U** (2 marks) (2 marks)
 c) Name **two** parts at the body where this type of joint is found. (2 marks)
 d) State the functions of the fluid found in **W**. (2 marks)
 e) Name the structure which attaches muscles to the bones at a joint. (1 mark)

SECTION B : (40 MARKS)

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

6. In an investigation, two persons A and B took the same amount of a meal rich in carbohydrates. Their blood sugar levels were immediately determined and thereafter at intervals. The results were as shown in the table below.

Time (minutes)	Glucose level in blood (mg/100cm ³)	
	Person A	Person B
0	92	80
15	90	76
30	105	90
40	116	105
60	140	162
80	138	210
120	100	202
135	96	194
160	90	180
180	90	162

- a) On the grid provided, plot graphs of glucose level in blood against time on the same axes. (7 marks)
 b) i) When was the blood glucose level of person **A** equal to that of person **B**. (1 mark)
 ii) What was the concentration of glucose in the blood of **A** and **B** at the 20th minute ? (2 marks)
 c) i) Account for the blood sugar level in person **A** and **B** between 0 and 15. (2 marks)
 ii) In man, the normal blood sugar level is about 90mg/100cm³ of blood. Explain the change in the blood sugar level in person **A** between 15 and 60 minutes. (4 marks)
 d) i) Suggest a possible reason for the high blood sugar level in person **B**. (2 marks)
 ii) How can the high sugar level in person **B** be controlled ? (1 mark)
 e) Name the compound that stores energy released during oxidation of glucose. (1 mark)
7. a) Describe the adaptations of wind pollinated flowers. (5 marks)
 b) Explain how the mammalian male reproductive system is adapted to perform its functions. (15 marks)
8. a) Describe the way by which terrestrial plants are adapted to living in arid and semi-arid ecosystems. (10 marks)
 b) Explain how various human activities cause soil pollution. (10 marks)

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Paper 3

July/August 2015

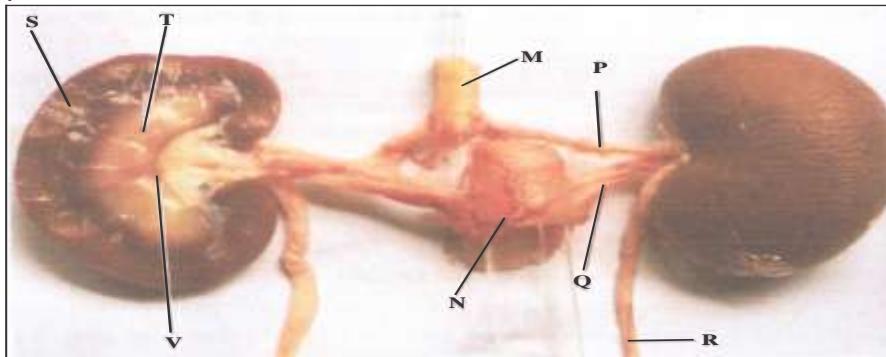
Time: 2 Hours

1. You are provided with specimen Q, Benedict's solution, sodium hydroxide solution, 0.01% DCPIP and copper (II) sulphate solution.

- a) Make a transverse section of specimen Q and make a large labelled drawing. (3 marks)
- b) Name the type of placentation. (1 mark)
- c) Name the agent of dispersal. (1 mark)
- d) State three ways in which the specimen is adapted to its dispersal by the agent named in (c) above. (3 marks)
- e) Squeeze a little juice from specimen Q in a beaker. Add an equal amount of water. Use the given reagents and test for the food substances in the specimen. Record your results in the table below. (6 marks)

Food Tested	Procedure	Observation	Conclusion
-------------	-----------	-------------	------------

2. The photographs below shows a pair of mammalian organs with their blood supply. One of the organs has been sectioned longitudinally. Examine them.



- a) Identify the pair of organs. (1 mark)

- b) i) Name the blood vessels labelled M, P and Q (3 marks)
 ii) Which of the blood vessels P and Q carries blood with a higher concentration of urea? Give a reason for your answer.

Blood vessel (1 mark)
 Reason (1 mark)

- c) Name the structures labelled R and state its function.
 Name (1 mark)
 Function (1 mark)

- d) i) Name the parts labelled S and T (2 marks)
 ii) Name two parts of the nephron found in the part labelled S. (2 marks)

3. You are provided with potato cylinders, a scalpel blade, solutions A and B, tissue paper and a ruler. Chip off one end of each cylinder. Starting from the chipped end, measure exactly 3cm long and cut the cylinder. Repeat this to obtain six cylinders. Record their original / initial lengths in the table provided below.

Place three cylinders in solution A and the other three in solution B. Allow the pieces to remain in the solution for 45 minutes.

- a) Remove the cylinders from the solutions, dry them using the piece of tissue paper provided and measure their lengths. Record the final lengths and the averages in the table below. (4 marks)

Length in cm	Original / initial length in cm	Final length after 45 minutes in cm	Average
Solution A	3		
	3		
	3		
Solution B	3		
	3		
	3		

- b) Account for the results in (a) above:

- i) In solution A (3 marks)
- ii) In solution B (3 marks)
- c) i) What would happen if potato cylinders in solution A had been boiled? (1 mark)

-
- ii) Give a reason in your answer in c(i) above. (1 mark)
 - d) State **two** importances of the physiological process being investigated. (2 marks)

NYERI COUNTRY JOINT ASSESSMENT*Kenya Certificate of Secondary Education***BIOLOGY**

Paper 1

July/August 2015

Time: 2 Hours**Marking scheme**

1. Movement in plants is localized/ move parts of their bodies while animals move their whole body as well as parts of their bodies; (1 mark)
2. Stores genetic information (in a coded form); (1 mark)
3. (a) Magnifies/ Enlarges the image of the object; (1 mark) Rej. Magnifies object
(b) With Light microscope you can view live specimens/organisms; (1 mark)
4. 450; = X 15; (2marks) Rej. Without X sign
30
5. Reduces excessive loss of water;
Protects the inner tissues of leaf from mechanical damage;
Prevents entry of disease causing microorganisms;
Allows penetration of light for photosynthesis;
Mark the Ist three (3marks)
6. (a) Diabetes mellitus; Cl mark) Rej wrong spellings
b) Test urine with Benedict's reagent/ solution; orange colour indicates presence of glucose/ sugar in urine; (2marks)
(b) is tied to (a)
7. (a) (i) (Kingdom) Protoctista; (1 mark)
Acc Protista Rej. Wrong spellings
(ii) Kingdom Plantae; (1 mark) Rej. Plants
(b) Species; (1mark)
8. (a) Reduces the number of chromosomes in the gametes/ halving of chromosomes;
A process through which gametes are formed; (2marks)
(b) Anaphase 11; (1mark)
9. Searching for food/ mates/shelter/water;
Migration away from unfavourable places/natural disasters/ escaping from predators;
Colonization of new areas; (3marks)
10. (a) cytoplasm; (1mark)
(b) Pyruvic acid; (1 mark)
(c) (i) Lactic acid and energy; (1mark)
(ii) Ethanol / ethyl alcohol, carbon (IV) oxide and energy; (1mark)
NB: All products should be named to award the mark
11. (a) Medulla oblongata; (1mark)
(b) Hypothalamus; (1 mark)
12. (a) Respiration provides energy for all activities of the body cells of the organisms; (1mark)
(b) Reproduction ensures procreation / continuation of species or life; (1 mark)
13. (a) A- Antipodal cells; (1mark)
Rej. If singular cell
B- Polar nuclei; (1mark) Rej. If singular nucleus
(b) Zygote; (1mark)
14. (a) Valves; (1mark)
(b) Biconcave shape to provide a large surface area for absorption of oxygen / carbon (IV) oxide;
Absence of nucleus hence pack more haemoglobin to carry sufficient oxygen /carbon (IV) oxide;
Alter shape/ pliable to be able to pass through the narrow lumen of the capillaries;
Has haemoglobin for high affinity/ high uptake of oxygen/ carbon (IV) oxide;
Mark the 1st three (3marks)
15. (i) Hairy ear (pinnae);
Premature baldness; (2marks)
(ii) The disorder is controlled by a recessive gene on X-chromosome hence a (single) recessive gene expresses itself fully; while in females requires two recessive genes on both X- chromosomes for the disorders to be expressed; (2marks)
16. (a) Grass; (1 mark) Rej. Plants
(b) Secondary consumers; (1 mark)
(c) Increase competition for grass with other primary consumers leading to reduction in their population; (1 mark)
(d) Pesticides kill microorganisms/ decomposers hence no breakdown of organic matter/ decomposition to release nutrients in the soil; (1 mark)
17. (a) Cambium; (1mark)

(b) Divide (tangentially); to give rise to phloem on outside; or Xylem to the inside; (3marks)

18. (a) (i) Homologous structures; (1 mark)

(ii) Divergent evolution; (1 mark)

(b) Explain the role of environment in directing phenotypic changes;

Tries to explain the occurrence of vestigial structures; (2marks)

19. (a)



; (1 mark)

(b) Auxins migrate to the lower side of the shoot (due to gravity);

High auxin concentration promotes faster growth on the lower side of the shoot than upper side; causing the shoot to bend upwards; (3marks)

20. Thin / narrow and long to allow for capillarity;

Wall lignified to strengthen the stem/ to

prevent collapse of vessels;

Have bordered pits to allow for exchange of materials;

Mark the 1st two (2marks)

21. (a) Peristalsis/ churning/ propelling food;

Acts as valves/ regulates movement of food; (2marks)

(b) Promotes peristalsis; (1 mark) Rej. Prevents constipation

22. (i) Blood (tissue); (1mark)

(ii) Skeletal (tissue); (1 mark)

(iii) Nervous (tissue); (1 mark)

23. (a) Ultrafiltration; (1 mark)

(b) Urea; excess water; excess salts; (3marks)

24. (i) A- Epidermal cell; (1 mark)

B- Guard cell; (1 mark)

(ii) Thicker inner wall than outer wall makes it possible for stomatal pore to open once they become turgid;

Has chloroplasts making them photosynthetic; (2marks)

25. (a) Cell membrane/ plasma membrane;

Tonoplast; (2marks)

(b) Red blood cells draw water by osmosis; and burst/ haemolyse; (2marks)

26. (a) (i) Recycling of nutrients; (1 mark)

(ii) Regulation of numbers/ population of prey; (1 mark)

(b) Lead to stiff competition for available resources; leading to elimination! exclusion of one;

(2marks)

c) Rhizobium Acc. Rhizobia

Rej. wrong spellings (1 mark)

NYERI COUNTRY JOINT ASSESSMENT*Kenya Certificate of Secondary Education***BIOLOGY**

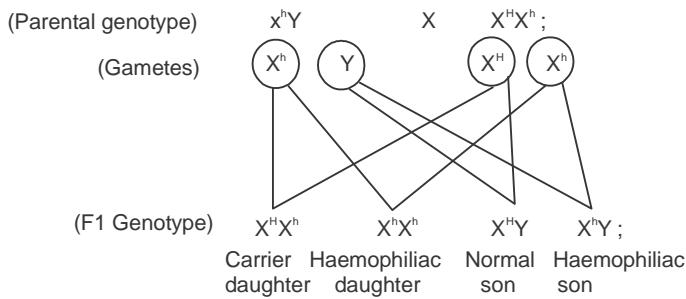
Paper 2

July/August 2015

Time: 2 Hours**Marking scheme**

1. a) These are genes that are transmitted together with those that determine sex; 1mk
 b) i) X^hX^h ; 1mk
 ii) (Parental phenotype)

(Parental phenotype) Haemophiliac man Carrier woman

Probability $\frac{1}{2}$ / 50% ;**Total 4mks**

or Accept punnet square

Gametes;	X^H	X^h
X^h	$X^H X^h$	$X^h X^h$
Y	$X^H Y$	$X^h Y$;

 $X^H X^h$ - carrier daughter $X^h X^h$ - haemophiliac daughter $X^H Y$ - normal son $X^h Y$ - haemophiliac sonProbability $\frac{1}{2}$ / 50% ;**Total 4mks**

- c) It has a short life cycle (of 10-14 days) hence has short growth over period of time;

It produces large number of offsprings;

It is easily bred in the laboratory;

It has easily observable contrasting characteristics;

Are safe to handle (as they are not known to transmit any human disease);

Mark the 1st two 2mks

2. a) i) Villi; 1mk Rej. Villus
 ii) Increase surface area for absorption of digested food; 1mk
 b) A - Epithelium;
 B - Lacteal;
 C - Blood capillaries; 3mks
 c) B - responsible for absorption of fats; 1mk rej. fatty acids and glycerol
 C - important for transporting digested food; 1mk
 d) They secrete mucus to lubricate food and form a protective layer for the gut wall to prevent it from being digested; 1mk
3. a) A - Epidermis; 1mk
 C - pith; 1mk
 b) B - transports manufactured food / translocation; 1mk
 D - transports mineral salts and water; 1mk
 E - produces / gives rise to secondary thickening / growth / increase in the girth / give rise to additional xylem and phloem; 1mk
 c) Xylem at the centre star shaped;
 Phloem in arms of xylem;
 No pith (at the centre);

- Piliferous layer bearing root hairs; **3mks**
4. a) B - hypocotyl; **1mk**
 b) A - storage of food (and enzymes);
 Protect the plumule during germination;
 C - absorption of water and mineral salts;
- c) Epigeal germination; **1mk**
 d) Mature embryo;
 Absence of chemical inhibitors;
 Presence of growth promoter;
 A seed coat / testa that is permeable to water and oxygen; **3mks**
- e) Enzymes involved in germination require optimum temperature for them to function best; **1mk**
5. a) Ball and socket; **1mk**
 b) Z - Femur;
 U - Articular cartilage; **2mks**
 c) Shoulder / pectoral girdle;
 Hip / pelvic girdle;
 d) Reduction of friction / lubrication;
 Absorption of shock / distributes pressure / shock absorber; **2mks**
 e) Tendon; **1mk**
- SECTION B**
6. a) **Plotted graph**
 b) i) 47 minutes \pm 2 minutes; **1mk**
 ii) A - 94mg / $100\text{cm}^3 \pm 2$ **1mk**
 B - 80mg / $100\text{cm}^3 \pm 2$ **1mk**
 c) i) In both there is a slight decline in glucose level;
 The carbohydrates meal has not been digested / there is no absorption of glucose from the intestine; **2mks**
 ii) There is rapid increase in sugar level; because the meal has been digested; and there is fast absorption of glucose into the blood;
 The rate of absorption is higher than glucose assimilation/ conversion to glycogen; **4mks**
- d) i) Suffering from diabetes mellitus; due to malfunctioning of pancreas / lack of enough insulin in the body; **2mks**
 ii) Administering insulin; **1mk**
 e) Adenosine triphosphate; **1mk** rej. ATP
7. a) Large anthers to hold / produce many pollen grains;
 Small / inconspicuous petals / bracts so that the anthers are exposed to wind / the stigmas are exposed to trap pollen grains;
 Large anthers which are loosely attached to a long filament which hang outside so that they can easily be swayed by air currents / so that pollen grains can easily be released;
 Pollen grains are usually small / smooth / light to enable them float in air current;
 Featherly stigmas to increase surface area to trap pollen grains;
 Produces a lot of pollen grains to increase the chance of pollination;
- Total 6mks max. 5mks**
- b) Presence of scrotal sac; which protects the testes; testes are suspended in the scrotal sac and hang outside the body; to provide a cooler environment for production of sperms and hormones;
 Presence of seminiferous tubules; provide a large surface area for sperm formation; Sertoli cells; nourishes the sperms after they have been formed;
 Sperms have a lot of mitochondria for energy production / long tail; to swim towards the ovum;
 Epididymis is long / coiled tubules; which store sperms (temporarily);
 Presence of vas deferens; which is muscular and contracts; to push sperms out / ejaculation;
 Penis is spongy / contains erectile tissue / has sensory cells; which upon sexual excitement becomes erect; for penetration into female reproductive system;
 Presence of accessory glands / prostate / cowpers glands and seminal vesicles; whose secretions provide a medium in which sperms swim; and also nourishes the sperms;
- Total 20mk**
Max. 15mks
8. a) Roots are superficial and extensively developed; to provide large surface area for water absorption;
 Roots grow deep / long roots; to reach water table / source deep in the ground;
 Succulent / fleshy stem / stem possession of water storage tissue to store water for future use / to enable them survive drought;
 Possession of waxy thick cuticle to reduce transpiration rate;

Reduced leaf surface / spines / scales / leaves modified into needle-like to minimize surface area (directly exposed to sunlight) to lower rate of transpiration;
Sunken stomata / hairy stomata / hairy leaves to lower rate of transpiration;
Some xerophytes have reversed stomatal rhythm to minimize rate of transpiration;
Rolled leaves / folded leaves to minimise stomata directly exposed to sunlight to lower rate of transpiration;
Short life cycles / quick growth after rains to make use of available water quickly;
Reduced number of stomata that lower the rate of transpiration;
Some shed their leaves during dry period to reduce transpiration rate;

Total 11

Max 10mks

b) Dumping of solid wastes / empty containers scrap metals, glass bottles, plastic containers; these lenders the environment to be useless for agricultural purposes;
Excessive use of inorganic fertilizer on the farm; lowers the organic content of the soil reducing the water retention ability; decreases organic matter content making the soil uninhabitable by micro and macro organisms in the soil; making the soil to reduce soil fertility;
Excessive use of pesticides; this kills intended beneficial soil organisms both micro and macro organisms resulting to reduction in soil fertility;
Agrochemicals like pesticides / fungicides / herbicides alters the soil pH; resulting in poor plant growth;
Continuous use of chemicals in the farms / aerosols / agrochemicals precipitate in the soil and are taken up by plants; their concentration build up in the plants increasing to toxic levels;
Heavy metals contained in agrochemicals in the soil are not used by plants hence accumulating in the soil; and eventually make it inhabitable by micro-organisms;
Air pollutant like sulphur (IV) oxide and nitrogen (IV) oxide forms acid rain; the acid rain alters the soil pH causing poor growth of plants;
Radioactive wastes dumped in the soil; cause death of micro-organisms in the soil;
Oil effluent in the soil; they kill soil organisms / prevent root from taking oxygen and absorption of water;

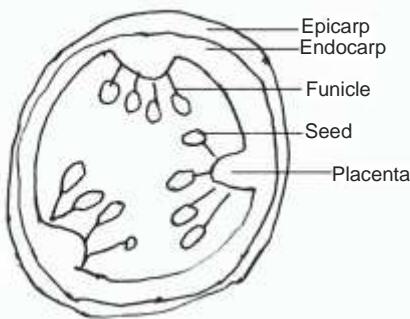
NYERI COUNTRY JOINT ASSESSMENT*Kenya Certificate of Secondary Education***BIOLOGY**

Paper 3

July/August 2015

Time: 2 Hours

1. a)



$$L = \frac{4}{2} = 2 \text{ mks}$$

$$D = 1 \text{ mk}$$

$$M = 1 \text{ mk}$$

Total 4mks max. 3mks

- b) Parietal; **1mk**
 c) Animal; **1mk**
 d) - brightly coloured to attract the dispersal agent;
 - mucoid / slippery seeds protect them from being digested;
 - hard testa resistant to digestion;
 - juicy can be eaten by animals; **mark 1st three (3mks)**

e)

Food Tested	Procedure	Observation	Conclusion
Reducing Sugars;	Put a little food substance into a test tube. Add a little Benedict's solution. Heat to boil;	Yellow/orange;	Reducing sugars present;
Vitamin C;	Put a little DC PIP in a test tube. Add a little food substance into a test tube containing DCPIP;	Deep blue fades to pink colour/ clears/ becomes colourless;	Vitamin C present;
Proteins;	Put a little food substance into a test tube. Add a little NaOH(aq). Add a little CUSO ₄ (aq);	Purple colour;	Proteins present;

2. a) Kidneys;
- 1mk**

- b) i)
- M**
- Aorta;
- 1mk**

P - Renal artery; **1mk****Q** - Renal vein; **1mk**

- ii) Blood vessel - Renal artery;
- 1mk**

Reason - most of the urea that enters via the renal artery is removed through ultrafiltration as blood flows through the kidney; 1mk

- c) Name - Ureter;
- 1mk**

Function - draws urine from kidneys pelvis to the urinary bladder; **1mk**

- d) i)
- S**
- Cortex;

T - Medulla;

- ii) - Bowman's capsule;

- Glomerulus;

- Distal convoluted tubule;

- Proximal convoluted tubule;

Mark the 1st two (2mks)

3. a)

Length in cm	Original/ initial length in cm	Final length after 45 minutes in cm	Average
Solution A	3	3.2 ± 0.1	Award according to readings obtained
	3	3.2 ± 0.1	
	3	3.2±0.1	
Solution B	3	2.8± 0.1	A ward according to readings obtained
	3	2.8± 0.1	
	3	2.8± 0.1	

NB: Award for the three final readings with one mark

Award for average of the three final with one mark on the average column

b) i) Solution **A**

Solution **A** is hypotonic to the cell sap of the cells of potato cylinder; the cells drew water by osmosis and swelled to become turgid; hence increase in length; **3mks**

ii) Solution **B**

Solution **B** is hypertonic to the cell sap of the cells of potato cylinders; the cells lost water by osmosis and shrunk to become plasmolysed; hence reduced in length; **3mks**

c) i) The lengths will not change; **1mk**

ii) Dead cells would not allow osmosis to take place / high temperatures destroy semipermeability properties of the cell membrane; 1mk

d) - opening and closing of stomata;

- absorption of water;

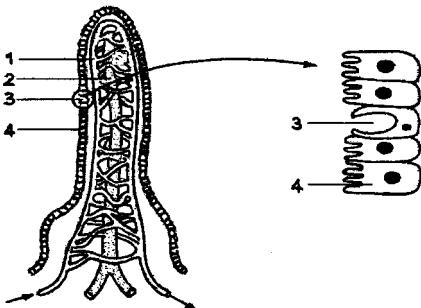
- feeding in insectivorous plants;

- support in herbaceous plants;

Rej. roles of osmosis in animals **Mark the 1st two (2mks)**

KMT JOINT EXAMINATION**231/2****BIOLOGY****PAPER 2****(THEORY)****JULY / AUGUST 2015****TIME: 2 HOURS****SECTION A: 40 MARKS****Answer ALL the questions in this section in the spaces provided.**

1. The diagram represents a villus.



- (a) (i) State the roles of the following structures in the villus: [2 marks]
 Capillary
 Lacteal:
- (ii) The epithelial cells, one of which is shown enlarged on the figure have microvilli on their exposed surface. Suggest an advantage of these microvilli to the epithelial cells. [1mark]
- (b) (i) Name the process by which the products of digestion, present in high concentrations in the ileum, would pass into the capillaries. [1mark]
- (ii) Describe how the capillaries are adapted to allow this process to happen efficiently. [2marks]
- (c) Some substances are absorbed into the capillaries by active uptake.
 (i) Explain why active uptake is sometimes necessary. [1mark]
 (ii) Suggest why active uptake stops when the epithelial cells of the ileum are exposed to a respiratory poison. [1mark]
2. A rooster with grey feathers was mated with a hen of the same phenotype. Among their offspring, 15 chicks were grey, 5 were black and 8 were white.
- (a) Give an explanation for the appearance of the black and white feathers colours in the offspring of the chicken. (1mark)
 (b) What feather colours would one predict from the mating of a grey rooster and a black hen? (show your working) (4marks)
 (c) Name **one** trait in human beings transmitted by multiple alleles (1mark)
 (d) The following statements are cellular short messages and represent gene mutations

Intended message

- 1 Eat the meat
 11 This is my team

Actual message

- Heat the meat
 This is my tea

Identify the type of mutation represented in each case.

(2marks)

3. A student was observing a specimen using the high power objective but the image was not clear.

(1mark)

- (a) Which part of the microscope can be used to get a sharp image? (1mark)

(2marks)

- (b) Which parts of the microscope should be held when it is being moved from one place to another? (2marks)
 (c) A cell was magnified 400 times using a light microscope whose eye piece was X 10. What was the magnification of the objective lens? (Show your working) (2marks)

(3marks)

- (d) Give reasons why microscope sections require to be:

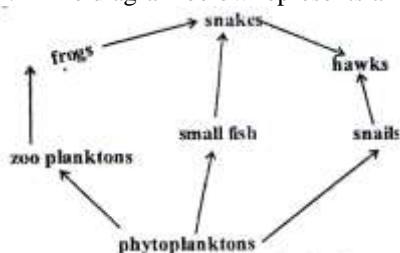
(3marks)

(i) Very thin:

(ii) Stained:

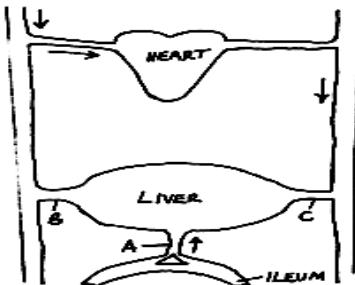
(iii) Kept wet during processing:

4. The diagram below represents a feeding relationship in an ecosystem.



- (a) Name the type of ecosystem represented by the above food web. (1 mk)
 (b) Name the organisms in the food web that are:

- (i) Are producers. (1mk)
(ii) Occupies the highest trophic level. (1mark)
(c) (i) Write a food web that ends with the hawk as tertiary consumer. (1 mark)
(ii) State **two** short term effects on the above ecosystem if all small fish were killed. (2marks)
(d) How does oil spills lead to death of fish. (1 mark)
(e) Name **one** other cause of water pollution apart from oil spills., (1mark)
5. The diagram below represents part of the mammalian blood circulatory system and some associated glands;



- a) Name the blood vessels labelled A and B. (2mks)
b) Which of the blood vessels will have the highest sugar concentration under the following conditions?
(i) After a heavy meal (1mark)
(ii) During fasting (1mark)
c) Explain how the liver assists in regulating the high sugar level in the blood. (2marks)
d) How can a sample of urine be tested in the lab to confirm that a person has diabetes mellitus (2marks)

SECTION B: 40 MARKS

Answer question 6 (Compulsory) and either question 7 or 8 in the spaces provided after question 8

6. A study was carried out to investigate increase in weight of organisms A and B over a period of time. The results are shown in the following table.

Time (days)	Mass of organisms A in grams	Mass of organisms B in grams
0	5	5
2	6	10
6	17.5	10
8	30	20
14	56	20
16	65	30
20	75	30
22	79	40
26	80	40
28	80	50
32	80	50
34	80	60

- (a) Draw **two** graphs showing mass of both organisms against time on the same axes (6marks)
(b) (i) Name the type of growth curves for organisms A and B (2marks)
(ii) To which phylum does organism B belong? (1mark)
(c) Account for the shape of the graph for organisms A between the:
(i) 6th – 16th day (3marks)
(ii) 26th – 34 day (2marks)
(d) Account for the shape of the graph for organism B. (3marks)
(e) i) Name a hormone which is responsible for the growth pattern in organism B. (1mark)
ii) What is the role of the hormone in growth of the organism? (1mark)
(f) Name the type of competition that exists between members of the same species. (1mark)
7. Describe the role of hormones in human female menstrual cycle. (20marks)
8. (a) Discuss the role of kidney in osmoregulation (10marks)
(b) Explain how the image of an object is formed in the brain. (10marks)

KEIYO MARAKWET SECONDARY SCHOOLS (KEMASSE) 2015

**231/3
BIOLOGY
PAPER 3
PRACTICAL
JULY/ AUGUST 2015**

CONFIDENTIAL

INSTRUCTIONS TO SCHOOLS

Each candidate should be supplied with the following

- 4 test tubes and test tube rack
- Iodine solution – supplied with dropper
- 10cm visking tubing labeled J
- Piece of string 20cm long
- 10cm³ solution of a mixture of soluble starch and glucose labeled K
N.B. 30g glucose mix with 3g starch add 100cm³ water heat to boil then cool
- 500 ml beaker
- Adequate distilled water/ rain water
- Benedict's solution
- Means of heating/ Bunsen burner

KMT JOINT EXAMINATION 2015**231/1****BIOLOGY****PAPER 1****MARKING SCHEME**

1. Herbivory/herbivorous (*Rej. Herbivore. Herbivores*)

Presence o a horny pad:

Presence of a diastema: (Any one)

2. (a) Have fats deposit, that act as shock absorbers;

Have pericardium membrane that encloses the heart/secret the lubricating fluid;

Have to mention the structure and its importance to score and mark first two only.

- (b) Deposition of calcium in the walls of the blood vessels;

3. a) cell diameter = diameter of a field of view in mm

No. of cells

$$4000\text{um} = \frac{8000\text{um}}{\text{No. of cells}}$$

$$\text{No. of cells} = \frac{8000\text{mm}}{4000\text{um}}$$

$$= 2 \text{ cells}$$

- b) i Regulate the amount of light that illuminate the specimen;

- ii) For accurate focusing/to bring the image into sharp/accurate focus;

4. (a) intermittent/staircase/stepwise;

(b) Arthropoda; *Rej. Wrong sp.*

c) cuticle hardens: hence inhibiting / reducing growth leading to little/ no increase in mass/growth because of presence of heparin, the anti-clotting factor

5. (a) David

(b) Has fats for insulation;

Has small surface area to vol ratio hence loses less/conserve heat; (a) and (b) are tied and *mark first two only for part (b)*

6. (a) Absorption of NaCl when in low concentration in soil than in the plant require active transport; which uses energy from respiration; that requires increase in oxygen supply;(owtte)

7. a) anaphase I

b) Homologous chromosomes separate at the equator

- Chromosomes migrate to the opposite poles

- sister chromatids attached to the centromere

c) spindle fibres

8. (a) Have lignified walls;

(b) Have spiral bands of chitin to prevent it from collapsing when pressure is low;

9. (a) Split water molecules/for photosynthesis that split water into hydrogen ions and oxygen/OH; (the two products must be presented to score)

(b) Sugars/carbohydrates/glucose;

10. The sub-stomatal air spaces accumulates moisture; leading to low diffusion gradient hence reducing transpiration (OWTTE)

11. (a) proteins; Blood cells/cells;

(b) By carrying out uric benedict's test; if sugars are present then the disease is present;

(OWTTE)

13. a) ovule

b) ovary

14. male parts/stomen matures earlier than the female parts/ carpels

Female parts/ carpels matures earlier than the male parts/ stamen

15. amylase enzyme from the germination grain diffuse to areas around the grain and digest starch in to simple sugars explaining absence of starch

16. allow the larvae to exploit different food inches from adults Eggs/pupa allow to overcome unfavorable conditions

Avoid competition for food between larvae and pupa (*first 2*)

17. Thin walled; moist surfaces; Highly vascularised/dense network of capillaries;

18. Alcohol; energy; carbon (iv) oxide; (*first three only*)

19. a) myopia/short sightedness

b) Short eyeball

c) Use concave lens/ divergent lens to diverge the rays so that the image is formed at the retina.

20. homologous structures are structures with similar embryonic origin but have been modified to perform different functions analogous structures with different embryonic origin but have modified to perform similar functions

21. Stomata; lenticles; cuticles (*first 2*)

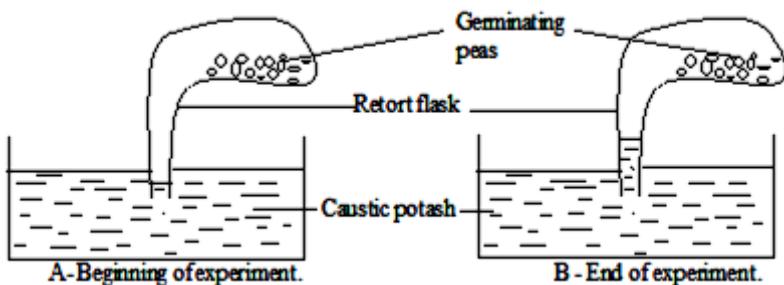
22. a) Scapula

b) attachment of muscles

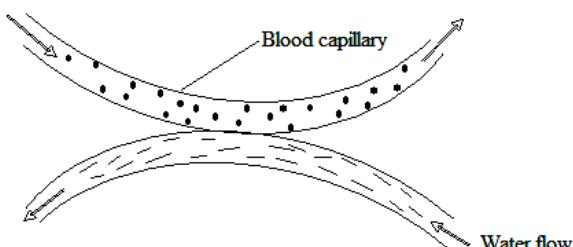
23. a) treponema pallidum
b) plasmodium malariae
24. a) on the diagram
b) acetylcholine
c) for energy production required for reconstitution of acetylcholine for transmission of nerve impulse across the synapse
25. nuclear material is not endorsed by a membrane
Lack most of the cell organelles
26. Organisms compete for resources/food/mates/water/shelter/space; leading to weaker ones migrating/dying/eliminated; and the stronger ones increases; (OWTTE)
27. Cell wall/chloroplast;
28. (a) Have thin walls for easy diffusion of substance into the roots;
Are long and thin to provide large surface area for fast absorption of substance into the roots; (*any 1 must state adaption and its importance to score*)
(b) impervious to prevent water loss/transpiration; (state the adaptation and importance to score)
29. a) ribose nucleic acid RNA
Because it has base uracil
b) deletion
30. sodium ions Na^+
Potassium Ions K^+
31. there will be no bile juice for emulsification
32. -turns food and facilitates it's mixing with the saliva
-Facilitates formation of food boluses for easy swallowing
-Pushes food in to the back of the mouth for swallowing

KIRINYAGA WEST SUB-COUNTY EFFECTIVE '40' EXAMINATION 2015*kenya certificate of secondary education***231/1****BIOLOGY****PAPER 1****FORM FOUR****JULY / AUGUST 2015****2 HOURS.**

1. Give **two** reasons for studying Biology. (2 marks)
2. Why does food stored in a refrigerator remain unspoiled longer than it does under ordinary conditions? (1 mark)
3. State **one** use for each of the following apparatus in the study of living organisms.
 - (a) Hand lens. (1 mark)
 - (b) Pair of forceps. (1 mark)
4. The diagram below shows an experiment on germination peas.



- A- Beginning of experiment. B - End of experiment.
- (a) (i) What changes are observable at the end of the experiment? (1 mark)
 - (ii) Give the reason the observation in a(i) above. (2 marks)
 - (b) If water had been used instead of caustic potash in the experiments, what would be observed? (1 mark)
 5. State **three** sites of gaseous exchange in mesophytes. (3 marks)
 6. List the main characteristics of kingdom monera. (3 marks)
 7. The diagram below illustrate the flow of blood and water within the respiratory surface in fish.

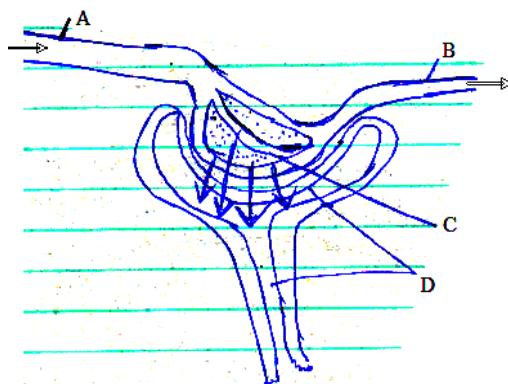


- (a) Name the term used for this arrangement. (1 mark)
- (b) Explain the significance of the arrangement. (2 marks)
8. (a) State **two** roles of DNA molecule. (2 marks)
- (b) Give two nitrogenous bases in a DNA molecule. (2 marks)
9. Distinguish between;
 - (a) Single and double circulatory system. (2 marks)
 - (b) Blood plasma and serum. (2 marks)
10. The table provided below shows stomata distribution on leaves A and B and their surface area.

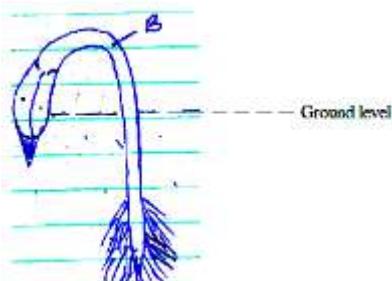
	Leaf surface	A	B
Number of stomata	Upper surface	25	5
	Lower surface	0	18
Surface area		25 cm ²	18 cm ²

- (a) Identify the habitats of the plant from which leaf A was obtained. (1 mark)
- (b) Give a reason for your answer in (a) above. (1 mark)
11. (a) Distinguish between analogous and homologous structures. (2 marks)
- (b) What is adaptive radiation? (2 marks)

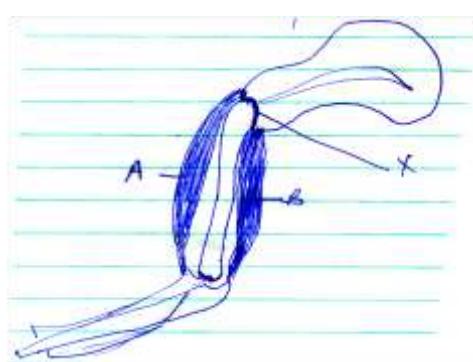
12. The diagram below shows a part of nephron. Study it and answer the questions that follow.



- (a) Name the parts labelled A and B. (2 marks)
 (b) Name the process by which the fluid found in D is formed. (1 mark)
13. With a reason, name the organelles that would be found in large numbers in cell of secretory glands. (2 marks)
14. State three adaptations of red blood cells to their functions. (3 marks)
15. Give **three** prevention measures of cholera. (2 marks)
16. The diagram below shows a germinating seedling.

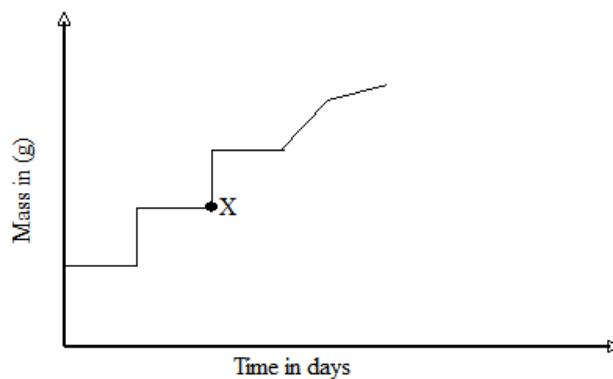


- (a) Name the part of the seedling labelled B. (1 mark)
 (b) State the type of germination exhibited above. (1 mark)
17. What are the structural units of lipids? (2 marks)
18. State the importance of the following features in gaseous exchange;
 (i) The presence of cartilage in trachea and bronchi. (1 mark)
 (ii) Alveoli, gill filaments and tracheoles being numerous in the respective organisms where they occur. (1 mark)
19. Study the diagram below and answer the following questions.

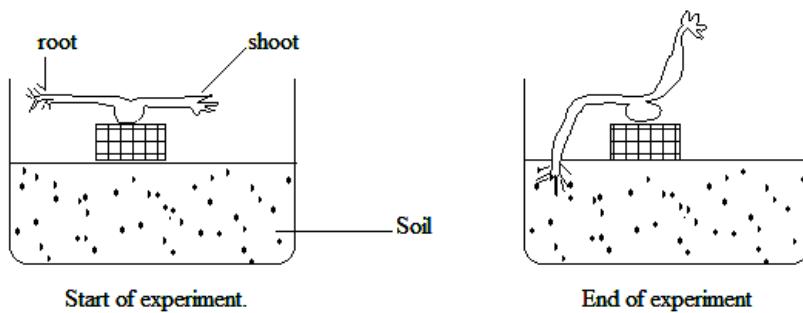


- (a) Name the muscles labelled A and B. (2 marks)
 (b) What happens to each muscle as the arm is straightened? (2 marks)
 (c) Name the type of joint present in part labelled X. (1 mark)
20. (a) State **two** adaptation of herbivorous which enable them to digest cellulose? (2 marks)
 (b) What is the importance of chewing food? (2 marks)
21. (a) Name **two** excretory processes in plants. (2 marks)
 (b) Give **two** reasons why plant lack complex excretory organs. (2 marks)
22. What characteristics do mammalian lungs and the gills of bony fish have in common that enables them to exchange gases efficiently? (4 marks)

23. The graph below represents the growth in a certain phylum.



- (a) Name the type of growth pattern shown on the graph. (1 mark)
 - (b) Identify the process represented by X. (1 mark)
 - (c) Name the hormone responsible for the process in (b) above. (1 mark)
24. (a) What is sex-linkage? (1 mark)
- (b) Name **two** sex-linked characteristics in human determined by genes located on Y- chromosome. (2 marks)
25. An experiment was carried out to investigate the growth response in a bean seedling as illustrated in the diagram below.



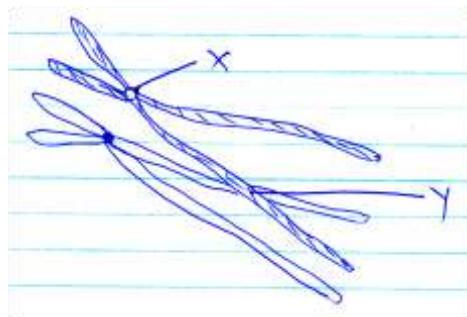
- (a) What type of response was being investigated. (1 mark)
 - (b) Explain the response exhibited by the root. (3 marks)
26. (a) Explain what happens during the dark stage of photosynthesis. (2 marks)
- (b) Give **three** examples of complex carbohydrates. (3 marks)

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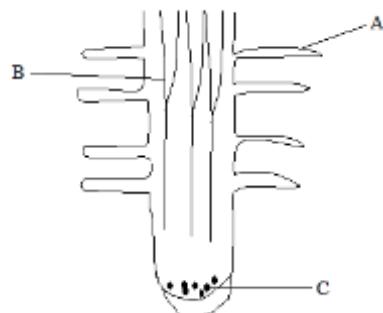
BIOLOGY**PAPER 2****JULY / AUGUST 2015****2 HOURS.****SECTION A****Answer all the questions in this section.(40 marks)**

1. The diagram below shows a phenomenon which occurs during cell division.

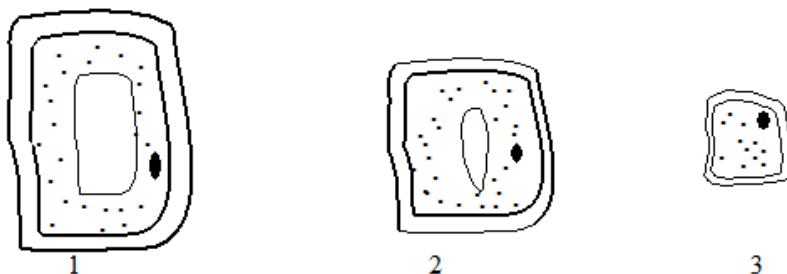


- (a) Name the parts labelled X and Y. (2 marks)
 (b) State the biological importance of the parts labelled X and Y. (2 marks)
 (c) (i) What is meant by bivalent chromosome. (1 mark)
 (ii) In which stage of cell division are the above structures likely to be. (1 mark)

2. The following diagram is a longitudinal section of the root apex.

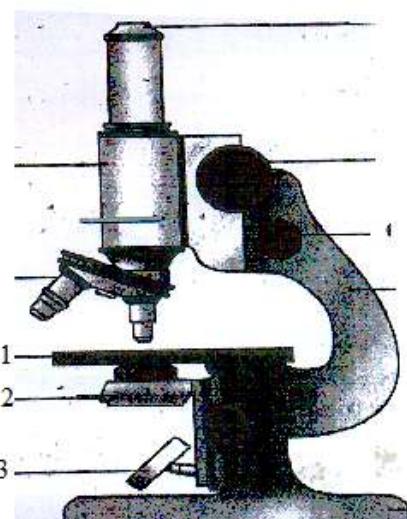


- (a) Identify the parts labeled A, B and C. (3 marks)
 (b) The figure below represents three cells 1, 2 and 3.

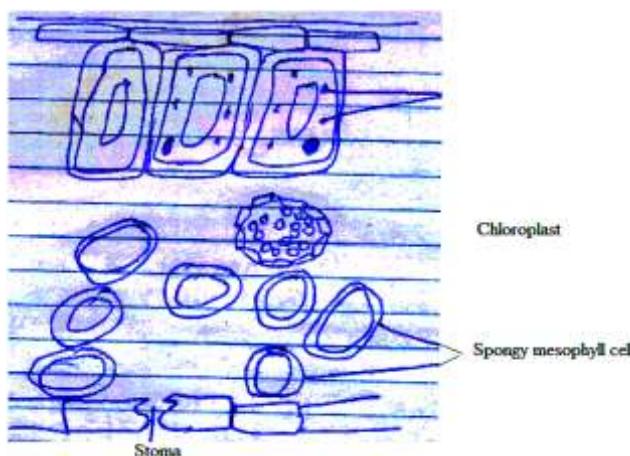


- Identify the three regions of the root tip from which the cell were got from? (3 marks)
 (c) Name the tissues which are responsible for growth in;
 (i) girth (1 mark)
 (ii) length (1 mark)

3. The figure below shows a light microscope.



- (a) State the functions of the parts labelled 1, 2, and 3. (3 marks)
- (b) (i) State **two** differences between an electron microscope and a light microscope. (2 marks)
- (ii) Give **one** advantage of using a light microscope over that of an electron microscope. (1 mark)
- (c) Calculate the magnification that is obtained when an object is viewed with a X10 eye piece and a X100 objective lens. (2 marks)
4. In an experiment, a black mouse was mated with a brown mouse. All the offsprings in F₁ generated were black. The offspring grew and were all allowed to mate with one another. The total number of F₂ generation offspring were 96.
- (a) Using letter B to denote the gene for black colour, work out the genotype of the F₁ generation.(Use a punnet square) (3 marks)
- (b) State the following for the F₂ generation.
- (i) Genotypic ratio. (1 mark)
 - (ii) Phenotypic ratio (1 mark)
 - (iii) The total number of brown mice. (1 mark)
- (c) (i) What is non-disjunction? (1 mark)
- (ii) Give **one** example of a genetic disorder associated with non-disjunction. (1 mark)
5. The figure below shows a section through a leaf. A leaf is designed for photosynthesis and this process provides a supply of simple sugars for a plant.



- (a) State the adaptation of the chloroplasts to photosynthesis. (2 marks)
- (b) Name a mineral ion in chloroplast. (1 mark)
- (c) (i) Name the tissues that translocates sugar from the leaves to other parts of the plants. (1 mark)
- (ii) How is the tissue named in c(i) above adapted to its function? (2 marks)
- (d) Write a word equation for the process of photosynthesis. (2 marks)

SECTION B (40 marks)**Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided.**

6. An experiment was carried out to investigate the population increase of yeast cell in a culture over a period of 48 minutes. The results were recorded as shown in the table below.

Time in minutes	Number of yeast cells
0	2
5	2
10	4
15	16
20	46
25	94
30	123
35	136
40	140
45	140
50	140

- (a) Using a suitable scale. Plot a graph of number of yeast cells against time in minutes. (6 marks)
- (b) (i) Determine the number of yeast cells after 24 minutes. (1 mark)
- (ii) Determine the number of yeast cell after 37 minutes. (1 mark)
- (c) After how long was the population of yeast cells 120? (1 mark)
- (d) Account for the shape of the curve between;
- (i) 0 and 12 min. (2 marks)
- (ii) 17 and 30 min. (3 marks)
- (iii) 31 and 45 min (3 marks)
- (e) Briefly explain how any **three** factors affect population growth. (3 marks)
7. (a) State **six** common uses of excretory products in plants. (6 marks)
- (b) Describe the process of excretion in the kidney. (14 marks)
8. (a) Describe how a finned fish is adapted for locomotion in water. (12 marks)
- (b) Explain the movement of a molecule of water from a root hair cell to the xylem of the root. (8 marks)

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BIOLOGY**PAPER 3 (CONFIDENTIAL)****JULY / AUGUST 2015****CONFIDENTIAL**

1. A ripe orange (NB. Each candidate should be provided with at least $\frac{1}{2}$ a piece)
Reagents.
2. Iodine solution.
3. Benedict’s solution.
4. DCPIP
5. Two small beakers.
6. 4 test tubes
7. A test tube rack
8. Means of heating.
9. 0.1% ascobic acid

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BIOLOGY**PAPER 3 (PRACTICAL)****JULY / AUGUST 2015** **$1\frac{3}{4}$ HOURS.**

1. (a) Squeeze the juice from the piece of specimen B in a beaker. Using the reagents provided test for food substance in the juice. Record your observation in the table below. (9 marks)

Food	Procedure	Observation	Conclusion

- (b) Using 0.1% ascobic acid provided count the number of drops used to decolourise 2 ml of DCPIP in a test tube. Record your observation. (1 mark)
 - (c) (i) Count the number of drops used to decolourise 2 ml of DCPIP using the juice from specimen B. Record your observation. (1 mark)
 - (ii) Using the data collected, calculate the percentage ascobic acid present in specimen B. (2 marks)
2. The photographs below represent specimen obtained from plants. Examine the photographs.

(a) In the table below name the mode of dispersal and the features that adapt the specimen(s) to the mode of dispersal.

(8 marks)

Specimen	Mode of dispersal	Adaptive features
K		
M		
Q		
L		

(b) Classify specimen P into its correct taxonomic unit below.

(3 marks)

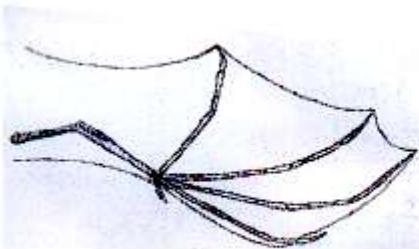
- (i) Division.
- (ii) Sub-division.
- (iii) Class.

(2 marks)

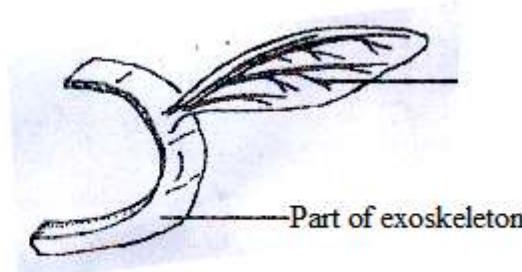
(c) Describe the type of placentation exhibited by specimen L, and give a reason for your answer.

- (i) Placentation.
- (ii) Reason

2. Examine photographs shown below.



Wing of a bat



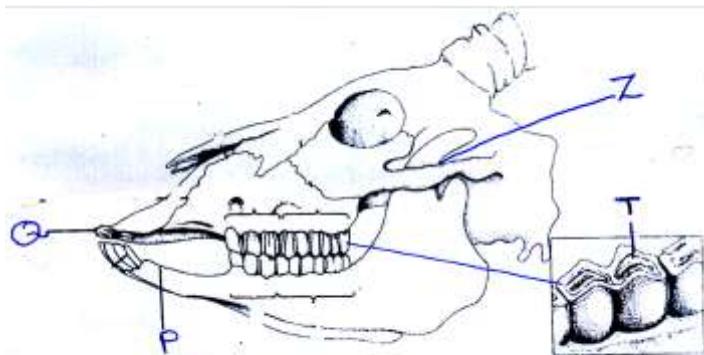
Wing of insect

Wing of a bat

Wing of insect

- (i) What does the origin of the wings suggest about the ancestry of the organisms? (1 mark)
- (ii) This type of evolution is referred to as; (1 mark)
- (iii) Give another example that illustrates this type of evolution. (1 mark)
- (iv) Outline **two** differences between the two types of wings. (2 marks)

(b) The diagram below shows the lower and upper jaw of a certain mammal.



- (i) Using observable features on the diagram identify the mode of nutrition for the above mammal. (2 marks)
- (ii) Write the dental formulae of the above mammal. (1 mark)
- (iii) Label parts marked P and Q and state the function of each. (2 marks)
- (iv) Name the type of joint at part labelled Z. (1 mark)
- (v) State the function of part labelled T. (1 mark)

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BIOLOGY
PAPER 1
JULY / AUGUST 2015
2 HOURS.

1. Entry into careers ; acc correct examples.
 Gain scientific skills ;
 Help in solving environmental problems ;
 Useful in international co-operation;acc correct examples.
2. Low temperature suppresses/ inactivates enzymes produced by bacteria hence lowering their activity. (OWTTE)
3. (a) Enlarge / magnifying tiny specimens which cannot be seen clearly using un aided eyes ;
 (b) For picking up small crawling animals /stinging animals ;
4. (a) (i) The level of caustic potash in retort flask rises ;
 (ii)Oxygen has been used up by germinating peas 'The caustic potash raises to occupy the spaces ;
 (b) No observable change ;
5. Stomata ;
 lenticel ;
 Cuticular surface ;
 Accept cuticle surface.
6. - Are prokaryotic / nuclear material is not enclosed within a nuclear membrane ;
 - Have few organelles
 - Their cell walls is not made up of the cellulose ;
7. (a) Counter - current flow (system) ;
 (b) This ensure efficient diffusion of oxygen from water into blood i.e there is continuous diffusion of oxygen from water into blood ;
 Eventually blood that leaves the gills has almost the same concentration of oxygen as the water that enter the gills / maintains a steep diffusion gradient between water and blood ;
8. (a) (i) Store genetic information in ar coded form.
 (ii)Transfer of genetic information unchanged to daughter cell through replication ;
 (iii)Translates the genetic information into characteristics of an organism ;
 (iv) Synthesis of protein (structural and functional) ;
 (mark the first 2)
 (b) Adenine ;
 Guanine ;
 Thymine ;
 Cytosine ;
 (mark the first 2)
9. (a) -Single circulatory system - blood flows through the heart only once during a complete circulation. ;
 - Double circulatory system blood flows throughthe heart twice for every complete circulation ;
 (b) Blood plasma ; It is the fluid part of the blood, yellow in colour and it consist of plasma proteins ;
 While a serum blood plasma from which plasma proteins have been removed ; (mark as a whole)
10. (a) Fresh water / aquatic ;
 (b) - Have maximum number of stomata on the upper surface ;
 - Higher leaf surface area / broad leaf ; (any one)
 NB/ If (a) is wrong do not award (b). (b) is tied to (a)
- 11.(a) Analogous structures - different embryonic origin but have evolved to perform similar functions due to exploitation of some kind of environment ;
 Homologous structures - are those that have common embryonic origin but modified to perform different functions ;
 (b) one basic structural form with a common embryonic origin is modified to give rise to various different forms to exploit different environment ;
12. (a) A - Afferent arteriole ;
 B - Efferent arteriole ;
 (b) ultrafiltration ;
13. Golgi bodies ; - Involved in secretion of synthesizes proteins and carbohydrates ;
14. - Have haemoglobin which readily combines with oxygen to form an unstable compound- oxyhemoglobin ;
 - They are biconcave in shape to increase their surface area for gaseous exchange ;
 - Few organelle / absence of nucleus to create more room for more haemoglobin ;
 - Presence of enzyme carbonic anhydrase to speed up the transport of carbon (IV) oxide ;
15. - Domestic water should be boiled / chlorinated before use ;
 - Infected persons should be isolated and treated ;

- Proper disposal of faeces and refuse ;
 - Use of pit - latrine in rural areas ;
 - Washing of hands after visiting toilets and before meals ;
16. (a) B - Hypocotyl ;
 (b) Epigeal (germination) ;
17. - Fatty acids ;
 - Glycerol ;
18. (i) - Ensure that it does not collapse during breathing ; (OWTTE)
 (ii) - To increase the surface area over which diffusion occurs.
19. (a) A - Biceps / flexor ;
 B - Triceps / Extensor ;
 (b) Biceps - relax ;
 Triceps - contracts ;
 (c) Ball and socket (joint) ;
20. (a) - Have very long intestines to increase surface areas for digestion of plant materials ;
 - Have large caecum and appendix which contains bacteria that produces cellulase enzymes that digest cellulose ;
 (b) (i) Breaks food into small pieces ; increasing surface area for action of digestive enzymes ;
 (ii) Mixing food with saliva making it easy to swallow.
21. (a) - By diffusion ;
 - Deposition ;
 - Re-cycling during photosynthesis and respiration.
 - Leaf fall.
- (b)(i) Less accumulation of toxic waste ;
 (ii) Their metabolic substrate is mainly carbohydrates which has less toxic waste.
 (iii) Waste deposited in the leaves and fruits when they fall are removed ;
 (iv) They recycle most of their metabolic waste. *mark first 4*
22. - They are highly vascularised so as to take away diffused gases and maintain high concentration gradient ;
 - They have a large surface area to increase the rate of diffusion ;
 - They have a thin film of moisture to dissolve the gases for diffusion.
 - They have thin walls to reduce distance of diffusion increasing the rate of diffusion.
23. (a) Intermittent growth (curve) ;
 (b) Moulting / Ecdysis ;
 (c) Ecdysone / moulting hormone ;
 (c) is tied to (b)
24. (a) - Genes found on the sex - chromosome and are inherited together ;
 (b) - Premature baldness ; Rej baldness alone
 - Tuft of hair in the ear pinna tuft of hair in the nose ;
25. (a) Tropisms ; Acc Geotropism
 Reject tropism
 (b) Gravity causes a greater concentration of auxins to diffuse and accumulate on the lower side of roots ; High auxin concentration on lower part of root inhibit growth on lower part of roots while low concentration of auxins on the upper side promotes faster growth ; hence the root bends downwards ;
26. (a) - Carbon (IV) oxide combines with hydrogen ions to form glucose / carbon (IV) oxide fixation ;
 - Energy is used ;
 (b) Cellulose ;
 Starch ;
 Glycogen ;

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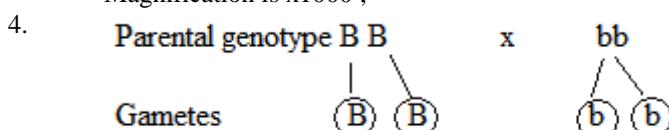
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BIOLOGY**PAPER 2****JULY / AUGUST 2015****2 HOURS.****SECTION A**

1. (a) X - centromere
Y - Chiasmata
(b) X - It joins / hold sister chromatids together/
It is a point of attachment for the spindle fibres ;
Y - (Non-sister chromatids) crossover and exchange genes ; (leading to genetic variation or recombination ;)
(c) (i) Association of two homologous chromosomes;
(ii) Prophase I; rej (prophase alone not correct)
(d) (i) Presence of an extra chromosome in a cell ;
(ii) Lack of either an X or Y sex chromosome in an individual ;
2. (a) A - Root hair ;
B - Phloem ;
C - Apical meristem ;
(b) 1 - Zone of cell differentiation ;
2 - Zone of cell elongation ;
3 - Zone of cell division ;
(c) Cambium meristem ;
Apical meristem ;
3. (a) 1 - Stage
Flat platform where specimen on the slide is placed ;
2 - Condenser
Concentrates light on the stage ;
3 - Mirror
Reflects light through the condenser to the object ;
(b) (i) Electron microscope
1. Has a higher magnification
2. Higher resolving power.
3. Use electro magnets to magnify.
4. Use electron beams to illuminate.
5. Specimen must be dead because it is mounted in a vacuum.
Light microscope
Has a lower magnification ;
Lower resolving power ;
Uses lens to magnify ;
Use light to illuminate ;
Specimen can be alive or ;
dead

mark first two

- (ii) Light microscope can be used to view live specimens / organisms ;
- (c) Eye piece lens X Objective lens magnification
10 x 100 ; = 1000
Magnification is x1000 ;



	0	-	
	-	-	
b	Bb	Bb	:
	b	Bb	Bb

Award for genotypes, circling gametes and punnet square.

- (b) (i) 1 BB : 2Bb : 1 bb 1 mk
Rej 1:2:2 alone
- (ii) 3 black : 1 brown 1 mk

- (iii) $96 \times \frac{1}{4} = 24$; (mark as a whole) *Rej 3:1 alone*
- (c) (i) Failure of homologous chromosomes to separate during anaphase I resulting in gametes with an extra chromosome and others with less chromosomes ; *1 mk*
- (ii) Downs syndrome / klinefelters syndrome / turners syndrome *1 mk*
5. (a) - Has grana with chlorophyll for trapping light for light stage of photosynthesis.
 - Has stroma which contains enzymes for the dark stage of photosynthesis;
 - It moves within the cell enabling it to receive maximum light for photosynthesis ;(mark the first two)
- (b) Magnesium / nitrogen ;
- (c) (i) Phloem ;
 (ii) - It has companion cells with numerous mitochondria to provide ATP for the active transport of nutrients ;
 - It has numerous mitochondria to provide energy for the active transport of food materials ;
 - It has sieve plates with sieve pores for the passage of food materials ;
 - It has cytoplasmic strands for the transport of food from one sieve tube ; to the other.
 - Its cell organelles are pushed to the periphery to give more room for the passage of food ;
 - It has sieve tubes cells placed end to end for a continuous flow of food ;
 - Presence of plasmodesmata to allow lateral movement of food ;
- Light energy
- (d) i) Carbon IV dioxide + water $\xrightarrow{\text{chlorophyll}}$; glucose + oxygen; *2 mks*
6. (a) See the graph on next page.
- (b) (i) 84 ± 1 ; (Mark from the graph)
 (ii) 138 ± 1 ;(mark from the graph)
- (c) 2 ± 0.5 min
- (d) (i) - Few dividing cells ;
 - Cells not yet adapted to the environment ;
 (ii) - Increased number of dividing cells ;
 - Cells well adapted to the environment ;
 - Few limiting factors ;
 - Plenty of food, no competition for available resources ;
 - Rate of multiplication is higher than rate of death ;
 (iii) - Shortage of oxygen ;
 - Limited space (overcrowding) ;
 - Accumulated metabolic wastes which is poisonous ;
 - Shortage of food nutrients ;
- (e) - Migration - Individuals in a population may move from one place to another and these movements may change the size of populations;
 - Infant mortality - the higher the infant mortality the lower the population growth rate ;
 - Natural enemies - Presence of natural enemies such as predators and pathogens reduced population growth rate and vice versa ;
 - Sex ratio ; This is the ratio of females to males in a population. The more the females the greater the population growth rate ;
 - Fertility - This is the number of offspring each organism gives rise to during its life span. The higher the fertility rate the greater the population growth rate ; *(mark the first three)*
7. (a) Quinine - Used to treat malaria ;
 Caffeine - A mild stimulant ;
 Cocaine - Local anaesthetic ;
 Nicotine - In manufacture of insecticides and cigarettes ;
 Papaine - Protein enzyme used as a meat tenderizer ;
 Rubber - Has latex used in the manufacture of shoes ; and tyres ;
 Opiates - In manufacture of painkillers ;
 Gum arabica - Used in food processing and in the printing industry ; *(any other correct excretory product)*
- (b) - Ultra filtration takes place in the Bowman's capsule.
 - The efferent arteriole is narrower than the afferent arteriole ; making pressure in the Bowman's capsule high. High pressure causes ultrafiltration to occur within the glomerulus ;
 - The filtrate consists of urea, glucose, amino acids, mineral salts and water ;
 - Large molecular particles such as plasma proteins and blood cells are not filtered ;
 - In the proximal convoluted tubule useful substances such as glucose, amino acids, some water and vitamins ; are selectively reabsorbed into the blood by active transport and diffusion ;
 - Selective reabsorption uses energy provided by the mitochondria found in cells lining the tubules ;
 - In the loop of Henle, salts are reabsorbed into the blood by active transport ; water is reabsorbed by osmosis ;
 - In the distal convoluted tubule, hydrogen ions are absorbed from the blood into the urine for excretion. This happens when there is a high concentration of the ions in the blood ;

- Reabsorption of salts occurs under the influence of aldosterone ; and reabsorption of water occurs under the influence of the anti-diuretic hormone ; in the distole convoluted tubule salt and water are reabsorbed ; In the collecting duct water and mineral salts are reabsorbed ;
 - The urine formed passes into the collecting duct which leads to the pelvis, then to the ureter and to the bladder.
 - Urea is not reabsorbed into the blood.
 - In a healthy person, glucose and amino acids are completely reabsorbed into the blood.
 - Reabsorption of water also takes place in the collecting duct by osmosis as the renal fluid flows down.
- 8.(a) - It has overlapping scales which point backwards and lie close to the body surface to reduce friction ;
- It secretes mucus which covers the body and this reduces friction during movement ;
 - It has an air-filled swim bladder to increase buoyancy ;
 - When the swim bladder is filled with the air the relative density of the body is lowered so the fish float ;
 - When air is expelled it becomes relatively denser and the fish sinks ;
 - It has a tail fin with a large surface area that increases the amount of water displaced hence an increase in forward thrust
 - It has strong block of muscles called myotomes and is highly flexible vertebral column; The muscles contract and relax to bring about movement ; When muscles on the right contract the muscles on the left relax and the tail swing to the right When the muscles on the left contract the muscles to the right relax - and the tail swing to the left ; This enables the forward thrust ;
 - It has pairs of pectoral and pelvic fins used for steering and bringing about downward and upward / pitching ;
 - It has unpaired dorsal and anal fins which increase the vertical surface area for stabilizing the fish, preventing it from rolling and yawing ;
- (b) Absorption of water is by root hair through osmosis ; The soil particles surrounding the root hair are surrounded by a film of soilwater ;
 The sap vacuole in the root hair has a much higher concentration of solutes than the soil water ; water molecules will move from the soil to the root hair by osmosis ; This dilutes the concentration of the sap in the root hair than that of the adjacent cells ; The water moves to the adjacent epidermal cells of the root hair by osmosis ; diluting their concentration. From the epidermis water moves to the cortex cells by osmosis ; From the cortex cells water moves to adjacent endodermal cells
 by osmosis ; until it reaches the xylem of the roots ;

max 8

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BIOLOGY**PAPER 3****JULY / AUGUST 2015**

NB: The teacher incharge must do the practical after the students have completed and compare the results with the marking scheme to avoid penalizing the students unfairly. But the score points must remain the same.

QUESTION 1.

Table 1.

Length from A to B (cm)	80	76	72	68	64	60
Time for 10 oscillations (s)	9.94	11.06	11.70	12.24	12.84	13.06
Periodic time T(s)	0.994	1.106	1.170	1.224	1.284	1.306
$T^2(s^2)$	0.988	1.223	1.3689	1.498	1.6486	1.7056
2θ (all correct 2 mks 3 and above correct 1 mk)	160	140	125	115	104	96
θ (all correct 1 mk)	80	70	62.5	57.5	52	48
$\cos \theta$ (all correct 1 mk)	0.1736	0.3420	0.4617	0.5373	0.6157	0.6691

9 mks

 $\frac{1}{2}$ for each correct max 8 mks 1 d.p must ± 25 all correct 1 mk ± 10 all correct + 1 mk(f) Graph of T^2 against $\cos \theta$

(g) The slope 's' of the graph. (3 mks)

$$S = \frac{DY}{DX} = \frac{1.7056 - 1.223}{0.6691 - 0.3420} = \frac{0.4826}{0.3271}$$

$$= 1.475 S^2$$

- Correct intervals 1 mk

- Correct evaluation with units must 1 mark

- Without units $\frac{1}{2}$ mk

- Wrong units zero

Accuracy (1.200 - 1.700) (1 mk)

$$(h) K = \frac{4\pi^2}{S}$$

- Correct substitution for π and students value of S 1 mk

- Correct evaluation to 2 decimal places with correct units 1 mk

- No units $\frac{1}{2}$ mk

- Wrong units no marks

- Accuracy (23.22 - 32.00) 1 mk

- Units must - without units no mark

Question 2: Part A(a) M_1- Accept any value of M_1 and M_2 such that $M_2 - M_1$ is between 1.5 - 1.7 to one decimal place. Must (2 mks)(b) M_2(c) $D = \frac{\text{Mass}}{\text{Volume}}$

- Correct substitution of candidates own values 1 mk

- Correct evaluation with correct units. 1 mk

- Correct evaluation without units $\frac{1}{2}$ mk

- With wrong units zero

Time in minutes	0	1.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Temperature of w(c) (To the nearest 0.5)	78 to 82	77 to 81	75.5 to 79.5	740 to 78	73 to 77	72 to 76	70.5 to 74.5	69.0 to 74.5	68 to 72	67 to 71
Temperature of L(c) (To the nearest 0.5)	78 to 82	74 to 78	78 to 77	70 to 74	68 to 72	66 to 70	64 to 68	62.5 to 66.5	60.5 to 64.5	89.0 to 63.0

For any correct value of Temp. W $\frac{1}{2}$ max - 2mks

Time in minutes	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
Temperature of w(c)	66.0 to 70.0	65.0 to 71.0	64.0 to 68.0	63.0 to 67.0	62.5 to 66.5	61.5 to 65.5	50.5 to 64.5	89.5 to 63.5	54.0 to 63.0	58.0 to 62.0
(To the nearest 0.5)										
Temperature of L (c)	57.0 to 61.0									
(To the nearest 0.5)										

For any correct value of Temp. L $1/2$ max - 2 mks

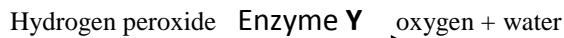
Total marks for the table 4 marks

- (h) On graph
 - (i) Correct reading from the graph. 1 mk
 - (ii) Correct reading from the graph 1 mk
- (j) Correct substution of t_L , t_w and d 1 mk

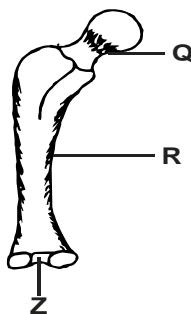
Correct evaluation 1 mk

BUSIA COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/1
BIOLOGY
PAPER 1
JULY/AUGUST 2015
TIME: 2 HRS

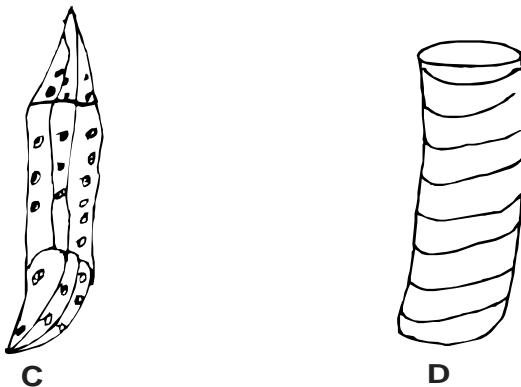
1. The reaction represented by the equation below occurs in the body.



- a) Name enzyme Y (1 mark)
 b) Name an organ in the body where the reaction occurs. (1 mark)
2. Name the type of circulatory system found in the phylum Arthropoda. (1 mark)
3. Name the organelles that perform the following function in a cell.
 i) Protein synthesis (1 mark)
 ii) Transport of cell secretions (1 mark)
4. How would one find out from a sample of urine whether a person is suffering from *Diabetes mellitus*? (2 marks)
5. What are the effect of gibberellins on the shoot of plants? (2 marks)
6. a) State the role of ATP molecule during active transport across the cell membrane of the plant root hair. (1 mark)
 b) List **two** factors that affect active transport. (2 marks)
7. Name the part of the microscope responsible for concentrating and directing light on the stage. (1 mark)
8. State **two** structural adaptations of the gill filaments of the bony fish. (2 marks)
9. Work out a phenotypic ratio if children of a couple with normal skin but are carriers of the albino trait. Use letter A to represent the gene for normal skin pigmentation. (4 marks)
10. The diagram below shows a bone of hind limb. Study it and answer the questions that follow.

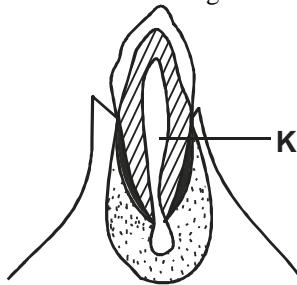


- a) Name the bone (1 mark)
 b) Name the parts labelled Q and R. (3 marks)
 c) Name the structure that articulates with the part labelled Z and the joint formed? (2 marks)
- Structure
 Joint
11. State the function of the following structures.
 a) Fallopian tube (1 mark)
 b) Endometrium (1 mark)
12. State the role of the cerebrum in human beings. (1 mark)
13. The diagrams below shows some components of xylem.



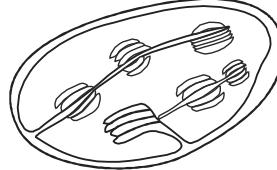
- a) Identify C and D (2 marks)
 b) Describe structural difference between the two components. (2 marks)
14. State **one** characteristics of a ball and socket joint. (1 mark)
15. a) Name the tissue in the stem and leaves of hydrophytes that allows them to store air for gaseous exchange.. (1 mark)
 b) State the function of pneumatophores. (1 mark)

16. The diagram below represents a section through a human tooth.



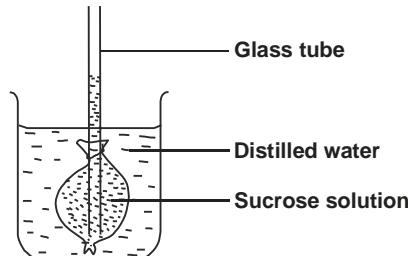
- a) Name the type of tooth shown..... (1 mark)
 b) Give a reason for your answer in (a) above. (1 mark)
 c) List and state the functions of two structures found in the part labelled K. (2 marks)
17. a) State Darwin's theory of natural selection. (1 mark)
 b) State **two** advantages of divergent evolution to organisms. (1 mark)
 c) What are vestigial organs? (1 mark)

18. Below is a diagram of an organelle.



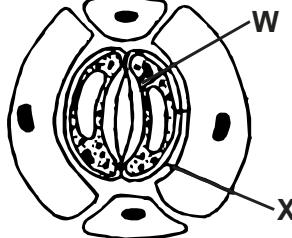
- a) State the function of the organelle drawn above. (1 mark)
 b) Name the parts of the organelle where:
 i) Oxygen gas is produced as a by-product (1 mark)
 ii) Carbon (IV) oxide is utilized. (1 mark)

19. An experiment was set up as shown below.

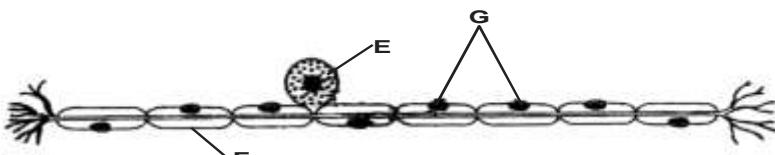


- a) Suggest the observations made after 20 minutes. (1 mark)
 b) Explain the observations. (2 marks)
20. a) State the role of the iris in the human eye. (1 mark)
 b) Give a difference between blind spot and the *Fovea centralis*. (1 mark)
21. a) What do you understand by the term synapse? (1 mark)
 b) State **one** adaptation of neuron to its function. (1 mark)

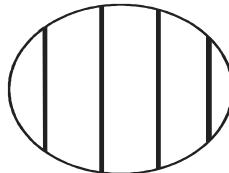
22. The diagram below shows part of a plant tissue.



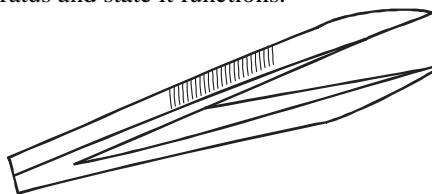
- a) Name cell labelled X and part labelled W. (2 marks)
 b) State **two** adaptations of cell labelled X to its function. (1 mark)
 c) Identify with a reason the type of neuron above. (1 mark)



- Reason (1 mark)
 b) Name parts labelled E and G (2 marks)
24. Name the type of muscle found in the gut. (1 mark)
25. A form one student trying to estimate the size of onion cells observed the following on the microscope's field to view.



- If the student counted 20 cells across the field of view calculate the size of one cell in micrometers. (2 marks)
- 26.** State **two** structural adaptations of veins to their function. (2 marks)
- 27.** Identify the following apparatus and state it functions.



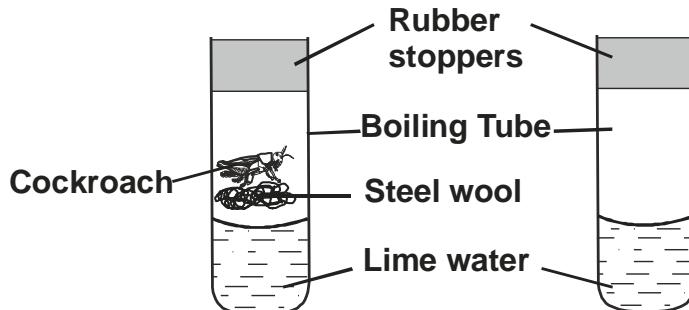
- i) Name (1 mark)
 ii) Function (1 mark)
28. Differentiate between photosynthesis and respiration. (2 marks)

Photosynthesis	Respiration
(i)	(i)
(ii)	(ii)
(iii)	(iii)

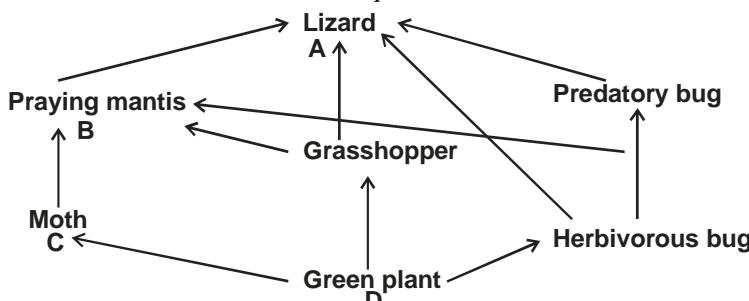
- 29.** Describe the physiological process that help in regulation of the body temperature in man on a hot day. (3 marks)
- 30.** State **two** advantages of metamorphosis to the life of an insect. (2 marks)
- 31.** Name causative agent of each of the following diseases. (3 marks)
- i) Pneumonia
 ii) Whooping cough
- 32.** a) What is polysepalous flower. (1 mark)
 b) How is a sugarcane flower adapted to wind pollination? (2 marks)

BUSIA COUNTY JOINT EXAMINATION**KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)****231/2****BIOLOGY****PAPER 2****JULY/AUGUST 2015****SECTION A (40 MARKS)****Answer ALL questions in this section**

1. A student setup the following apparatus to investigate a physiological process in animals. The set-ups were then left for one hour.

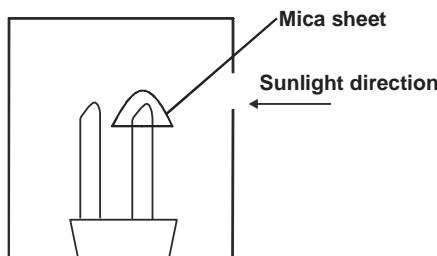


- a) What was the aim of the experiment? (1 mark)
- b) i) What observation was made in: (2 marks)
- Tube A
 - Tube B
- ii) Account for the change that occurs in Tube A. (2 marks)
- c) State the role of Tube B in the above experiment. (1 mark)
- d) Explain what would be observed if a green leaf was introduced in Tube A in place of the cockroach then set-up exposed to light for one hour. (2 marks)
2. When pure breeding red flowered plants were crossed with pure breeding white flowered plant, the offspring were all pink flowered.
- Using letter R to represent the gene for red coloured flower plants and W for the gene for the white flowered plants. Work out the genotypic ratio of F₂ generation. (5 marks)
 - State the phenotypic ratio of F₂ generation. (1 mark)
 - i) What is the name given to a condition when two alleles in heterozygous state contribute equally to the phenotype of an organism. (1 mark)
 - ii) Give an example of a trait in human beings where the above condition in c(i) above express itself. (1 mark)
3. Study the diagram below and use it to answer the questions below.



- i) What name is given to this diagram..... (1 mark)
- ii) Name the organism with the largest biomass..... (1 mark)
- iii) Name the organism with the largest number of prey (1 mark)
- State the feeding levels of organelles labelled A, B, C and D. (4 marks)
- State three adaptations of the grasshopper that would help protect it against the lizard. (3 marks)

4. The diagram below represents growing seedling which were subjected to unilateral light at the beginning of an experiment.



- a) i) State the result of P and R. (2 marks)
ii) Account for your answer in (a) (i) above. (2 marks)
- b) i) If the apical bud of seedling P was removed, what results would be expected after 5 days. (1 mark)
ii) Explain your observation in (b) (i) above. (2 marks)
- c) What is the significance of the practice in b (i) above in agriculture? (1 mark)
5. An experiment was carried out to find out the concentrations of ions in the cell sap of an aquatic plant and that of the water in the pond in which they grew.

Ions	Concentration in	
	Cell sap	Pond water
Na ⁺	50	1.2
K ⁺	49	0.5
Mg ²⁺	11	3.0
Ca ²⁺	13	1.3
Cl ⁻	101	1.3
SO ₄ ²⁻	13	0.67

- a) i) Name the process by which the aquatic plant absorbs ions from the pond water. (1 mark)
ii) Outline four roles of the process you have named in (a) (i) above in a mammalian body. (4 marks)
- b) How can the rate of uptake of ions by aquatic plants be increased. (2 marks)
- c) Name the part of the cell that allows passage of ions in and out of the cell. (1 mark)

SECTION B

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

6. A researcher in a plant breeding farm measured the growth of pollen tube down the style of Solanum incanum flower over a period of time. He recorded his data as in the table below.

Time in microseconds	0	5	10	15	20	25	30	40	50	55	60	65	70
Length of pollen tube in micro millimetres	0.0	0.01	0.015	0.04	0.06	0.09	0.12	0.16	0.18	0.19	0.19	0.19	0.18

- a) Plot a graph of length of pollen tube against time. (5 marks)
- b) From your graph determine the length of the pollen tube at 22.5 microseconds. (1 mark)
- c) Account for the shape of the graph between;
- i) 0 - 15 microseconds (3 marks)
 - ii) 10 - 50 microseconds (3 marks)
 - iii) 55- 65 microseconds (2 marks)
 - iv) 65- 70 microseconds (2 marks)
- d) Explain what happens after the 65th microsecond in this flower. (4 marks)
7. a) Name **three** supportive tissues in woody plants. (5 marks)
- b) State **three** functions of the endoskeleton. (5 marks)
- c) Explain how the girdles are adapted to their functions. (14 marks)
8. a) Name **two** functional parts of the mammalian circulatory system. (2 marks)
- b) Name **two** diseases of the mammalian circulatory system. (2 marks)
- c) Describe water movement from the soil into a plant until it is lost to atmosphere through the leaf. (16 marks)

BUSIA COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/3
BIOLOGY
Paper 3
(Practical)
July/August 2015

1. You are provided with substances labeled H. Filter the substance and collect the filtrate. Filtration is expected to be completed after 25 minutes. Using the reagents provided, carry out food tests on both the residue and filtrate of substrate H and record your results in the tables below.

RESIDUE

Food substance	Procedure	Observation	Conclusion

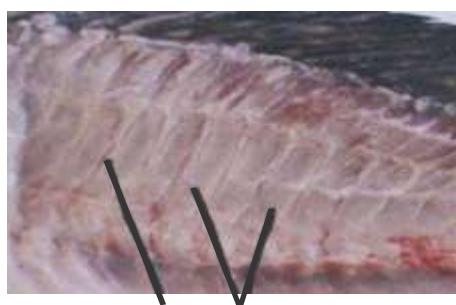
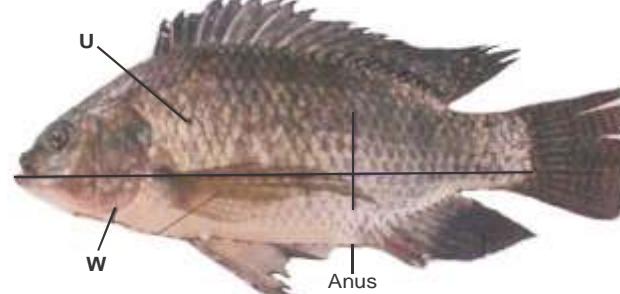
(8 marks)

FILTRATE

Food substance	Procedure	Observation	Conclusion

2. You are provided with a specimen labeled K.
- Make a transverse section through specimen K and draw a labeled diagram. (4 marks)
 - State the magnification used (1 mark)
 - Name the part of plant the specimen K provided is (1 mark)
 - Give one reason for your answer in (c) above. (1 mark)
 - i) Using one of the reagents provided determine the type of vitamin present in specimen H above.
Name of vitamin (1 mark)
 - ii) Name the deficiency diseases for the vitamin in (e) (i) above. (1 mark)
 - f) i) Give the identity of specimen H. (1 mark)
ii) Using observable reasons state the reasons for your answer in (f) (i) above. (2 marks)

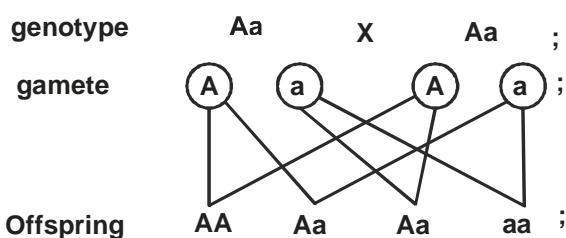
3. Examine the photograph of a fish shown below.



- Name the fins responsible for the following during swimming.
 - Balance, break and change direction. (2 marks)
 - Prevent fish from rolling and yawing (2 marks)
- Explain the process of gill ventilation between part labelled S to part labelled T. (4 marks)
- State one adaptation each for the structures labelled K and L. (2 marks)
- Name the parts labelled U and W. (2 marks)

BUSIA COUNTY FORM 4 JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
MARKING SCHEME
BIOLOGY (231/1)
(Theory) Paper 1
JULY/AUGUST 2015

1. a) Catalyse; (1mk)
b) Liver; (1mk)
2. Open circulatory system; (1mk)
3. i) Ribosome; (1mk)
ii) Endoplasmic reticulum; **Accb** Rough/Smooth endoplasm reticulum (1mk)
4. Test/react urine with Benedict's solution; positive result (yellow, orange, red colour) is an indication of diabetes mellitus/Accept negative result (blue colour) indicates absence of diabetes mellitus. (2mks)
5. -Promote elongation;
- Promote cell division;
- Increase of internodes;
- Provide fruit formation without fertilization/pathenocarpy; (2mks)
6. a) To assist in movement of molecules/mineral ions; against a concentration gradient across the living membrane; Acc: Provide the energy for the carrier to bind with molecule/ion to be transported across the membrane. (1mk)
7. Condenser; (1mk)
8. Gill filaments/lamellae numerous provide large surface area for gaseous exchange; gill filaments are lined with a thin epithelium to facilitate faster diffusion of gases. The gill filaments are well supplied with blood capillaries (highly vascularised) to transport gases; (2mks)
- 9.



Phenotypic ratio 3 normal : 1 Albino

Rej: Genotype cross if mixing

Rej: Phenotypic ratio with description

10. a) Femur;
b) Q - neck;
R - shaft;
c) Structure - patella;
Joins - hinge joint;
11. a) Fallopian tube - Provide a site for fertilization to occur /inner lining has cilia that assist in the movement of the ovum towards the uterus; (1mk)
b) Endometrium - become folded and vascularised for implantation of fertilized ovum, nourishes the embryo. (1mk)
12. – Control voluntary activities in the body /receive and integrate impulses from sensory neuron and send impulses to motor areas.
– Centre for memory/ learning/ reasoning /intelligence;
– Centre for controlling fine movement of the limbs; (**Any one**) (1mk)
13. a) C - Tracheid;
D - Xylem vessel;
b) A tracheid consists of long tubes with tapered perforated ends cross walls; while (B) vessels consists of long continuous tubes; (2mks)
14. All movement in all planes/directions; (1mk)
15. a) Aerenchyma tissue;
b) Breathing roots/has lenticles that are used for gaseous exchange by halophytes;
16. a) Incisor;
b) Chisel shaped;
c) (Capillaries) - supply oxygen and nutrients/remove waste products;
(Nerve endings) - detect stimuli of pain, cold/hot;
17. a) Nature selects suitable adapted organisms to be parents of future generation rejecting poorly adapted ones;
b) Enables the organisms to exploit different ecological niche (due to homologous structure; specializationdevelopment of

- new species; (2mks)
- c) Organs which in course of time have ceased to be functional hence reduce size /rudimentary;
- 18.** a) Site of photosynthesis;
 b) (i) grana/granum;
 (ii) stroma;
- 19.** a) Level of sucrose solution rose;
 b) Visking tubing is semi permeable; sucrose solution in hypertonic to distilled water; water enters into the sucrose solution by osmosis; (2mks)
- 20.** a) Control the diameter of the pupil;
 b) Fovea centralis has high concentration of photoreceptors/cones while blind spot has no photoreceptors/cones; (2mks)
- 21.** a) A microscopic gap between neurons across which impulses jump/Pass
 b) Have myelin sheath for insulation of axon; have axon for transmission of impulse;
 Has node of ranvier to speed up transmission of impulse;
- 22.** a) X - Guard cell;
 W - Stoma; **rej.** Stomata
 b) - Have chloroplast that help in the process of photosynthesis;
 - Have thin outer wall and thick inner wall to enhance bulging during opening of stomata; (2mks)
- 23.** a) Sensory neurone;
 Reason - Cell body is off the axon;
 b) E = Cell body
 G - Schwann cells
- 24.** Smooth muscles;
- 25.** Diameter of field of view = 3mm
 No of cells 20 cells
 $1\text{mm} = 1000\text{mm}$
 $3\text{mm} = 3000\text{mm}$
 Size of 1 cell = $\frac{3000}{20} = 150\text{mm}$; (2mks)
- 26.** -Presence of valves to prevent back flow of blood;
 - Thin walled which are less muscular and have few elastic fibres and wide lumen for blood to flow under low pressure; (2mks)
- 27.** (i) Pair of forceps;
 (ii) Picking up small crawling animals;
- 28.**

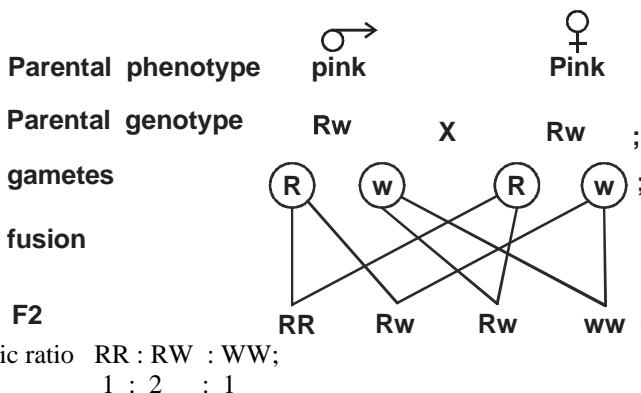
Photosynthesis	Respiration
-Occurs in chloroplasts	-Occurs in mitochondria and cytoplasm
- Carbon (IV) oxide is used up	- Carbon (IV) oxide is produced
- Oxygen is released	-Oxygen is used up
- Occurs only in green plants	-Occurs in all organisms
-Requires presence of light	- Does not require presence of light
- Food substances synthesized	-Food substances broken down

- 29.**
 - Hairs lie flat on the skin;
 - Vasodilation;
 - Increased sweat production;
 - Reduced metabolic activities; (3mks)
- 30.**
 - Adult and larva exploit different food niches;
 - They do not compete for food;
 - Pupa can survive adverse conditions;
 - It prevents overcrowding; (2mks)
- 31.** Diplococcus pneumonia;
 Bordetella pertusis; (2mks)
- 32.** a) Flower with free sepals; (1mk)
 b)
 - Long feathery stigma to trap pollen grains from air currents; (1mk)

- Anthers are large, loosely attached to flexible filament to release pollen grains easily; (1mk)
- Pollen grains are small, smooth and light for easy blowing by wind. (1mk)

BUSIA COUNTY JOINT EXAMINATION**KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)****MARKING SCHEME****BIOLOGY (231/2)****(Theory) Paper 2****JULY/AUGUST 2015**

1. a) To investigate whether carbon (IV) oxide is produced during (aerobic) respiration by animals;
 b) i) White precipitate formed; **rej** cloudy
 ii) Lime water remains colourless; **rej no observable change**
 iii) Cockroach produces carbon (IV) oxide (which react with lime water); during aerobic respiration;
 c) Control setup; **rej control expt**
 d) Limewater will remain colorless; Green tube use the carbon (IV) oxide in the tube for photosynthesis;
2. a)



- b) Phenotypic ratio
 Red: Pink : White
 $1 : 2 : 1$
- c) Codominance;
- f) Inheritance of blood groups/blood group AB;
3. a) i) Foodweb;
 ii) Plants;
 iii) Lizard;
- b) A - Tertiary consumer;
 B- Secondary consumer;
 C - Primary consumer;
 D - Producer;
- c) - Presence of wings for flight;
 Long/powerful/muscular hind limbs for hopping;
 Prominent compound eyes for perception;
 Presence of feelers for sensitivity;
 Colour camouflage for deception;
 Hind limbs with spikes for protection; **Acc. first 3**
4. a) i) P - Will bend towards light;
 R Continue growing upright;
 ii) P- Light causes lateral migration of auxins to dark side of the seedling causing faster growth on darkside than lightside hence curvature;
 R - Mica sheet reflect light hence uniform distribution of IAA in the seedling;
- b) i) Sprouting of lateral buds into branches;
 ii) Apical shoot is source of IAA; Low IAA concentration stimulate lateral bud to sprout out;
- c) Increased yields;
5. a) i) Active transport;
 ii) Sugars and some mineral salts reabsorption at the nephron tubule/kidney;
 Absorption of digested food at the small intestines;
 Accumulation of substances into the body to offset osmotic imbalance in arid and saline environments;
 Impulse transmission along the neurones;
- b) Increase oxygen concentrations;
 Increase temperature;
- c) Cell membrane;

SECTION B (40 MARKS)

- 6.** a) Graph
 $A - \frac{2}{2} = 1$ - with units
 S - 2
 C - 1
 P - 1 ***all points must be correct*** ***5mks***
 b) $0.85\text{mm} \pm 0.005$;
 c) i) 0 - 10 microseconds
 Slow rate of growth of pollen tube;
 Few dividing cells; pollen grain adjusting to new environment;
 ii) 10 - 50 microseconds
 High growth rate; rate at which cells are forming is higher than rate at which cells are dying; There is enough food in the style;
 iii) 50 - 65 microseconds
 - The rate of growth remains constant; the pollen tube has reached maturity/microphyle hence no more growth; iv) 65- 70 microseconds
 - The pollen tube has negative growth/senescence; cells are dying/pollen tube nucleus disintegrates hence no more growth/opens into embryo sac;
 d) Pollen tube nucleus disintegrate; one male nucleus fuse with egg cell nucleus to form diploid zygote; other male
 e) nucleus fuse with .polar nuclei/definitive nucleus to form triploid primary endosperm nucleus; this is double fertilization;
- 7.** a)
 - xylem;
 - sclerenchyma;
 - collenchyma;
 b)
 - Protect inner delicate organs;
 - Site for muscle attachment;
 - Bring about locomotion;
 - Give body shape;
 - Provide support to the body; ***First 3***
 c)
 - Girdles comprise pectoral girdle; Pelvic girdle;
 - Pectoral girdle comprise the clavicle; and scapula; scapula has glenoid cavity; articulate with head of humerus; to form ball and socket joint; scapula has coracoids process; metacramion; acromion; spine; provide site for muscle attachment;
 - Pelvic girdle comprise 3 fused bones;
 - The two halves of pelvic girdle articulate at pubic symphysis; to offer support to upper parts of the body;
 - On either side of pelvic girdle are cupshaped acetabulum; articulate with femur; form ball and socket joint;
 - At the pubis is the obturator foramen; passage of blood vessels; on dorsal side the pelvic girdles have articular facets; articulate with sacrum of the axial skeleton; ***Total 22 (max 16)***
- 8.** a) Heart; blood capillaries;
 b) Varicose veins; thrombosis; arteriosclerosis;
 hypertension; ***First two***
 c) Water is absorbed into the root hairs by osmosis; root hairs cell sap is hypertonic to the surrounding film of water; Root hair sap become dilute compared to adjacent cortex cells; hence set osmotic pressure for water to move by osmosis; some water moves by cytoplasmic streaming; upto the endodermis; water then moves across the endodermis by active transport; to the root xylem; water xylem move to the plant by root pressure; capillarity; adhesive and cohesive forces; and transpirational pull; The water then enter leaf cells by osmosis; then into the intercellular air spaces; of the spongy mesophyll layer; after is then lost to atmosphere by diffusion; through stoma; process called transpiration;

**BUSIA COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
MARKING SCHEME
BIOLOGY (231/3)
(Practical) Paper 3
JULY/AUGUST 2015**

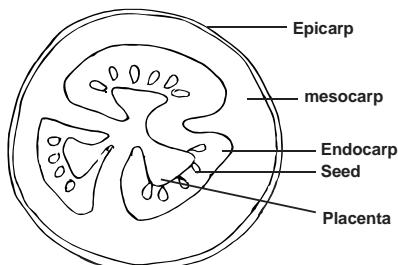
1. RESIDUE

Food substance	Procedure	Observation	Conclusion
Proteins;	Add sodium hydroxide and then add copper sulphate solution;	Purple/Violet;	Proteins present;
Reducing sugars;	Add Benedict's solution then heat;	Green, yellow, orange/yellow/orange; Rej: Wrong sequence	Reducing sugar present;

FILTRATE

Food substance	Procedure	Observation	Conclusion
Proteins;	Add sodium hydroxide and then add copper sulphate solution;	Blue/no colour change; Rej no change	Proteins absent;
Reducing sugars;	Add Benedict's solution then heat;	Green, yellow, orange/yellow/orange; Rej: Wrong sequence	Reducing sugar present;

2. a)

D marks

- D1 - continuous line, no shading
D2 - thin epicarp seed within endocarp

L. Marks

- Label lines must touch structure
- Correct sp

b) X1 to X2; **Rej** x1,

X

X1 cm X

- c) Fruit;
- d) Two scars;
- e) i) Ascorbic acid; / Vitamin C
ii) Scurvy;
- f) i) Berry;
ii) Thin epicarp; many seeds;

3. a) Pectoral (fin);
Pelvic (fin);ii) Dorsal (fin);
Ventral /anal (fin);b) Muscles of mouth floor contract; mouth opens volume inside decreases and pressure in the mouth decreases; water rushes into mouth.
Muscles of mouth floor relax and mouth closes;

Volume in mouth decreases and its pressure increases; water moves to part labelled T.

c) K - Long transverse process to provide large surface areas for muscle attachment;

L - Antagonistic muscles which contract and relax alternatively;

d) U - Scale;

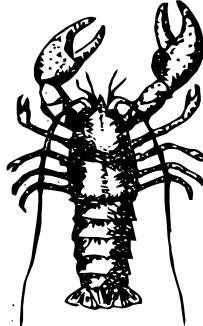
W - Operculum/gill cover;

KERICHO WEST FORM FOUR JOINT EVALUATION**Kenya Certificate of Secondary Education****231/1****BIOLOGY****Paper 1****(Theory)****July/August 2015**

- 1.** State the name given to the study of :

- a) The cell (1 mark)
 - b) Micro-organism (1 mark)
- 2.** a) Write the dental formula of an adult human (1 mark)
- b) Name two dental diseases. (2 marks)

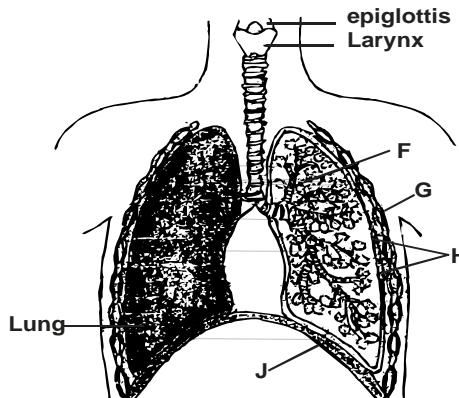
- 3.** The diagram below represents a certain organism collected by a student at the sea shore.



- a) Name the class to which the organism belongs. (1 mark)
 - b) Give three reasons for your answer in (a) above. (3 marks)
- 4.** Give three reasons for classifying organisms. (3 marks)
- 5.** In an investigation, a student extracted three pieces of pawpaw cylinders using a cork borer. The cylinders were cut back to 50mm length and placed in a beaker containing a solution. The results after 40 minutes were shown in the table below.

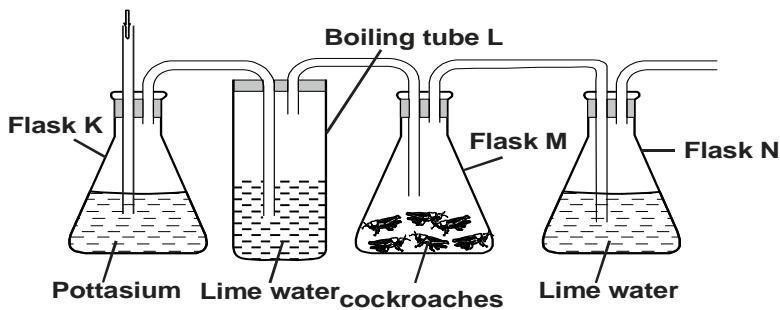
Feature	Results
Average length of cylinders mm	56mm
Stiffness of cylinders	Stiff

- a) Account for the results in the table above. (3 marks)
 - b) What would be a suitable control set-up for the investigation. (1 mark)
- 6.** State three ways in which a respiratory surface is adapted to its function. (3 marks)
- 7.** The diagram below represents part of the gaseous exchange system in human.



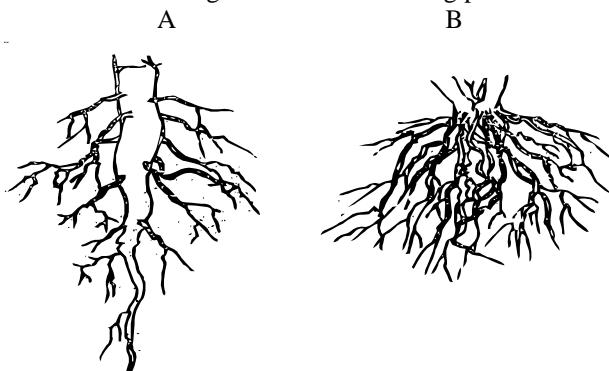
- a) Name the parts labelled F and G. (2 marks)
 - b) State one function of each of the parts labelled H and J. (2 marks)
- 8.** What is meant by the following terms?
 - a) Ecology (1 mark)
 - b) Carrying capacity. (1 mark)

9. The diagram below represents a set-up that a student used in an investigation.



- a) Name the physiological process that was being investigated. (1 mark)
 b) State the role of potassium hydroxide in a flask K. (1 mark)
 c) Account for the observation in boiling tube L and flask N (2 marks)

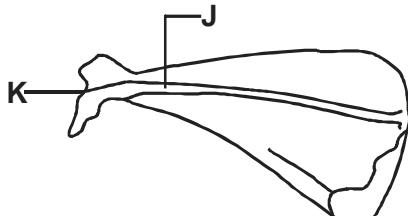
10. The diagrams below illustrate the organs of some flowering plants.



- State the classes of plants to which each belong. (2 marks)
11. State the functions of the following parts of a light microscope.

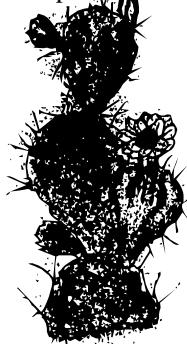
- a) Fine adjustment knob. (1 mark)
 b) Stage (1 mark)

12. The diagram below represents a bone obtained from a mammal.

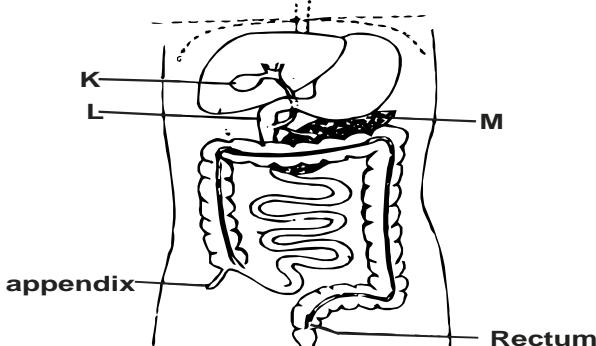


- a) Name the bone (1 mark)
 b) Name the
 i) Bone which articulates with the bone named in (a) above at the cavity labelled K. (1 mark)
 ii) Joint formed by the two bones. (1 mark)
 c) State the function of the part labeled J. (1 mark)
13. State the importance of divergent evolution to organisms. (2 marks)
14. Explain why it is not advisable to be in a poorly ventilated room with a burning charcoal stove. (3 marks)

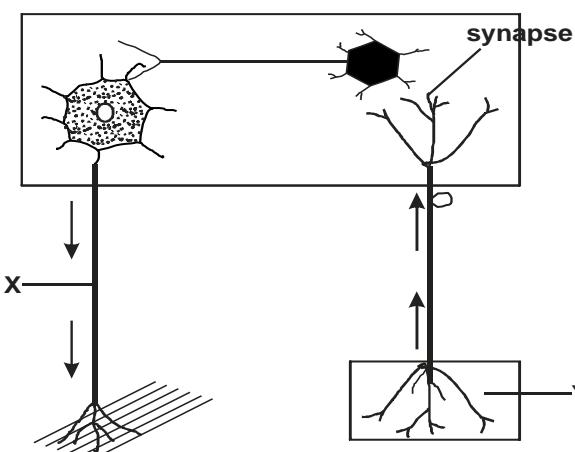
15. The diagram below represents a certain plant.



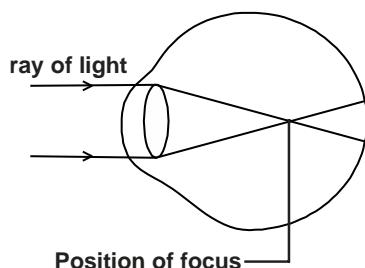
- a) What is the likely habitat for the plant? (1 mark)
 b) Give two reasons for your answer in (a) above. (2 marks)
- 16.** Give reasons for carrying out the following procedures when preparing temporary wet mounts of plant tissues. (1 mark)
- Making this plant sections. (1 mark)
 - Adding water on the plant section. (1 mark)
 - Placing cover slip over the plant section. (1 mark)
- 17.** Name three mechanisms that ensure cross pollination takes place in flowering plants. (3 marks)
- 18.** Name two substances that leave the foetal blood through the placenta. (2 marks)
- 19.** The diagram below represents a part of the human digestive system.



- a) Name the organs labelled L and M (2 marks)
 b) i) Name the substances produced by the organ labelled K. (1 mark)
 ii) State the function of the substances named in b(i) above. (1 mark)
- 20.** Name the flower part that produces gametes. (1 mark)
- 21.** Name support tissues in plants that is not thickened with lignin. (1 mark)
- 22.** Explain why plants do not require specialised excretory organs. (4 marks)
- 23.** The diagram below represents a reflex arc in human.



- Name the parts labelled X and Y. (2 marks)
- 24.** The diagram below illustrates a defect in the eye.



- Explain how the defect illustrated above can be corrected. (2 marks)
- 25.** a) Differentiate between the following terms. (1 mark)
- Dominant gene and recessive gene. (1 mark)
 - Continuous variation and discontinuous variation. (1 mark)
- b) What would be expected results from a test cross? (2 marks)
- 26.** Explain what happens in human when the concentration of glucose in the blood decreases below the normal level.

(3 marks)

27. State two differences between open and closed circulatory systems.

(2 marks)

28. State four reasons why water is significant in seed germination.

(4 marks)

KERICHO WEST FORM FOUR JOINT EVALUATION

Kenya Certificate of Secondary Education

231/2

BIOLOGY

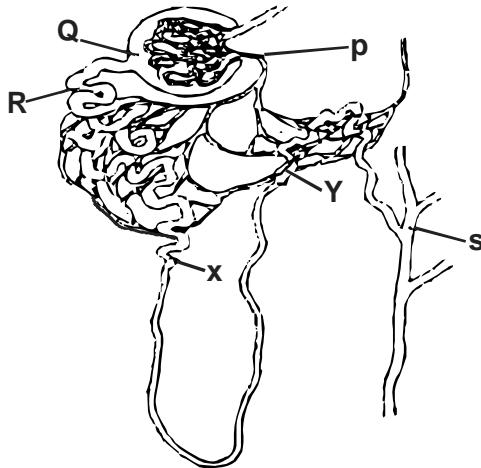
Paper 2

(Theory)

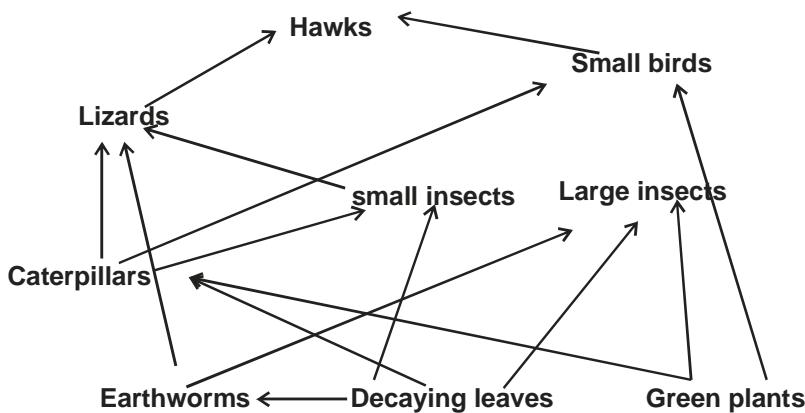
July/August 2015

SECTION A : (40 marks)**Answer ALL the questions in this section in the spaces provided.**

1. a) Name two reproductive hormones secreted by the pituitary gland in women. (2 marks)
 b) Explain how a seed is formed after an ovule is fertilized. (4 marks)
 c) State two ways by which acquired immuno deficiency syndrome (AIDS) virus is transmitted. (2 marks)
2. The diagram below represents a mammalian nephron.



- a) Name the;
 i) Structure labelled P. (2 marks)
 ii) portion of nephron between x and y. (2 marks)
- b) Name the process that takes place at point Q. (1 mark)
- c) Name one substance present at point R but absent at point S in a healthy mammal. (1 mark)
- d) The appearance of the substance you have mentioned in (c) above is a symptom of a certain disease caused by a hormone deficiency. Name the
 i) disease (2 marks)
 ii) hormone.....
- e) State the structural modification of nephron in the desert mammals. (2 marks)
3. a) Mwalimu Andrew of Mwisho wa Lami High school quarrels with his wife Fiolina over the identify of their child. Andrew is heterozygous blood group A and Fiolina is homozygous blood group B. The child born is of blood group O. Andrew has sued Fiolina for divorce over infidelity. Does Andrew have a chance of winning the case? Show your working. (4 marks)
 b) A transmission of Rh^{+ve} blood was given to a patient of Rh^{-ve} blood. After one week a similar transfusion was given to the same patient. What was likely to be the effect of the second transfusion? (2 marks)
 c) State two consequences of gene mutations. (2 marks)
4. The diagram below represents a food web in a certain ecosystem.



- a) Name the trophic level occupied by each of the following: (2 marks)
- Caterpillar
 - Small insects
- b) From the food web, construct two food chains which end with lizards as tertiary consumer. (2 marks)
- c) i) Which organisms have the least biomass in this ecosystem? (1 mark)
ii) Explain the answer in c(i) above. (3 marks)
5. a) A shoot of seedling exposed to light on one side bends towards the source of light as it grows. (1 mark)
i) Name the response exhibited by the shoot of the seedling. (1 mark)
ii) Explain how the bending towards the source of light occurs. (3 marks)
- b) A person was able to read a book clearly at arm's length but not at normal readings distance; (1 mark)
i) State the defect the person suffered from ? (1 mark)
ii) What was he unable to read the book clearly at normal distances? (2 marks)
iii) How can the defect be corrected? (1 mark)

SECTION B (40 marks)**Answer question 6 (COMPULSORY) and either question 7 or 8 in the spaces provided after question 8.**

6. An experiment was carried out to investigate haemolysis of human red blood cells. The red blood cells were placed in different concentration of sodium chloride solution. The percentage of haemolysed cells was determined. The results were as shown in the table below.

Salt concentration (g/100cm ³)(%)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Red blood cells (haemolysed)(%)	100	91	82	69	30	15	0

- a) i) On the grid provided, plot a graph of haemolysed red blood cells against salt concentration. (6 marks)
ii) At what concentration of salt solution was the proportion of haemolysed cell equal to non-haemolysed cells? (1 mark)
iii) State the percentage of cells haemolysed at salt concentration of 0.45%. (1 mark)
- b) Account for the results obtained at: (3 marks)
i) 0.33 percent salt concentration. (3 marks)
ii) 0.48 per cent salt concentration. (3 marks)
- c) What would happen to the red blood cells if they were placed in 0.50 percent salt solution? (3 marks)
- d) Explain what would happen to onion epidermal cells if they were placed in distilled water. (3 marks)
7. Describe the role of hormones in the growth and development of plants. (20 marks)
8. Discuss the various evidences which show that evolution has taken place. (20 marks)

KERICHO WEST FORM FOUR JOINT EVALUATION**Kenya Certificate of Secondary Education****231/3****BIOLOGY****Paper 3****(Practical)****July/August 2015**

1. You are provided with the following solutions labelled E, F, G, H and J on the table.

E - food substance

F - dilute sodium hydrogen carbonate

G - dilute hydrochloric acid

H - Benedict's solution.

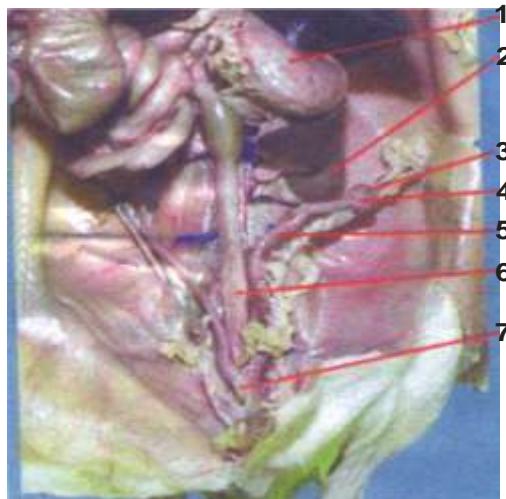
Source of heat.

Carry out tests using the reagents provided to determine the food substance(s) presented in solution E

(14 marks)

FOOD SUBSTANCE BEING TESTED	PROCEDURE	OBSERVATIONS	CONCLUSION

2. Examine the photograph which shows parts of the urogenital system of a female rat and answer the questions that follow. The organ marked 1 is the stomach.



- a) i) Name the organ marked 2 (1 mark)
 ii) State two functions of the organ. (2 marks)
 iii) What is the functional unit of the organ named in (a) (i) above? (1 mark)
- b) i) Identify and name each of the organs marked 3 and 4. (2 marks)
 ii) State two functions of the part marked 4. (2 marks)
- c) i) Identify and name the organ marked 5. (2 marks)
 ii) Explain two functions of the organ named c(i) above. (2 marks)
- d) The organ marked 6 is the large intestine. State two functions of the large intestine. (2 marks)
3. Study the photographs A and B that shows part of plants in natural habitat.



A



B

a) Name the type of the plant response shown in:

i) A.....(1 mark)

ii) B.....(1 mark)

b) Explain the mechanisms of the response in

A (3 marks)

B (5 marks)

c) State the biological significance of the response to plants in

A (1 mark)

B (1 mark)

d) Suggest the nature of the habitat that plants with the type of response A grows. (1 mark)

KERICHO WEST JOINT EXAMINATION**Kenya Certificate of Secondary Education****BIOLOGY****Paper 231/1**

July/August- 2015

MARKING SCHEME**1. State the name given to the study of:**a) **The cell**

- cytology; (1mk)

b) **Micro-organisms**

- microbiology (1mk)

2 a) Write the dental formula of an adult human.
 $I \frac{2}{2} C \frac{1}{1} Pm \frac{2}{2} m \frac{3}{3};$ (1mk)
b) Name two dental diseases

- Dental carries
- Periodontis/gingivitis/pyorhoea (2mks)

3. a) Name the class to which the organism belongs

- Crustaceae; (1mk)

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

- Head fused with thorax, has a cephalothorax.
- Has two pairs of antennae;
- Has compound eyes/A pair of compound eyes;
- Has five pairs of limbs;
- Has external Gills; (3mks)

4. Give three reasons for classifying organisms

- Identifying similarities and differences between organism.;
- Organize scientific knowledge in an orderly system.;
- Monitor emergence presence and disappearance of organisms;
- Grouping organisms for easy study.;

5. In an investigation, a student extracted three pieces of pawpaw cylinders using a cork borer. The cylinders were cut back to 50mm length and placed in a beaker containing a solution. The results after 40 minutes were shown in the table below

Feature	Results
Average length of cylinders mm	56mm
Stiffness of cylinders	Stiff

a) Account for the results in the table above .

- The solution was hypotonic/less concentrated compared to the cell sap of pawpaw cylinders cell;
- The tissue cells gain water by osmosis becoming turgid/stiff. (3mks)

b) What would be a suitable control set-up for the investigation?

- Boiled pawpaw cylinders of the same size/lengths placed in a similar solution; /
- Isotonic solution. (1mk)

6. State three ways in which a respiratory surface is adapted to its function.

- Thin walls/epithelium for faster diffusion of gases reducing distance for diffusing molecules;
- Moist for gases to dissolve and diffuse in solution form;
- Large surface area for maximum diffusion.;
- Highly vascularised to maintain a steep concentration gradient;
- Permeable to respiratory gases; (3 mks)

7. Name the parts labelled F and G.

F- Bronchiole; rej Bronchioles,

G -Intercostal muscles; (2mks)

b) State one function of each of the parts labelled H and J.

H - (Pleural Membrane) - Secretes pleural fluid to lubricate lungs/protect lungs)

J - (Diaphragm) - Separates chest cavity from abdominal cavity; works to effect volume/pressure changes in chest cavity.

8. What is meant by the following terms?**a) Ecology**

- Study of inter relationships between organisms and their environment.; **(1mk)**

b) Carrying capacity

- The maximum number of a species that a particular habitat can support.; **(1mk)**

9.

a) Name the physiological process that was being investigated.

- Respiration; **(1mk)**

b) State the role of potassium hydroxide in a flask K.

- In flask K potassium hydroxide removes/absorbs carbon (iv) oxide from the atmospheric air. **(1mk)**

c) Account for the observation in boiling tube L and flask N.

L - lime water remains clear because carbon (IV) oxide has been removed;

N -flask N lime water forms a white precipitate because the respiring cockroach produce carbon (IV) oxide.; **(2mks)**

10. State the classes of plants to which each belong.

A - Dicotyledonae;

B - Monocotyledonae; **(2 mks)**

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

a) Fine adjustment knob

- Moves the body tube through smaller distances to bring the image into sharper focus; **(1mk)**

b) Stage

- Plat form where specimen in placed; **(1mk)**

12.

a) Name the bone.

- Scapula; Rej Scapular **(1mk)**

b) Name the:

i) Bone which articulates with the bone named in (a) above at the cavity labeled K.

- Humerus ; **(1mk)**

ii) Joint formed by the two bones

- Ball and socket joint; **(1mk)**

c) State the function of the part labelled J.

- Attachment of muscles; **(1mk)**

13. State the importance of divergent evolution to organisms.

- Homologous structures are modified to suit different functions; hence organisms are able to exploit their environment better.; **(2mks)**

14. Explain why it is not advisable to be in poorly ventilated room with a burning charcoal stove.

- Charcoal in limited supply of air produces carbon (ii) oxide; which combines with haemoglobin forming carboxyhaemoglobin which is stable/does not dissociate reducing capacity of haemoglobin to carry oxygen leading to suffocation hence death. **(3mks)**

15.

a) What is the likely habitat for the plant?

- Dry/arid/semi-arid/desert; **(1mk)**

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

- Succulent/fleshy stem / reduced leaves/leaves reduced into thorns/spines; **(2mks)**

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

a) Making this plant sections

- To reduce a layer of cells to allow light to pass through; **(1mk)**

b) Adding water on the plant section

- To make cells turgid/prevents drying up; **(1mk)**

c) Placing cover slip over the plant section.

- To protect the lens on the objectives;

- To exclude air/solid; **(1mk)**

17. Name three mechanisms that ensure cross pollination takes place in flowering plants.

- Protogyny and protandry;

- Self sterility / incompatibility;

- Dioecious plants; **(3mks)**

18. Name two substances that leave the foetal blood through the placenta.

- Carbon (IV) Oxide;

- Nitrogen waste/urea; **(2mks)**

19.

a) Name the organs labelled L and M.

L - Duodenum;

M- Pancrease; Rej Pancreases **(2mks)**

b) i) Name the substances produced by the organ labelled K.

- Bile; **(1mk)**

ii) State the function of the substances name in b(i) above.

- Emulsification/Emulsifies fats;
- Neutralises; chyme; (1mk)

20. Name the flower part that produces gametes.

- Anther/ovary; (1mk)

21. Name support tissues in plants that is not thickened with lignin.

- Parenchyma / collenchyma; (1mk)

22. Explain why plants do not require specialized excretory organs.

- Some wastes i.e gases easily diffuse out of plant tissue;
- Some waste products are mainly made from carbohydrates and hence are not as harmful as portentous materials;
- Some wastes are formed slowly thus little accumulation of wastes;
- Plants are less active;
- Some products such as oxygen are reused/recycled;
- Some wastes products are stored in non-toxic forms in leaves, flowers, fruits and old bark then drop off; (4mks)

23.

Name the parts labelled X and Y.

X - Motor neurone;

Rej; axon alone

Y - Receptor/sense organ; Acc; axon of motor neurone Rej; cells.

(2mks)

24.

Explain how the defect illustrated above can be corrected.

- Short-sightedness is corrected by wearing concave/diverging lenses; it diverges light rays before reaching the lens which then focuses light into the retina; (2mks)

25 a) Differentiate between the following terms

i) Dominant gene and recessive gene.

- Dominant gene expresses itself on both homozygous state and heterozygous state while recessive gene can only express itself in the homozygous state; (1mk)

ii) Continuous variation and discontinuous variation

- Continuous variation - Characteristics for which there is a continuous range with many intermediaries;. Discontinuous variation are discrete/distinct/separate/definite categories or units or clear out differences; (1mk)

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

- Either all offspring's show dominant characteristic or half offspring's show the recessive while other half show dominant characteristics. (2mks)

26. Explain what happens in human when the concentration of glucose in the blood decreases below the normal level.

- Pancrease releases glycogen hence glycogen is converted to glucose;
- Fat is converted to glucose; reduced rate of respiration; (3mks)

27. State two differences between open and closed circulatory systems.

- | | |
|-------------------------------|------------------------------|
| Blood flow in haemocoel; - | Blood confined in vessels; |
| - Blood flow in low pressure; | Blood flow in high pressure; |

28. State four reasons why water is significant in seed germination.

- Activate enzymes - Provide a medium for enzymatic activities to break down stored food to soluble forum;
- Hydrolyse; dissolves food materials.
- Medium of transportation;
- Soften seed coats to facilitate emergence of radicle.

KERICHO WEST FORM FOUR COMMON EVALUATION

Kenya Certificate of Secondary Education

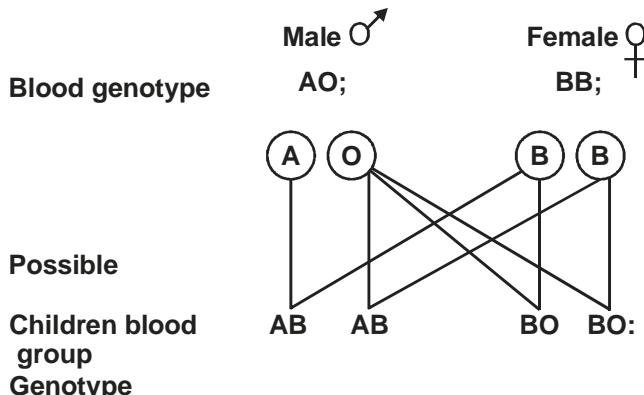
BIOLOGY

Paper - 231/2

July/August 2015

Marking Scheme

1. a) Follicle stimulating hormone;
- Luteinizing hormone; (2 mks)
 - b) Diploid zygote undergo mitosis to develop into an embryo which differentiate into a plumule; radical and one or two cotyledons; primary endosperm nucleus develop into endosperm; integument develops into testa/seed coat thereby bringing a great reduction in water level and this causes dormancy; (4 mks)
 - c) Sexually transmitted from an infected partner; blood transfusion using infected blood.; sharing needle or syringes or razors with infected persons; from infected mother to baby during birth or through breast milk; (4 mks) **max 2 mks**
- 2.** a) i) Efferent arteriole/vessel;
ii) Loop of Henle;. (2 mks)
- b) Ultra-Filtration ;(1 mk)
- c) Glucose/Blood sugar; amino acids ;(1 mk)
- d) (i) Diabetes mellitus/sugar diabetes;
(ii) Insulin hormone; (2 mks)
- e) Small Bowman's capsule/Glomerus;
Long loop of Henle; (2 mks)

3.

or Use punnet square

	A	O
B	AB	BO
B	AB	BO

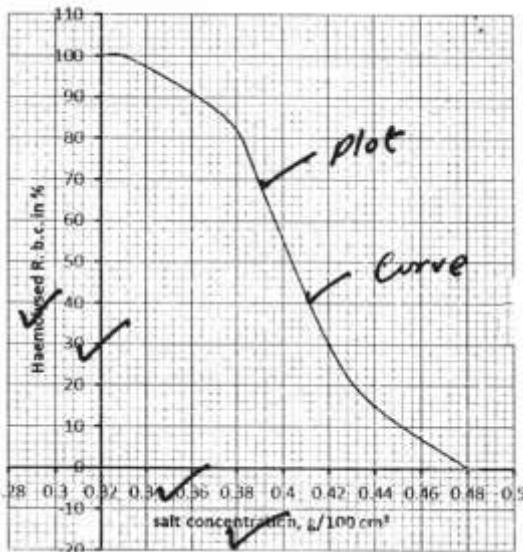
Male Female
AO; × BB;

Andrew has a chance of winning

- b) After first transfusion with Rh +ve blood some rhesus antibodies were produced in the recipient; after the second transfusion rhesus antigens react with the rhesus anti bodies agglutination results and this lead to blood clotting and death; (2 mks)
 - c) Emergence of insects' resistance to insecticide e.g mosquito strains resistance to DDT; micro-organisms resistance to antibiotics; immunity in mammals; genetic disorders which include sickle cell anaemia. albinism. haemophilia and colour blindness;. (4 mks) **max.2 mks**.
- 4.** a) i) primary consumer;
ii) Primary consumer /secondary consumer ;(2 mks)
- b) Green plants ® caterpillar ® small insect ® lizards;
Decaying leaves ® caterpillars ® small insect ® Lizards;
- c) (i) Hawks; (1 mk)
(ii) At each trophic level energy is lost as heat (respiration); and during decomposition; Heat is also lost in defecation/faeces/waste product of metabolism/excretion; some parts of the body are not eaten. hence less biomass as one move up the trophic levels; **4 mks (max 3 mks)**

- 5. a** i) Positive phototropism; (1 mk)

- ii) Light causes lateral migration of auxins hormones; They move or diffuse to the dark side away from the light side; causing more growth on the dark side hence bending / curvature towards light ;(3 mks)
- b. i) Long sightedness or hypometropia; (1 mks)
 ii) Eye ball too short or lenses are weak; unable to focus the image on the retina;
 Eyes are unable to accommodate change in their focal length ;(2 mks)
 iii) By wearing convex or biconvex lenses or converging lenses; (1 mks)
6. a) (i) on the graph paper.(6 mks)



- ii) 0.403 ± 0.002 ;(1 mks)
 iii) $10 \pm 1\%$; (1 mks)
- b) i) 0.33 percent salt concentration - Less concentration/dilute/hypotonic than blood cells cytoplasm; water is drawn in by osmosis; the cell swell and eventually burst(a process called haemolysis);.(3 mks)
 ii) 0.48 percent salt concentration - concentration of red blood cells cytoplasm is same as concentration of salt solution (isotonic) therefore no net movement of water by osmosis; hence cells remained normal and none were haemolysed.;(3 mks)
- c) 0.50% salt concentration is highly concentrated solution/hypertonic than blood cells cytoplasm; red blood cells would loose water by osmosis; shrink and become crenated.(3 mks)
- d) The cell sap is more concentrated than surrounding; water enters into the cell by osmosis; the cell swells/become turgid; but does not burst due to the rigid cellulose cell wall;.(3 mks)
7. **Indole acetic acid/IAA/Auxins;** promote cell division and cell elongation; promote tropic response; promote formation of abscission layers/bring about leaf- fall; promote fruit formation without fertilization i.e parthenocarpy ;promote cell differentiation (of vascular tissue);causes apical dominance/inhibit growth development of lateral buds; promote growth of adventitious roots(on stems);IAA + cytokin; induce formation of callus tissue during healing of wounds); **8 mks (max 5 mks)**
Gibberellins; promote cell division/cell elongation in dwarf varieties.; parthenocarpy/initiating formation of IAA/setting of fruits after fertilization.; promote formation of side branches(of stems) and dormancy in buds);inhibits growth of adventitious roots; activates (hydrolytic) enzymes during germination/promote germination of seeds hence break seed dormancy; affect leaf expansion and shapes/retard leaf abscission; **5 mks**
Cytokinins; break dormancy (in some species);promote flowering in some species; promote cell division (in presence of IAA);stabilizes proteins and chlorophyll; promote root formation; low concentration encourages leaf senescence/high concentration protein increased cell enlargement; promote flowering in some species); **7 mks (max 5 mks)**
Ethylene/Ethyne; stimulate lateral bud development; ripening of bananas/fruits; induces thickening of stem/inhibits stem elongation; promotes germination of certain seeds; causes abscission of leaves/fruit/leaf fall; **6 marks - max = 5 marks**
Abscisic Acid(ABA);High concentration of ABA causes stomata closure (by interfering with uptake of potassium ions);inhibits germination/growth of embryo/causes seed dormancy; causes abscission of leaves/fruits/leaf fall; inhibits elongation growth, inhibits sprouting of bud/induce dormancy in buds;
6 mks(max 5 mks)
Florigens ;promote flowering; **(20 mks) 2 mks**
(33 mks max 20 mks)
8. **Fossil records;**- fossils are preserved remains of ancestral forms of organisms that lived long time ago mainly formed from preserved hard parts found on sedimentary rocks; when fossils of related organisms are arranged in chronological order which made possible by carbon dating. they form fossil records which reveal trends in evolution overtime in the organism concerned. This gives direct evidence of the type of organism that existed at a certain geological age; **(4 mks)**
Geographical distribution of organism; the theory of continental drift supposes that at some time the present day continents were one single landmass which later broke up into parts which drifted apart; closely related organism were separated and

isolated from one another thus evolving differently, with time leading to formation of different species through natural selection; each group of organisms adapted to different set of environmental conditions; e.g camels in Africa and llamas in South America. **(5 mks)** **max = 3 marks**

Comparative embryology:-embryology is the study of formation and development of an embryo while comparative embryology is a study comparing formation and development of different embryos; this study shows that some embryos show similar morphological features during their early stages of development; e.g embryos of all vertebrates show great resemblance and almost impossible to tell them apart. This indicates a common ancestry; **(3 mks)**

Comparative anatomy- Anatomy is the study of structures of living organisms. comparative anatomy is comparison of internal structures of various organisms; some show basic structural similarities and this suggests that the organism have a common or related ancestry; i.e homologous structures, but are modified to perform different functions. They have gone through divergent evolution; examples of homologous structures are beaks of birds, feet of birds, pentadactyl limb in mammals; other structures show basic structural differences since they have different embryonic origin but have gone through convergent evolution and modified to perform similar function; these are analogous structures e.g wings of bats, insects and birds; others are vestigial structures-those structures in course of time become greatly reduced and become functionless; this indicates that they were present in their ancestral forms which have since evolved e.g Coccyx - tails in humans. body hair. reduce wings in flightless birds like Kiwi; **(9 mks)** **Max 4 marks**

Comparative serology-Serology is the study of blood/serum proteins. Comparative serology is comparison of different blood proteins in different organisms; this study shows that organisms are closely related or have a common ancestry have similar blood proteins which is tested using antigen - antibody reaction; where precipitate forms varies from one animal to another. Greater amount of precipitate shows many common antigen hence more reaction; this indicates that organisms have a common ancestry; less amount of precipitate shows that few or no antigen is common in organisms hence are far apart i.e. no common ancestry; **(6 marks)** **Max - 4 marks**

Cell biology;-is the study of cells making up living organisms. Similarities in structure and function of cells point to a common ancestry; The difference that occur between plant and animal cells show that they separated and evolved differently hence difference that exist among them though they have some organelles that are common;

3 marks max - max 2 marks

KERICHO WEST COMMON EVALUATION

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/3

July/August 2015

Marking Scheme

1.

Food substance being tested	Procedure	Observation	Conclusion
Reducing sugars;	To 2ml of solution E in a test tube, add equal amount of Benedict's solution, heat to boil;	No colour change OR colour of Benedict's solution is retained;	Reducing sugars absent;
Non-reducing sugars;	To 2 ml of solution E, add dilute hydrochloric acid, warm and cool; add dilute sodium hydrogen carbonate until fizzing stops. Add Benedict's solution and heat to boil;	Colour changes from blue to green to yellow / brown / orange;	Non-reducing sugars present;
Ascorbic acid (vitamin C);	Put 2ml of DCPIP in a test tube; add solution E drop by drop and shake after each drop;	No colour change/ colour of DCPIP retained;	Ascorbic acid (vitamin C) absent

Procedure - 2 marks each for non-reducing sugar and ascorbic acid and 1mark for reducing sugar.

Observation - 1 mark each

Conclusion - 1 mark each

Total = 12 marks

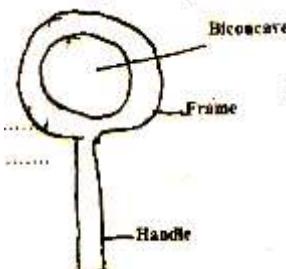
NB- When the procedure is wrong, no mark for observation and conclusion.

2. a) i) Kidney;
ii) Osmoregulation;
Excretion;
- iii) Nephron;
- b) i) 3 funnel ;
4 ovary;
ii) site for production of ova / female gametes / secondary oocytes.;
Secretion of hormones ;
- c) i) Uterus;
ii) Site for implantation;
Nourishment and development of foetus.;
- d) Site for absorption of water;
Site for absorption of vitamins and mineral salts.;
Propulsion of food down the alimentary canal ; (any two points)
3. a) A Nastic response / haptotaxis;
B Thigmotropism;
- b) A
– The plant secretes sugary secretions that attract insects.
– Insect touch is sensitive / triggers hairs in the leaves / midrib. The midrib cells lose water by osmosis; the midrib becomes flaccid causing the trap to spring and thus trap insects due to interlocking of the spines.
B
– At the point of contact, Auxins /IAA to migrate to side away from contact; reaching to a higher auxins concentration at point away from contact than at point of contact.
– High auxin concentration stimulate shoot growth thus side away from contact grows faster than the side in contact; leading to continuous coiling of the shoot / tendrils along support material.;
- c) A
- Enables feeding in insectivorous plant.
B
- Enables shoots of herbaceous plants to obtain support to expose leaves for photosynthesis; flower for pollination fruits and seeds for dispersal.;

d) Nitrogen deficient soil / marshy areas.;

LONDANI SUB-COUNTY JOINT EXAMINATION 2015*kenya certificate of secondary education***231/1****BIOLOGY****PAPER 1****JULY / AUGUST 2015****2 HOURS.**

1. Name the field of science that specializes in the study of chemical changes in an organism (1 mark)
2. The diagram below show an instrument used in the Biology laboratory



Name the instrument and state its functions

Name

Function (2 mks)

3. A couple gave birth to children with all types of blood groups. Suggest the possible genotypes of the parents (1 mk)
4. a) Nitrogen in the atmosphere cannot be directly utilized by plants. State two ways by which this Nitrogen is made available for plant use (2 mks)
- b) What is the biological importance of denitrification (1 mk)
5. Explain the following statements
- The thyroid glands swell in some individuals (1 mk)
 - Lack of magnesium leads to yellowing of leaves in plants (1 mk)
 - High temperature stops enzyme action (1 mk)
6. a) Name a chemical substance required for transmission of impulse in a synapse (1 mk)
- b) State the functions of the following structures in neurone
- Node of ranvier (1mk)
 - Myelin sheath (1mk)
7. Name the organelles that would be most likely found in large numbers in cells that perform the functions below.
- A cell in the ileum that actively takes in glucose (1 mk)
 - A cell in the liver that breaks down foreign bodies (1 mk)
8. a) Name the blood vessel that connects arteries to veins (1mk)
- b) State three ways in which the vessel named in (a) above are adapted to carry out their function (3mks)
9. The number and distribution of stomata of three different leaves are shown in the table below

Leaf	Number of stomata	
	Upper epidermis	Lower epidermis
A	300	0
B	150	200
C	02	13

- a) Suggest the possible habitat of the plant from which the leaves were obtained

A..... (1mk)

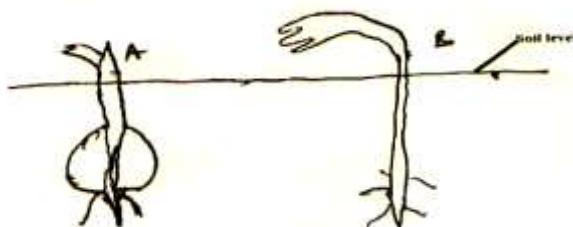
B..... (1mk)

10. What is meant by the following terms

a) Habitat (1mk)

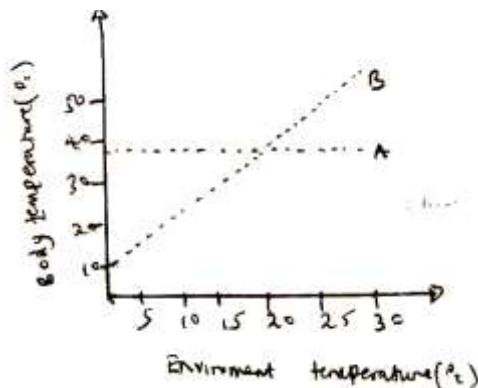
b) Biomass (1mk)

11. The diagram represents a stage of growth and development of two different plants

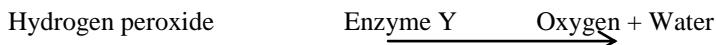


With reasons identify the types of germination shown by Plant A and B

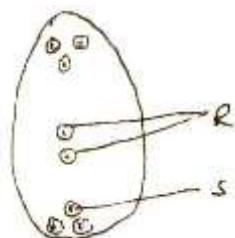
12. A boy could clearly read a book placed 10cm away but could not identify his friend 10 metres away
 a) What eye defect was he suffering from (1mk)
 b) State how the defect can be corrected (1mk)
13. Active yeast cells were added to dilute sugar solution in a container. The mixture was left in a warm room. After a few hours bubbles of gasses were observed escaping from the mixture.
 a) Write an equation to represent the chemical reaction (1mk)
 b) State two economic importance of this type of reaction (2mks)
14. a) Name the parts of a mammalian ear which carry out the following function
 i) balance and posture (1mk)
 ii) hearing (1mk)
 b) state two economic importance of presence of glands in auditory canal (1mks)
15. body temperature of two animals A and B were taken over the increase in environmental temperature. The results are shown in the diagram below



- a) what name is used to describe group of animals represented
 A (1mk)
 B (1mk)
- b) state two advantages of the group of animals represented by A and that of B (2mks)
16. a) name two disorders in man that occur through gene mutation (2mks)
 b) Give two advantages of polyploidy in plants (2mks)
17. the reaction represented by the equation below occurs in the body



- a) Name enzyme Y (1mk)
 b) Name an organ in the body where the reaction occurs (1mk)
 c) What is the significance of the reaction (1mk)
18. a) Name two main sites of gaseous exchange in terrestrial green woody plants (2mks)
 b) Explain why respiratory surfaces in animals need to be thin and moist (2mks)
19. study the diagram of the embryo sac below and answer questions that follow

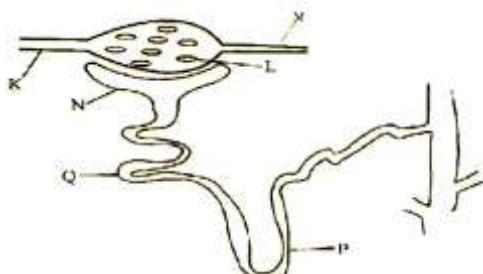


- a) Name the type of fertilization that occurs in the embryo sac (1mk)
 b) What do the structures labeled R and S develop into after fertilization (2mks)
20. Name joints formed between the
 A) Humerus and scapula (1mk)
 B) Cranial bones (1mk)
21. a) State the significance of the following in evolution
 i) accumulation of variations in organisms (1mk)
 ii) survival of the fittest (1mk)
 b) Explain what leads to struggle for existence in organisms (1mk)

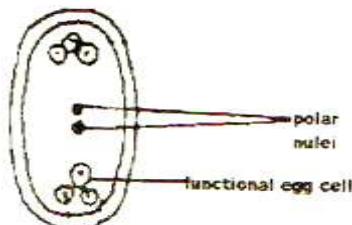
22. a) A certain animal has no incisor, no canines, 6 premolars and 6 molar in its upper jaw. In the lower jaw there are 6 incisors, 2 canines, 6 premolars and 6 molars. Write its dental formula (1mk)
c) Explain how the following prevent self pollination (1mk)
i) Protandry (1mk)
ii) Self sterility (1mk)
23. Name one function of
a) Progesterone (1mk)
b) Luteinizing hormone (1mk)
24. Distinguish between diffusion and osmosis (2mks)
25. a) explain what happens when a wilting young plant is well watered (2mks)
b) Name a support tissue in plants thickened with (1mk)
i) cellulose (1mk)
ii) Lignin (1mk)
26. a) Name the plant excretory product which is used for (1mk)
i) Treatment of malaria (1mk)
ii) As beverage (1mk)
b) Explain why lactic acid is not considered as an excretory product though it is toxic to tissues (1mk)
27. State functions of the following parts of the microscope (1mk)
i) Condenser (1mk)
ii) Eye piece (1mk)
28. List any two distinguishing characteristics of the kingdom monera (2mks)
29. Other than temperature, list down three other factors that can affect the rate of enzyme catalyzed reaction (3mks)
30. What is meant by the term Binomial nomenclature (1mk)

**LONDIANI COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/2
BIOLOGY
PAPER 2
JULY/AUGUST 2015**

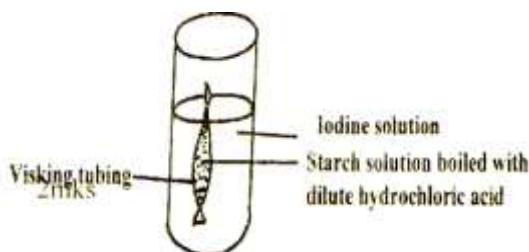
1. The diagram below is a functional unit of a mammalian kidney
a)



- b) Name the process that occurs in
L
P
c) (i) state the structural difference between K and M
(ii) How does the structural difference above help in the process that occurs in L
d) State two adaptations of structure Q to its functions
e) Explain why aquatic animals in fresh water excrete ammonia
2. (a) What is meant by the term linked genes?
(b) Haemophilia is a genetic condition transmitted through a recessive gene linked to X chromosome. The normal gene may be represented by XH
i) What is the genotype of the haemophilic female?
ii) A woman who is a carrier for the haemophilia gene marries a normal man. Work out the phenotypic ratio for their offspring
iii) Haemophilia is more common in males than in females. Explain this phenomenon.
3. a) Name the plant organs in which meiosis take place
b) Identify the figure below



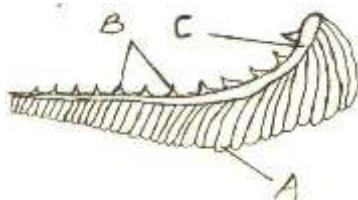
- c) Using the diagram, explain the meaning of double fertilization in flowering plants
d) What happens to the structure above after fertilization
e) State three adaptations of fruits to animal dispersal
4. a) A group of students set up an experiment to demonstrate a certain process as shown below.



After 10 minutes the students carried out iodine test inside and outside the visiking tuning

- a) state two roles of the process being investigated in animals
b) account for the results expected in the experiment above
c) (i) What is the importance of plasma membrane in active transport
(ii) Give one similarity between osmosis and active transport

5. The diagram below show a respiratory structure of a bony fish



- a) Name the parts labeled A, B and C (3mks)
 b) What is the advantage of counter current flow system in fish over the parallel flow? (2mks)
 c) How is the part labeled A adapted to its function (3mks)

Section B (40 Marks)

Answer questions 6 (compulsory) and either questions 7 or 8

6. The table below shows the relative numbers of three main species of organisms in a pond.

Depth in metres		0.00	0.50	0.75	1.00	1.25	1.75	2.00	2.50	3.00
Number of organisms in thousands	R	0	0	0	0	8	25	34	15	0
	Q	20	160	190	165	115	10	0	0	0
	P	10	25	40	53	45	18	5	2	0

- a) Using the same axes, draw the graphs to show number of organisms against depth (8mks)
 Graph
- b) Which of the three species is widely distributed within the pond (1mk)
- c) Giving a reason for your answer which of the species is a producer?
 Producer (1mk)
 Reason (1mk)
- d) At which depth are the population of the species the same? (1mk)
- e) Giving a reason for your answer which of the species is a primary and secondary consumer? (4mks)
 Primary consumer
 Reason
 Secondary consumer
 Reason
- f) Explain two ways in which the following are adapted to their functions (2mks)
 i) Palisade layer (2mks)
 ii) Cuticle (2mks)
7. (a) (i) What is accommodation of the eye (1mk)
 (ii) Describe the accommodation of a close object by the eye (3mks)
- (b) Discuss the adaptations of the human eye to its functions (16mks)
8. Discuss the various evidence of organic evolution (20mks)

LONDIANI COUNTY JOINT EXAMINATION KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)

231/3

BIOLOGY(PRACTICALS)

PAPER 3

JULY/AUGUST 2015

CONFIDENTIAL.

Confidential instructions to schools

Each candidate requires

- 10ml of solution labeled W (mixture of 10% glucose and 10% egg white)
- 10% sodium hydroxide
- 10% copper (ii) sulphate with a dropper
- 10ml measuring cylinder
- Iodine solution with a dropper
- Benedict's reagent
- Dil. Hydrochloric acid
- Sodium hydrogen carbonates solution
- A test tube rack
- 5 test tubes (clean)
- A test tube holder
- Distilled water in a wash bottle

13. A means of heating
14. Moss plant labeled Y

LONDIANI COUNTY JOINT EXAMINATION

KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)

231/3

BIOLOGY (PRACTICALS)

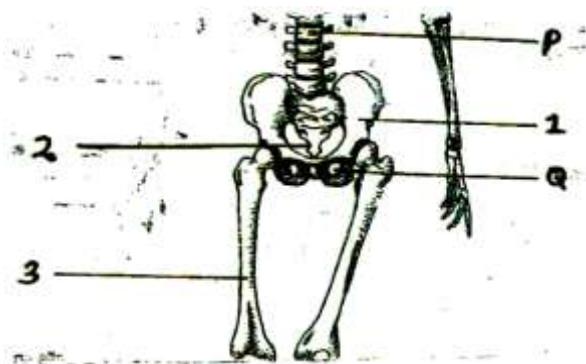
PAPER 3

JULY/AUGUST 2015

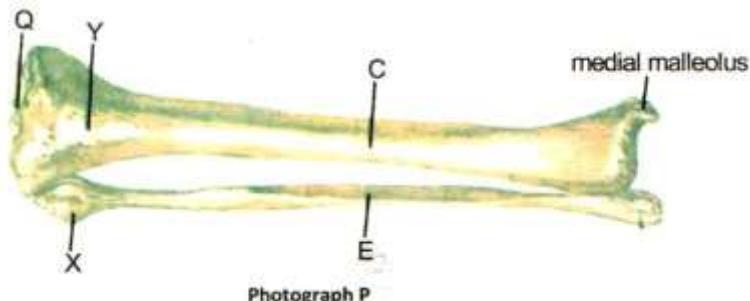
1. You are provided with solution W. using the provided reagents; carry our possible food tests to identify food substances present in solution (12mks)

Food substance	Procedure	Observation	Conclusion

2. Below is a photograph obtained from the pelvic region of a human being and showing some bones of the vertebral column. Examine it carefully and answer the questions that follow.



- a) Identify the bones labeled 1,2 and 3 (3mks)
 b) (i) Name the type of joint formed at the proximal end of bone as 3 as it articulates with the adjacent bone (1mk)
 (ii) Give an observable feature on bone 3 for your answer in (b) (i) above (1mk)
 c) (i) Identify the part labeled P (1mk)
 (ii) Give two functions of the part identified in (c) (i) above (2mks)
 d) Using observable features only, state how bone 1 is adapted to its functions (2mks)
 e) (i) Identify the part labeled Q (1mk)
 (ii) Give the function of the part labeled Q (1mk)
 f) Photograph P below is from a mammalian skeleton



Photograph P

- i) Identify bone C and E (2mks)
 ii) Name the bone that articulates at point Q and the type of joint formed (2mks)
 Bone
 Joint
 3. You are provided with a specimen labeled Y
 a) Identify the organism (1mk)
 b) State the kingdom and division to which it belongs (2mks)
 Kingdom
 Division
 c) How does the organism reproduce? (1mk)
 d) Draw a well labeled diagram of the specimen (5mks)

LONIANI COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/1
BIOLOGY 1
MARKING SCHEME

1. Biochemistry
2. Name : Hand lens
Function : it is used to magnify tiny specimen which cannot be seen clearly using naked eyes
3. AO and BO
4. a) Through conversion into nitrates by nitrogen fixing bacteria, through action of lightning which combine atmospheric nitrogen into nitrates/ abiotic fixation.
b) Help to maintain a constant concentration of nitrogen in the atmosphere
5. (i) Deficiency of iodine
(ii) Magnesium is necessary for the formation of chlorophyll in plants which is green in colour / deficiency leads to yellowing in plants
(iii) High temperature denature (proteinous) enzymes
6. (a) Acetylcholine
(b) (i) Speeds up the propagation of impulse through action potential
(ii) Shock absorber
7. (a) Mitochondria; reject mitochondrion
(b) Lysosomes, reject lysosome
8. (a) Capillaries
(b) Numerous to increase the surface area over which exchange of substances occur; narrow lumen to enhance ultrafiltration;
have small pores for passage of materials;
Mark the first three
9. A. Aquatic habitat/ fresh water
B Arid / semi arid areas
10. a) Specific locality with a particular set of conditions where an organism lives
b) Total dry weight of living organisms at a particular trophic level
11. A: Hypogea – Cotyledon remains below the ground
B: Epigeal – Cotyledon grows above the ground
12. a) Short – sightedness / myopia
b) Wearing glasses with concave (diverging) lenses
13. a) Glucose Ethanol + carbon (IV) oxide + energy
 $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + CO_2 + \text{energy}$
Must be balanced
b) Manufacture of ethanol / biogas/ baking bread/ brewing of alcohol
14. a) i) Semi – circular canal
ii) Cochlea
b) Secrete wax to trap foreign bdes/ dust/ insect
15. a) A – Endothermic
B – Ectothermic
b) Active all the time; animals can colonise any environment
16. a) Haemophilia, sickle – cell anaemia; albinism; mark the first two
b) Early maturity, high yield; resistance to pests/ diseases/ drought (mark the first two)
17. a) Catalase
b) Liver
c) Detoxify hydrogen peroxide
18. a) Somata; lenticels; cuticle, rej. Pneumatophores/ breathing roots
b) Thin – reduce diffusion distance
moist – dissolve respiratory gases
19. a) Double fertilization
b) R- Endosperm
S- Embryo
20. a) Ball and socket
b) Fixed joint
21. a) (i) leads to emergence of new organisms/ species/ animals/ plants/ flora/ fauna
(ii) Enables the well/ moist adapted organism to live up to reproductive age/ survive/ and pass their characteristics to their offsprings.
b) Scarcity of resources/ limitation of resources/ breeding mates/ shelter
22. a) I 0/3 c 0/1 pm 3/3 m 3/3;
b) i) Male reproductive organ/ stamen matures earlier than the female carpel/ stigma reproductive organs
(ii) Pollen grains fail to germinate on the stigma of the same flower

-
- 23. a) inhibit secretion of follicle stimulation hormone; inhibit pregnancy; bring about proliferation of inner lining of uterus; mark the first one
b) Luteinizing hormone – cause ovulation; formation of graafan follicle; mark the first one
 - 24. diffusion is the movement of substances from a regim of high concentration to a regim of low concentration (until an equilibrium is reached) while osmosis is the movement of water or solvent molecules from a diluted hypotonic solution to a more concentrated / hypertonic solution across a semi permeable membrane
 - 25. a) root hairs/ roots absorb water by osmosis; cells of the plant become lurgid, leaves become firm and spread out/ plants become firm/ upright
b) (i) Collenchyma
(ii)Xylem/ tracheids/ vessels/ sclerenchyma
 - 26. a) (i) Quinine
(ii) Caffeine
b) Lactic acid is oxidized to carbon (IV) oxide, water and energy when oxygen is available
 - 27. (i) Concentrates light on the object on to the stage
(ii) Contain a lens which contributes to the magnification of the specimen under view
 - 28. Prokaryotic; They lack some organelles such as mitochondria
 - 29. Substrate concentration; enzyme concentration; enzyme cofactors/ co-enzymes; PH;
Mark the first 3
 - 30. Scientific system of naming organisms using the generic and specific names

**LONIANI COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/2
BIOLOGY 2
MARKING SCHEME**

1. a) Name the process
 L – ultra filtration
 P – reabsorption
 b) (i) K has a wide lumen
 M has a narrow lumen
 (ii) Blood coming in is at high pressure; M provides resistance to blood flowing out creating high pressure that allows small molecules to be filtered out
 c) It is highly coiled to allow slow movement of filtrate for reabsorption; Have micro villi to increase surface area for re-absorption; cell have numerous mitochondria to provide energy for reabsorption
 2. (a) Genes located on the same chromosome and are always transmitted together
 (b) –
 i) X^hX^h Parental genotype X^hX^h X X^hY
 ii)
- Phenotypic ratio 3 normal: 1 haemophiliac;
3. iii) Males lack corresponding allele on the Y chromosome; therefore they cannot be carriers; OWTT
 3. a) Ovaries; anthers
 b) Embryo sac
 c) Fusion of one male nucleus with functional egg cell to form an embryo and the other with polar nuclei to form primary endosperm
 d) Develops into a seed
 e) some have hooks for attachment to clothes/ fur of passing animals; most are fleshy/ juicy / succulent to be eaten by animals; brightly coloured; scented to attract animals; some are eaten together with seeds covered by a tough seed coat
 any first 3 correct responses
 4. a) facilitates absorption of products of digestion .
 gaseous exchange
 excretion of nitrogenous wastes
 b) no observable change in colour
 boiling starch with hydrochloric acid hydrolyses starch into sugars/ maltose/ glucose which facilitates active transfer of materials across the cell membrane
 has phosphate groups which is used in synthesis of ATP to release energy for active transport
 c) (i) They are both involved in the movement of molecules across a semi permeable membrane
 (ii) Cell membrane – contains carriers
 5. (a) A – gill filament B – gill rakers C – gill arch/ bar
 (b) Maintain a steep concentration gradient across the respiratory surface; facilitating maximum gaseous exchange between the water flowing over the gills to the blood in the gills
 c) (i) Are numerous to increase the surface area for gaseous exchange, for faster diffusion of respiratory gases
 (ii) Thin walled for faster diffusion of respiratory gases
 (iii) Highly vascularized to transport the respiratory gases for faster diffusion of respiratory gases
 Moist to dissolve respiratory gases for faster diffusion of respiratory gases
 6. a) Graph
 b) P
 c) Q
 Has the largest number hence source of food for other species
 Mostly abundant on the water surface to trap sufficient light for photosynthesis
 d) 1.64 – 167
 e) Primary consumer – P
 Reason – higher population than R
 Secondary consumer – R
 Reason – smaller than P and Q

- Attain higher population when P and Q are lowest indicating that it depends on more than one source of food
- f) (i) palisade layer – densely packed with chloroplast for photosynthesis
Elongated and closely packed together to trap light
Positioned in the upper epidermis to trap light (max 2mks)
7. a) (i) accommodation of the eye
adjustment of the eye structures to bring an image from the near or far object into sharp focus on the retina
(ii) The ciliary muscles contract thereby relaxing the tension on suspensory ligaments. The curvature of the lens increases i.e. the close objects are greatly refracted by the lens focus them onto the retina
b)
- 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 turgor 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 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
 - Suspensory ligaments. This enables it to bring light rays coming 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 legaments
 - 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 eyeball in its up and down movements
 - 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 eye lashes 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.
8. (a) **Fossil/ paleontological evidence**
- Fossils are remains of ancestral forms accidentally preserved in some naturally occurring materials. Their exact age can be determined using radioactive carbon dating techniques; they give direct evidence of the type of plant or animal that existed during a certain geological era; (4mks)
- (b) **Comparative anatomy**
Based on the comparison of different structures; homologous structures; are those having a common ancestral or embryological origin but perform different functions; e.g. pentadactyl limb plan of vertebrates; (which has evolved in class mammalian into wings for flying in bats, long fast running legs in horse and flipper for swimming in whales) divergent evolution
Analogous structures having different ancestral / embryological origin but have evolved to perform similar functions; (due to exploitation of similar ecological habitats) e.g. wing of insects;
Convergent evolution
- (c) **comparative embryology**
A comparison of the embryo of the different vertebrates; e.g. fish embryo, tortoise embryo, chick embryo, all show similarities in their early stages; this shows that they have a common ancestral origin (3mks)
- (d) **Geographical distribution**
Based on the theory that before the continental drift; there was a continuous land mass / pangae; with continental drift, members of the population of originally the same species became separated and isolated; by (geographical barriers such as seas/ oceans)
They separated into different continents. The result of the isolation led to the evolution of different species; examples are members of the cat family in different continents such as the panthers and jaguars in South American forest. (leopards and cheetahs in African Congo forest, Tigers in Asian forests) (5mks)
- (e) **Comparative cell biology**
Comparison of cell organelles shows similarities in organisms of common origin e.g. mitochondria, chloroplast, cytoplasm and nucleus.
Serology
Serological test shows similarities between antigens of rabbits and human showing a phylogenetic hint (2mks) total 24 max 20mks

**LONIANI COUNTY JOINT EXAMINATION
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
231/3
BIOLOGY 3 MARKING SCHEME**

1. (12mks)

Food substance	Procedure	Observation	Conclusion
Starch	To solution W add (2 drops of) iodine solution	Brown / yellow color persists/ remains acc. No. color change observed	Starch absent
Reducing sugars	To solution W add benedict's solution and heat 1/ boil/ warm	Color/ brown changes from blue to green to yellow to orange Acc. Final colour Rej – red color	Reducing sugars present
Non reducing sugars	To solution W add dilute hydrochloric acid, heat and cool. Add sodium hydrogen carbonate solution until fizzing stops, then add benedict's solution and heat/ boil/ warm	Color changes from blue to green to orange 1/brown Acc. Final color Rej. Red color	Non reducing sugars present
Protein	To solution W add sodium hydroxide then copper (ii) sulphate Rej. Heat	Color changes from blue to purple 1 (purple color observed)	Protein present

2.

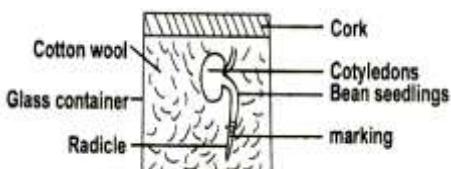
- a) 1 ilium
2 coccyx
3 Femur
- b) (i) Ball and socket joint rej. Hip joint / ball socket/ ball joint
(ii) Ferum
- c) (i) Lumbar vertebra; rej Lumbar vertebrae
(ii) Large surface area for attachment of muscles
Protects spinal cord / nerves
- d) It is wide to provide a large surface area for attachment of muscles
It is large to provide firm support to the body of animals
- e) (i) Obturator foramen
(ii) Allows passage of blood, nerves and muscles
- f) -
iii) C- tibia
E- Fibula
iv) Bone - Femur
Joint - Hinge joint

3.

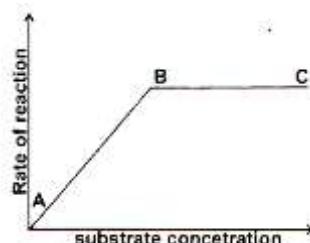
- a) Mass plant
- b) Kingdom plantae
Division Bryophyta
- c) A sexually by means of spores / sporulation
- d) Diagram
- e) Magnification = Length of drawing
Length of the specimen
- f) Leaf - photosynthesis
Capsule – enclose the spores
Rhizoid – anchorage / absorption of H₂O and dissolved mineral salts
Seta – hold the capsule

THARAKA SOUTH JOINT EVALUATION**Kenya Certificate of Secondary Education****231/1****BIOLOGY PAPER 1**

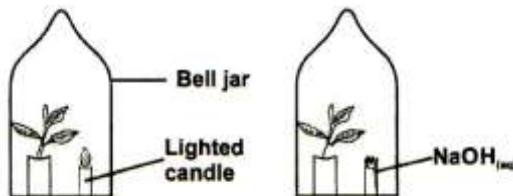
1. Give two characteristics that distinguish scientific names of organisms from the ordinary names. (2 marks)
2. Identify the structure of the cell that perform the following functions: (1 mark)
- Synthesize ribosomes (1 mark)
 - Regulate exchange of substance in and out of the nuclear. (1 mark)
 - Division of cells to form new ones. (1 mark)
3. A student set up an experiment as shown in the diagram below.



- (i) What was being investigated in the experiment? (1 mark)
ii. Draw a diagram to indicate the expected results of the experiment after three days. (1 mark)
iii. Why was it necessary to have wet cotton wool in the container? (1 mark)
 - What is the role of the following in a germinating seed? (1 mark)
 - Oxygen (1 mark)
 - Cotyledons (1 mark)
4. Name two enzymes and one ion metal that are needed in the blood clotting process. (3 marks)
5. Name the polysaccharides found in the following structures. (1 mark)
- Exoskeleton (1 mark)
 - Xylem vessels (1 mark)
6. Outline three ways in which the gills of tilapia fish are modified to perform their functions. (3 marks)
7. The graph below shows the effect of substrate concentration and the rate of enzyme reaction.



- (i) Account for the shape of the graph between
i. A and B (2 marks)
ii. B and C
 - How can the rate of reaction be increased after point B? (1 mark)
8. Two potted plants A and B were placed in the dark for two days. Each was then placed in an air tight bell jar as follows then transferred to light for four hours. Each plant was then tested for starch.



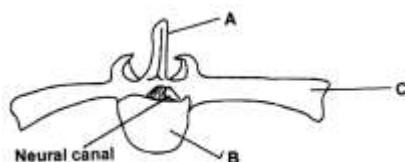
- why were the plants put in the dark place for two days. (1 mark)
 - what was the result of the starch test in plant B. Explain your answer. (2 marks)
9. identify two adaptations of vertebrate neurone that affects the speed of impulse transmission. (2 marks)
10. (a) State the kingdom to which chladydomonas belongs. (1 mark)
- (b) An organism has the following characteristics:
- Four pairs of wings
 - Cephalothorax and abdomen
 - Absence of antennae
 - Presence of a pair of chelicerae

Name the phylum and class that the organism belongs to? (2 marks)

Phylum

Class

11. Study the diagram shown below of the anterior view of a lumbar vertebra of a mammal.



- a) Name the parts labelled A and B (2 marks)
 b) State the function of part C (1 mark)

12. Name the type of response shown by:

- a) Leaves of *mimosa pudica* when they fold after being touched. (1 mark)
 b) Euglena when it swims towards the source of light. (1 mark)
 c) Maggots moving from the lit side of a boiling tube to the side painted black. (1 mark)

13. (a) Give two possible ways of establishing the genotype of an organism whose genotype is unknown. (2 marks)
 (b) Euglena when it swims towards the source of light. (1 mark)
 (c) Give the genotype of a male who could be born haemophiliac. (1 mark)

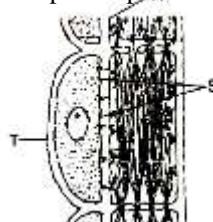
14. The diagram below shows a structure for gaseous exchange in class Pisces.



- a) Identify the structure. (1 mark)
 b) State the function of the part labelled C.
 c) How is the structure labelled B adapted for its function? (1 mark)

15. a) State two advantages of internal fertilization. (2 marks)
 b) Give reasons why a woman excretes less urea when she becomes pregnant. (2 marks)

16. The diagram below represents part of phloem tissue.



- a) Name the structures labelled R and S and the cell labelled T. (3 marks)
 R
 S
 Cell labelled T

- b) State the function of the structure labelled S (1 mark)
 17. Distinguish between natural and acquired immunity. (2 marks)

18. a) What is the difference between Darwinian and Lamarkian theories of evolution? (2 marks)
 b) What is meant by the term vestigial structures? Give one example. (2 marks)

19. Name the hormone responsible for:

- a) Conversion of glycogen to glucose (1 mark)
 b) Regulation of the amount of water in the blood (1 mark)

20. Name the substances produced as a result of anaerobic respiration in:

- i. Yeast (1 mark)
 ii. Human muscles (1 mark)

21. Account for the osmoregulatory changes that would take place in a marine amoeba if it was transferred to a fresh water environment. (3 marks)

22. a) What is meant by resolving power of a microscope. (2 marks)
 b) State the reason behind the addition of iodine solution, to an onion epidermis on a slide while being observed on a light microscope. (1 mark)

23. Why is excretion of nitrogenous wastes more of a problem to animals than plants. (3 marks)

24. Explain why sweat accumulates on a person's skin in a hot humid environment. (2 marks)

25. a) Name two kinds of nuclei found in a mature pollen grain. (2 marks)
 b) State what is meant by double fertilization in flowering plants. (2 marks)

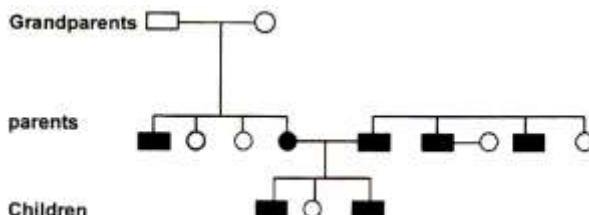
26. a) State the role of active transport in animal nutrition. (1 mark)
 b) Give two factors which affect active transport. (2 marks)

THARAKA SOUTH JOINT EVALUATION**Kenya Certificate of Secondary Education**

231/2

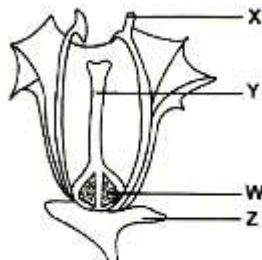
BIOLOGY PAPER 2**SECTION A :(40 MARKS)**

1. The diagram below shows a family tree. Squares represent males and circles represent females. Normal individuals are indicated by unshaded squares and circles. Individuals who show genetically controlled defects are indicated by shaded squares and circles.



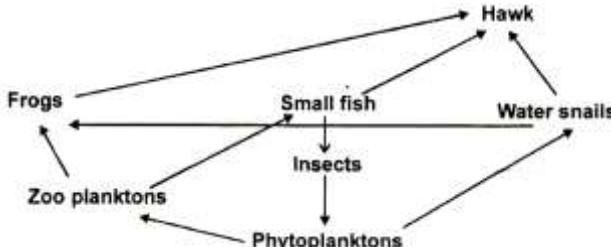
- a) What is the name given to this type of a family tree? (1 mark)
 b) In which of the grandparents is the genetically controlled defect likely to have developed and by what process. (2 marks)
 c) Assume the genetically controlled defect was haemophilia, show the genotype of the following:
 i. Grandparents (2 marks)
 ii. The two couples
 iii. The children of the couple that showed the defect. (1 mark)
 iv. What are the symptoms of the defect. (1 mark)
 v. What is the remedy? (1 mark)

2. The diagram below represents a flower.



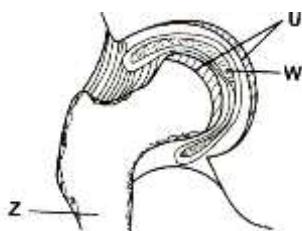
- a) Name the parts labelled X and Y (2 marks)
 X
 Y
 b) Describe the ovary position. (1 mark)
 c) i) Suggest an agent of pollination of the flower above. (1 mark)
 ii. Give a reason for your answer above. (1 mark)
 d) On the diagram above, which part do you expect to find haploid nucleus after meiosis? (1 mark)
 e) In the flower above its sepals cell was found to have 20 chromosomes. What would be the number of chromosomes found in the endosperm cell of the flower embryo sac after fertilization? (1 mark)
 f) State one way in which flowers prevent self-pollination. (1 mark)

3. The flow chart below represents a feeding relationship in an ecosystem.

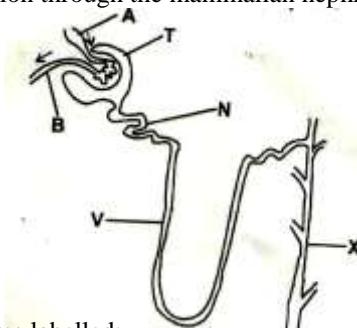


- a) Name two organisms which are both secondary and tertiary consumers. (2 marks)
 b) State two short term effects of immigration of insects in the ecosystem. (2 marks)
 c) Name the organism which has the least Biomass in the food web. Explain. (2 marks)
 d) State the role of the following in an ecosystem:

- i. Saprophytes (1 mark)
 ii. Leguminous plants. (1 mark)
- e) Name one method that would be used to estimate the fish population in the ecosystem. (1 mark)
4. The diagram below represents one of the joints in the mammalian skeleton.



- a) Name the type of joint shown in the diagram. (1 mark)
 b) Name the parts labelled Z and U (2 marks)
 c) Name two parts of the body where this type of joint is found. (2 marks)
 d) State the functions of the fluid found in W. (2 marks)
 e) Name the type of muscles found in the gut. (1 mark)
5. Shown below is a section through the mammalian nephron.



- a) Name the structures labelled:
 A
 N (2 marks)
- b) Name all structures in a nephron which are normally present in the cortex region of kidney. (1 mark)
 c) Which region in the nephron deals with conservation of body water. (1 mark)
 d) Name one hormone that has an effect on part labelled X. (1 mark)
 e) How is part labelled N adapted to its function. (2 marks)

SECTION B :(40 MARKS)

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

6. Carbohydrates used during respiration and those formed during photosynthesis by a certain plant was measured over a period of 24 hours at an interval of 3 hours.

Time of day	12a.m	3a.m	6a.m	9a.m	12p.m	3p.m	6p.m	9p.m	11p.m
Carbohydrates formed during photosynthesis(mg)	0	0	5	30	60	30	5	0	0
Carbohydrates used during respiration(mg)	10	10	10	10	10	10	10	10	10

Using the same axes,

- a) Plot a graph of carbohydrate formed during photosynthesis and carbohydrate used during respiration against time. (8 marks)
- b) Calculate the net carbohydrate formed by the plant. (2 marks)
- c) At what time of the day do the light compensation points occur? (2 marks)
- d) Account for the shape of graph on carbohydrates. (2 marks)
- i. Between 12.00a.m and 3a.m (2 marks)
 - ii. Between 3.00a.m to 12.00 noon (2 marks)
- e) How could foggy weather influence the net amount of carbohydrates formed over the 24 hour period? (1 mark)
- f) Give other external factors apart from temperature and light intensity that influence the rate of photosynthesis. (2 marks)
- g) In which form are carbohydrates stored in
 i. Plant bodies
 ii. Fungi (½ mark)
7. a) Describe secondary growth in flowering plants. (14 marks)
- b) Describe one method that can be used to measure the average growth rate of a single leaf. (6 marks)
8. a) What is organic evolution? (2 marks)

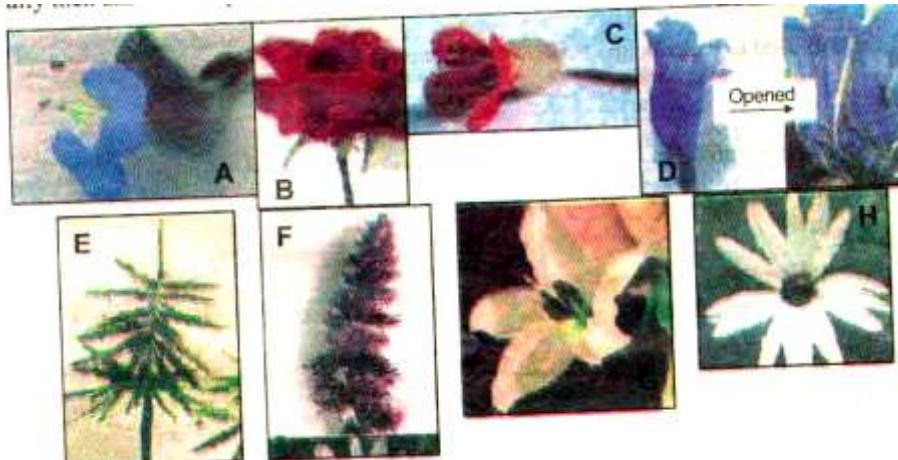
-
- b) Distinguish between homologous and analogous structure. (4 marks)
 - c) How does natural selection bring about adaptations of species to its environment. (14 marks)

THARAKA SOUTH JOINT EVALUATION**Kenya Certificate of Secondary Education****231/3****BIOLOGY PAPER 3 (PRACTICALS)****SECTION A :(40 MARKS)**

1. You are provided with specimen labelled M-soaked millet grains.
 Grind them using pestle and mortar, adding some water to get fine solution.
 Label four clean test tubes A, B, C and D.
 Put about 4ml of the solution into each of the four test tubes.
- a) To solution in test tube A, add some few drops of iodine. Shake the solution to mix well. Pour some little solution onto a white tile.
- Note down your observations. (1 mark)
 - Account for your observations in a(i)above. (1 mark)
- b) Into solutions in test tube B, add about 2ml of Benedict's solution. Place it in a boiling water bath.
- After about 3 minutes, record your observations. (1 mark)
 - What is your conclusion from observation in b (i) above. (1 mark)
- c) For the remaining test tubes:
 To test tube C, add about 3ml of solution labelled K
 To test tube D, add about 3ml of solution K and about 2ml of solution labelled L
 Place both mixtures C and D in a water bath. Maintain the water bath at 37°C
 Allow it to stand in the water bath for 30 minutes.
 After 30 minutes, remove the test tubes. Add about 2ml of Benedict's solution to each test tube and shake well. Place the two test tubes in a boiling water bath. After about 5 minutes record your observations in the table below.

TEST TUBE	OBSERVATIONS	DEDUCTIONS
C		
D		

- d) Account for your observations in the test tube C and D (2 marks)
 e) i) Why was set up placed at 37°C ? (1 mark)
 ii. Suggest identity of solutions (2 marks)
 K
 L
2. You are provided with photograph of specimens labelled A, B, C, D,E,F,GandH. Study them carefully then answer the questions that follow.



- (a) Group of florets/inflorescence.....go to 2
 (b) simple flowers.....go to 4
- (a) Florets compacted into compact heads.....compositae
 (b) florets not compacted but arranged in spikes.....go to 3
- (a) Florets conspicuous /purple in colour.....Amaranthaceae.
 (b) Florets inconspicuous/green in colour.....Graminae
- (a) Flower polysepalous/many free sepals.....Rosacea
 (b) Flower gamesepalous.....go to 5
- (a) Flowers with more than five anthers.....Umbelliferae
 (b) Flowers with five or less anthers.....go to 6
- (a) Petals form a corolla tube/gamepetalous...mimosacea
 (b) petals do not form corolla tube.....go to 7
- (a) Flowers with large anthers.....Solanacea
 (b) Flowers with small anthers.....Ranunculacea

Use the dichotomous key provided to Identify each specimen. In each case show in sequence the steps

e.g. 1(a), 2(b), 7(c).....etc. in the key that you followed to arrive at the identity of each specimen.

(8 marks)

a)

specimen	Steps followed	identity
A		
B		
C		
D		
E		
F		
G		
H		

- b) (i) What is the likely agent of pollination of specimen C and E? (2 marks)

C

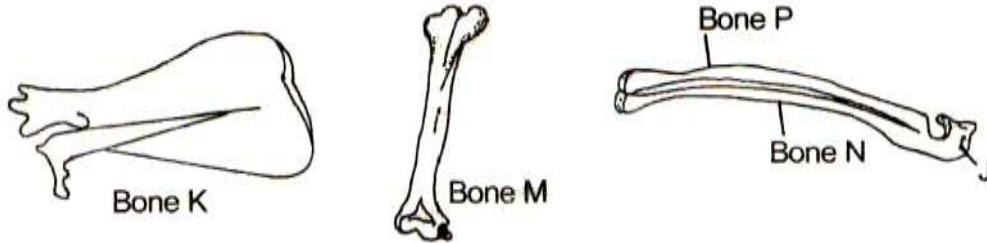
E

(ii) Briefly explain an adaptive feature of specimen C to the mode of pollination you have named in b(i) above (1 mark)

- c) Describe the ovary of specimen B and G using the most suitable biological terms. (2 marks)

- d) Supply a term used to describe the flower of specimen E and F. (1mark)

3. The photographs below are of bones obtained from the same region of a mammal body.



- a) Name the region from which bones were obtained.(1 mark)

- b) Identify the bones. (4 marks)

K

N

- c) State three ways by which bone K is adapted to its function. (2 marks)

- d) Giving a reason, name the type of joint that would be found in the animal at the proximal and distal ends of bone N.

Proximal end

(1 mark)

Reason

(1 mark)

Distal end

(1 mark)

Reason

(1 mark)

- e) What is the significance of the part labelled J in the bone N?(1 mark)

- f) Make a drawing to show how bones M,boneM and bone P are articulated (2 marks)

THARAKA SOUTH JOINT EVALUATION*Kenya certificate of secondary education***BIOLOGY PAPER 1****MARKING SCHEME**

- 1.
- Two names i.e 1st genus and 2nd species
 - Genus names start with capital letter while species start with small letter.
 - Both names are written in italics when printed / underlined when typed or handwritten. **Mark any 2 x 1 = 2 marks**
2. a). Nucleus 1mk
 b). Nuclear membrane / pore 1mk
 c). Centriole 1mk
3. a). i). Region of elongation / rapid growth in root / radical 1mk
 ii).
- 
- iii). To provide water / moisture for germination 1ml
 b). i). oxygen – for oxidation of food to provide energy for germination 1mk
 ii). Cotyledons – store food necessary for germination / protect plumule 1ml
- 4.
- enzymes – thrombin 1mk
 - thromboplastin (thrombokinase) 1mk
 - metal ion – calcium ions 1mk
5. a). Chitin 1mk
 b). Lignin 1mk
- 6.
- Gill filament are thin / cell thick to facilitate faster / rapid diffusion of respiratory gases 1mk
 - The surface of the gill filaments are moist to facilitate dissolution of the respiratory gases 1mk
 - The gill have numerous rakers that filter food / solid particles that may damage the gill filaments
 - The gill is highly vascularised to ensure efficient transport of respiratory gases **Mark any 3 - @1mk = 3 mks**
7. a).
 - i). More active sites of enzymes available for a large number of molecules of substrate hence increase in the rate of reaction (rapid or 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
8. a). So that they could be destarched / use up all the stored starch
 b). No starch in the plant
 the NaOH solution absorbed carbon (IV) oxides from the air hence no photosynthesis occurred to form starch
- 9.
- myelin sheath
 - Nodes of ranvier
10. a). Protoctista 1mk
 b). Phylum – arthropoda; rej Arthropods
 class – arachnida rej Arachnids
11. a). A – Neural Spine
 B- centrum
 b). For attachment of abdominal muscles
12. a). Nastic / Haptonasty Phototaxis
 b). Positive Phototaxis
 c). Negative phototaxis
13. a). – selfig / self fertilization as in plants
 – test cross / back cross
 b). Haemophilia is a sex – link characteristic which is only carried by the X chromosome and a father can only donate x- chromosome to his daughter but not son
 c). X^hY
14. a). Gill
 b). Creates a large surface area for maximum gaseous exchange

- c). Large and curved to provide large surface for attachment of numerous gill filaments bony / rigid to offer support
15. a). high chance of survival since zygote is highly protected in the body.
High chances of fertilization
b). Most of the excess amino acids are used in the development and growth of the foetus thus less amino acid are delaminated
16. a). R – sieve pore
S – cytoplasmic strand cytoplasm filaments rej. proto plasmic strad)
Cell labeled T – companion cell
b). Translocation (L is tied with structures)
17. Natural immunity is inherited / transmitted from parent to offspring
Acquired immunity is developed after suffering from a disease / through vaccination
Accept innate / inborn for natural immunity rej. Born with it
18. 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 of organisms therefore better – adaptable characters are then inherited by natural selection
b). Are structured greatly reduced in size and therefore not used to function acc. Third digit of wing or 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
19. a). Glucagon
b). Antidiuretic hormone /ADH/vasopressin *any first one*
20. i). Alcohol
ii). Lactic acid *2 mks*
21. More water will enter the amoeba by osmosis rate of water enter the amoeba by osmosis rate of water discharged by contractile vacuole will increase more contractile vacuoles formed
22. A. The ability of microscope to separate images of objects that lie close to one another
b). Stains / colour parts of the cell making it more visible / clear
23.
– Plants are able to store the wastes in their bodies in non-toxic forms
– Plants are stationary and therefore less active hence release less toxic wastes compared to plants which produce a lot
– Plants utilize simple inorganic substance to make their foods in amount required by the body hence less wastes while animals consume complex compounds whose breakdown releases more toxic wastes
24. Sweat produced does not evaporate due to high humidity and the body does not cool hence more sweat produced leading to accumulation *2mks*
25. a). – generative nucleus *1mk*
Pollen tube / tube nucleus *1mk*
b). A kind of fertilization in which the male nucleus divides into two male nuclei. One of which fertilizes the functional egg forming a zygote while the other fuses with the polar nuclei to form a primary endosperm nucleus
26. A). Helps in absorption of some products of digestion from alimentary canal into blood stream
b). Oxygen concentration / amount of oxygen
– Change of temperature
– substrate / glucose concentration
– Enzyme inhibitors / metabolic poisons *Any first correct two*

THARAKA SOUTH JOINT EVALUATION*Kenya certificate of secondary education***BIOLOGY PAPER 2****MARKING SCHEME**

1. a). Pedigree
b). Grand mothers; and by mutation
c. i) Grand parents $X^H Y, X^H X^h$
ii). The two couples $X^h Y^h; X^h Y; X^h Y, X^h X^H$
iii). $X^h Y/X^h X^h/X^h Y$
iv). Bleed profusely for long period even from the slightest cut, inject with vitamin K to cause blood clotting which seals up the wound
v). Inject with vitamin K to cause blood clotting which seals up the wound
2. a). X – anther / male part
Y – style / pistil / female part
b). Epigynous / superior flower / ovary above the other floral parts
c. i). Wind pollinated flower
ii). Anther located above the stigma
rej. Brightly coloured petals / scented nectarines
d). X/W
e). 30 chromosomes
f). Anthers located below the stigma self sterility / incompatibility Protandry / male parts (stamen) maturing earlier than the female parts (pistil) Protagyny / female parts (pistil) maturing earlier than the male parts stamens any one stated correctly 1 mk
3. a). Hawk and water snail 2mk
b). decrease in phytoplankton 1mk
increase in population of small fish
c). Hawk, top predator, amount of energy decrease in successive trophic levels / energy is lost through respiration
Undigested / uncovered food (mark any reason $1 \times 1 = 1\text{mk}$)
d. i) Cause decomposition / recycling of nutrients 1mk
ii). Root nodules have bacterial / rhizobium sp to convert free nitrogen into nitrates in the soil 1mk
e). Capture – recapture or capture release recapture 1mk
4. a). Ball and socket joint 1mk
b). Z – femur
U – articular cartilage 2 mks
c). Shoulder / pectoral girdle, hip/pelvic girdle
rej – (pectoral / pelvic alone)
d). – Reduction of friction / lubrication
Absorption of shock / distribution of pressure 2mks
e). Smooth muscles 1mk
5. a) A – Afferent arteriole
N – Proximal convoluted tubule 2 mks
b). Bowman's capsule, proximal convoluted tubule, distal convoluted tubule 1mk
all named or none
c). Loop of Henle
d). Antidiuretic hormone / vasopresin
e) i). Cell lining tubule have numerous mitochondria which provide energy for reabsorption
iii). Tubule long / highly coiled to increase surface area
iv). Coiling of tubule reduce speed of flow of filtrate to allow more time for efficient reabsorption
v). Tubule is well supplied with blood capillaries for efficient transport / reabsorption any correct first two

SECTION B

6. a) Title 1mk
Labelled axes 1mk
Correctly used scale 2mk
Plotting of points (Any 3 correctly plotted points in each case 1mk each $1 \times 2 = 2\text{mk}$)
Labeling of curves 1mk each 2mk
- b). Carbohydrates formed during photosynthesis
 $0+0+5+30+60+30+5+0+0= 130\text{mg } \frac{1}{2} \text{ mk}$
Carbohydrates used during respiration
 $10+10+10+10+10+10+10+10= 90\text{mg } \frac{1}{2} \text{ mk}$
- c). 6:36a.m + 10 minutes 1mk
5:24p.m + 10 minutes 1mk

- d. i) No carbohydrates 1mk
 ii). Gradual increase in carbohydrates 1mk
 fromed due to increasing light internstiy 1mk
- e). Reduced light available, hence carbohydrates formed becomes low 1mk
- f). Carbon (IV) oxide 1mk
 moisture / water 1mk
- g). Starch ½ mk
 Glycogen ½ mk

7.

- a). Secondary thickening id facilitated by meristematic cells known as cambium which are located between phloem and xylem in vascular budles of plants the cambium divides radically to form a ring (cylinder) of cambium rissue with the xylem inside the ring and the phloem outside the ring, cells of the cambium ring divide to four secondary phloem outside intervascular cambium (between vascular bundles) divide to form secondary phloem outside. Intervascular cambium (between vascular bumdles) divided to form secondary parenchyma, thereby increasing the growth of meducary easy much more xylem is formed than phyloem thus pushing phlem and cambium outwards the rate of secondary growth is dependant on the season / rainy resulting in annular rings,. Cork. Camvium / phellogen divides to form new cork / bark rissue to accommodate increased growth on outside and secondary cortex on the inside. 14mks
- b). Choose / identify a yound leaf which is folded, use the same leaf throughout measure the total length of the whole leaf (acc. Measure of any part of the leaf / record / length) repeat the procedure at regular interval, until no change occurs in length / until it gets constant length the average rate of growth is equal to toatal increase in length divided by the period taken to achieve final length

- 8.** a). Organic evolution is a gradual change of living organism from simple life forms to more complex forms, over a long period of time
- b). Homologous structures are structures of the same embryonic origin that become modified in the course of evalution to perform different ecological niches Analogous structures are structures of different embryonic origin that become modified in the course of evolution to perform similar functions in the same ecological niches. 2 mks
- c). How natural selection brings about adaoptation id the species ro its environment
- organisms in the same environment are always competing for resources such as food mates, shelter etc as well as enduring the harshness of the environment.
 - This phenomenon is described as a struggle for existence
 - those organisms that best adapted to survive to productive maturity and give tise tooffrsprings of the next generation.
 - the less well adapted die yound, hence survival of the fittest
 - if the favourable charaxteristics possessed by the ‘fittest’ organisms are genetic they are passed onto the offspring
 - this leads to a natural occurrence of variation onto the offsprings
 - this leads to a natural occurrence of various without a species
 - if these variations are genetic change in the characteristics of the species making it better adapted to its environment
 - accumulation of small variations over a long period of time lead to the emergence of new dorms of life i.e ne species
 - if suited and well adpted to the new environment these new forms reproduce successfully and pass on their characteristics
 - if not suited these new forms are eliminated by nature leaving mutant forms which are better adapted to the environment
 - through this process nature selects those oragnisns with better adaptations while ensuring the elimination of those not able to adapt to the changing environment.
 - thus the changing enviroment (nature) forces and organism (a species) to adapt or otherwise be eliminated

Total 18**Max 16**

THARAKA SOUTH JOINT EVALUATION*Kenya certificate of secondary education***BIOLOGY PAPER 3****MARKING SCHEME**

1. a) i). Solution turns blue – black in colour 1 mk
 ii). Indicates presence of starch in the solution 1mk
 b) i). No change in colour
 - no colour change / colour remained dirty blue that of Benedict's 1mk
 ii). Absence of reducing sugar / monosaccharide 1mk
 c).
- | Test tube | Observations | Deductions |
|-----------|---|--|
| C | Solution turns yellow / orange / brick red $\frac{1}{2}$ mk | Presence of reducing sugar / monosaccharides 1mk |
| D | No colour change / colour of benedict's remains $\frac{1}{2}$ mks | Absence of reducing sugar |
- d). C – starch solution converted / hydrolysed to monosaccharide's , the 3 minutes allowed hydrolysis of starch by soloution K. 1 mk
 D – the starch solution was not hydrolysed hence absence of reducing sugar after 30 minutes
 Solution L must have prevented the hydrolysis by K 1mk
- e). i) This is the human body temperature it's the best temperature for human enzymes to work any one 1mk
 ii). K – amylase enzyme / diastase 1mk
 L – hydrochloric acid (HCl), acc enzyme inhibitor 1mk
2. a).
- | Specimen | Steps followed | Identity |
|----------|--------------------|---------------|
| A | 1b, 4b, 5b, 6b, 7b | Ranunculaceae |
| B | 1b,4b | Rosacea |
| C | 1b,4b,5a | Umbelliferae |
| D | 1b,4b,5b,6a | Mimosacea |
| E | 1a,2b,3b | Graminae |
| F | 1a,2b,3a | Amaranthacea |
| G | 1a,4b,5b,6b,7a | Solanacea |
| H | 1a,2a | Compositae |
- b). C – insect
 E – wind
 ii). Brightly coloured petals to attract insects. Tubular / funnel shaped corolla / landing platform for insects
 c). B – Perigynous
 C – Hypogynous
 d). Inflorescence
3. a). Forelimb / arm / front legs / humerus – upper arm / ulna and radius lower arm / scapula – shoulder / pectoral girdle
 b). K – scapula
 M – Humerus rej. Humerous
 N – Ulna
 P- Radius
- c).
 - has a ridge or coracoids process for increasing surface area for muscle attachment
 - broad, wide or flattened for increasing surface area for muscle attachment
 - has a socket, cavity or glenoid cavity or depression for articulation with next bone humerus or head of humerus
 - has cartilage to make it smooth
 - a smooth surface of the socket for reducing or minimizing friction Any 3
 d). Proximal end – ball and socket
 Reason:
 - head shaped like a ball / ball like rounded head / round head , allow movement in more than one plane
 Distal end – hinge joint
 Reason:
 Allow movement in only one plane / presence of a groove / olecranon process / presence of condyl / trochlea which articulates with sigmoid notch
- e). attachment of muscles / tendons formation of hinge joint, prevent overstretching of forearms backwards allow movement in only one plane / 180^0 max 1
- f). Articulation
 A1 – inside
 A2 – small space between P and N
 Proportionality
 P thicker than N

M dits into P & N

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015

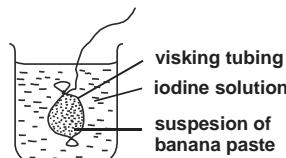
Kenya certificate of secondary education (k.c.s.e)

231/1**BIOLOGY****PAPER 1****TIME: 2 HRS**

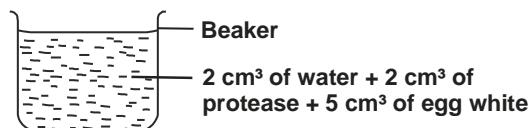
1. Name the organelle that performs each of the following functions in a cell.
- Protein synthesis (1 mark)
 - Transport of all secretions (1 mark)
2. The table below shows differences in the relative concentrations of various ions in the cell sap of a sea weed (valonia) and in the sea water in which it is growing.

Ions	Relative concentrations in%	
	Valonia cell sap	Sea water
Chloride	21.2	19.6
Sulphates	0.005	3.33
Sodium	2.1	10.9
Magnesium	0.001	1.31

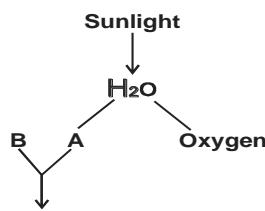
- Name the process by which the following ion will enter the cell sap of the valonia cells.
 - Sulphates (1 mark)
 - Chlorides (1 mark)
 - Give a reason for each of your answers in (a) (i) and (a) (ii) above. (2 marks)
3. In an experiment, raw banana was peeled, mashed into a paste and was treated as shown in the set-up below.



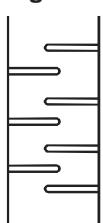
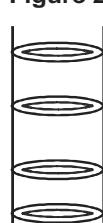
- Name the physiological process being investigated. (1 mark)
 - State the expected colour of the solutions inside the visking tubing after 30 minutes. (1 mark)
 - Explain the observation made in (b) above. (2 marks)
4. a) State two functions of tongue during digestion in the mouth of man. (2 marks)
- b) The following experiment was set up to investigate the action of protease on egg white.



- After 15 minutes, the contents of the beaker became clear, explain this observation. (2 marks)
5. The flow diagram below represents photosynthesis process. Study it and answer the questions that follow.



- Name the substances: (_ mark)
6. a) Distinguish between transpiration and guttation. (2 marks)
- b) The diagrams below shows two types of patterns of lignification in xylem vessels.

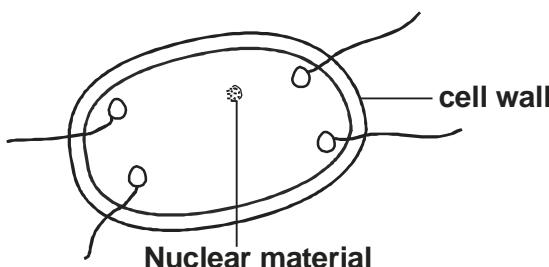
Figure 1**Figure 2**

- Name the pattern in
- Figure 1 (1 mark)
- Figure 2 (1 mark)
7. a) List two adaptation of leucocytes to their functions. (2 marks)
- b) Differentiate between O+ and O- blood group. (1 mark)
8. a) Explain why it is not possible to drown a locust while holding its head under water. (2 marks)
- b) State two mechanisms of opening and closing of stomata. (2 marks)
9. In an experiment to measure gaseous exchange between flying locust and its surrounding it was found that for every 1cm³ of carbon (IV) oxide, 1.43cm³ of oxygen was consumed.
- i) Calculate the respiratory quotient for the food substance that was being oxidised. (2 marks)
- ii) State the importance of respiratory quotient. (2 marks)
10. Name the main nitrogenous wastes excrete by:
- i) Birds (3 marks)
- ii) Shark (3 marks)
- iii) Cow (3 marks)

11. The table below shows percentage composition of blood plasma and urine from different substances.

Substance	Blood plasma %	Urine %
Water	90	90
Plasma proteins	8	0
Glucose	0.2	0.1
Urea	0.03	2

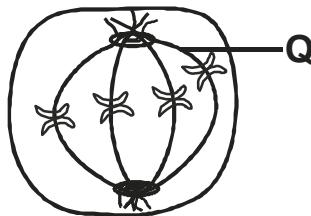
- a) Explain why;
- i) There are no plasma proteins in the urine. (1 mark)
- ii) Urea concentration is greater in the urine than in the blood plasma. (1 mark)
- iii) There is glucose in the urine. (1 mark)
12. a) The diagram below represents an organism.



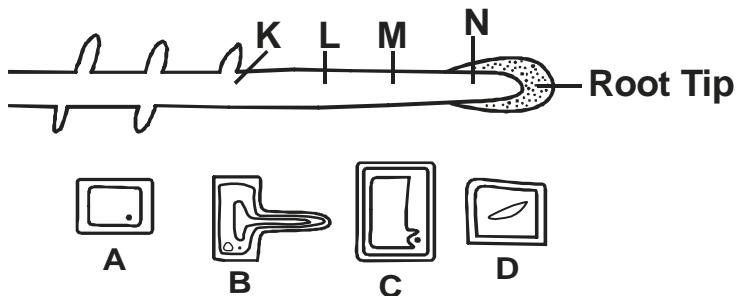
- i) Name the kingdom to which the organism belongs. (1 mark)
- ii) Give a reason for your answer in a (i) above. (1 mark)
- b) Give two reasons why classification is important. (2 marks)
13. A student named cockroach as AMERICAN PERIPLANTA.
- a) Identify two mistakes in the name above. (2 marks)
- b) Write the correct name of cockroach. (1 mark)
14. State two density dependent factors that affect population growth in an ecosystem. (2 marks)
15. The following organisms were found in a grassland habitat.
- | Organism | Abundance |
|--------------|-----------|
| Insects | 500,000 |
| Snacks | 200 |
| Green plants | 2,000,000 |
| Mangrove | 5 |
- a) Construct a pyramid representing the order of feeding in the grassland. (1 mark)

- b) Describe two features expected along trophic levels of pyramid constructed.

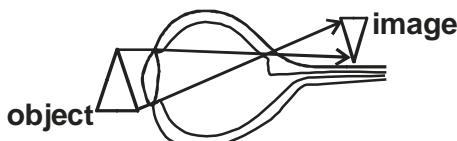
16. The diagram below shows a cell undergoing a stage in a cell division.



- a) Identify the stage..... (1 mark)
 b) Give a reason for your answer in (a) above. (1 mark)
 c) What is the functions of the part labelled Q. (1 mark)
17. List two possible effects that are likely to occur if the maternal and foetal circulatory system were directly connected. (2 marks)
18. State two characteristics of meristematic cells. (2 marks)
19. The diagram below represents a young root and four cells which occur in different regions of the root tip labelled K, L, M and N.



- State the regions of the root tip where each of the cells A B C D occur. (4 marks)
20. State two functions of DNA. (2 marks)
21. Below is a nucleic strand.
-
- a) Name the nucleic acid. (1 mark)
 b) Give a reason for your answer in (a) above. (1 mark)
 c) Write down the complimentary base pairing the pattern in the nucleic acid formed above. (1 mark)
22. State the limitations of fossils as an evidence of evolution. (2 marks)
23. i) The length from tail tip to the anus in a fish is 8cm whereas that from tail tip is 24cm. Calculate the tail power of the fish. (2 marks)
 ii) What is the significance of the high tail power in fish locomotion. (1 mark)
24. The diagram below shows an eye defect.



- State the defect. (1 mark)
25. a) Distinguish between exocrine and endocrine glands. (1 mark)
 b) State the functions of the following parts of mammalian ear:
 i) Tympanic membrane (1 mark)
 ii) Eustachian tube. (1 mark)
26. State the importance of Endoskeleton. (3 marks)
27. Give three types of movable joints found in mammalian skeleton. (3 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015

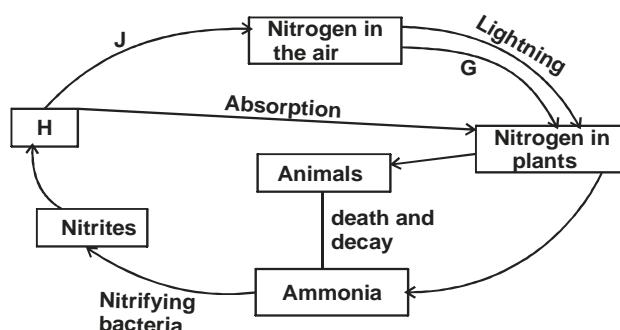
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231/2

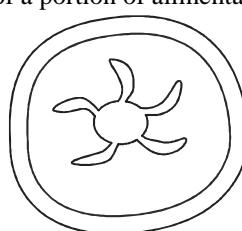
BIOLOGY**PAPER 2****TIME: 2 HRS****JULY/AUGUST 2015****SECTION A (40 MARKS)**

Answer ALL questions in this section in the spaces provided.

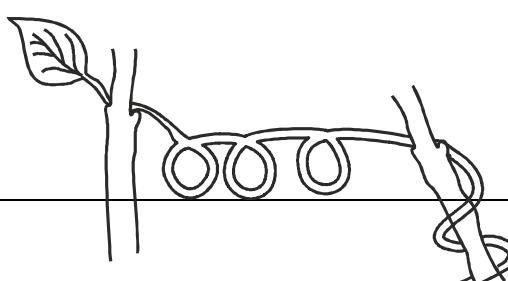
1. The colour of tips of hair in Shepherd dog is controlled by a gene with three alleles B for Black, R for red and C for copper. A cross between pure breeding red and copper hair tips produce offsprings with scarlet hair tips. Crossing pure breeding red and black hair tips yields all red offsprings. A cross between pure breeds of copper and black produce offsprings that are all copper.
- Comment on the inheritance of the three alleles B, R and C. (2 marks)
 - A dog breeder wishes to know the genotype of a dog with red hair tips. State and explain the cross needed to determine the dog's genotype. (2 marks)
 - A mother of blood group AB was married to a man of blood group B heterozygous. What is the probability that one of their sons would be blood group A? Show your working. (4 marks)
2. The diagram below represents the nitrogen cycle. Study it and answer the questions that follow.



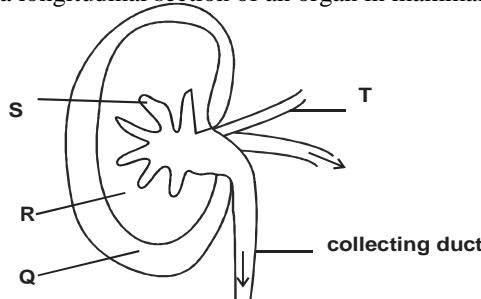
- i) Name the processes represented by K. (1 mark)
ii) Identify the organisms responsible for:
Process G..... (1 mark)
Process J (1 mark)
iv) Identify the compound represented by H. (1 mark)
 - Name a method of population estimation in the following:
i) When studying population of fish in a dam. (1 mark)
ii) When studying transition in habits and population through an area. (1 mark)
 - Define eutrophication. (2 marks)
3. The diagram below is a cross section of a portion of alimentary canal.



- i) Which part of the alimentary canal is represented by the portion above. (1 mark)
ii) Give a reason for your answer in (a) (i) above. (1 mark)
 - i) State two functions of the part of alimentary canal represented above. (2 marks)
ii) Explain two structural adaptations of the part of alimentary canal represented above. (4 marks)
4. A response exhibited by a certain plant tendril is illustrated below.



- a) Name the type of response..... (1 mark)
 b) Explain how the response name in (a) above occurs. (3 marks)
 c) Give two significances of the above response to plant. (2 marks)
 d) Name two other responses in plants other than the one illustrated. (2 marks)
5. The diagram below is a longitudinal section of an organ in mammals.



- a) Name the organ..... (1 mark)
 b) Identify the parts R and S. (2 marks)
 c) i) State three differences in the structure above found in the desert rat and fish. (3 marks)
 ii) Account for the differences stated above. (2 marks)
 d) Name the gland associated with the secretion of aldosterone hormone. (1 mark)

SECTION B (40 MARKS) Answer question 6 (compulsory) and either question 7 or 8

6. In an experiment, lactic acid concentration was measured before, during and after exercise to determine the effect of exercise on the concentration of lactic acid in blood. Study the data obtained and use it to answer the questions that follow.

Time (minutes)	0	10	20	25	30	40	50	60	70	80	90	100
Lactic acid conc. /obitery units	0.5	0.5	5	13	12	8	6	4	3	2	1	0.9

- a) Plot a graph of the concentration of lactic acid against time using a suitable scale. (6 marks)
 b) From the graph:
 i) Determine the period of exercise. (1 mark)
 ii) Explain (1 mark)
 c) i) Determine the time when oxygen debt incurred. (1 mark)
 ii) Explain (1 mark)
 d) i) The duration it took to pay back the oxygen debt (1 mark)
 ii) Explain (1 mark)
 e) Plot a hypothetical curve for oxygen intake during the experimental period on the same axes. (2 marks)
 f) Why does lactic acid level usually continue to rise in the blood after the exercise ceases? (2 marks)
 g) State two of effects of lactic acid on tissues. (2 marks)
7. a) Explain how mammalian lungs are adapted for gaseous exchange. (10 marks)
 b) Describe the role of the mammalian liver in carbohydrate metabolism. (10 marks)
8. Describe the effects of the various abiotic factors in a terrestrial ecosystem to plants. (20 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015

Kenya certificate of secondary education (k.c.s.e)

231/3**BIOLOGY****Paper 3****(Practical)****July/August 2015**

1. You are provided with specimens B1, B2 and C. B1 and B2 are similar except that B2 has been boiled while B1 and C are fresh.

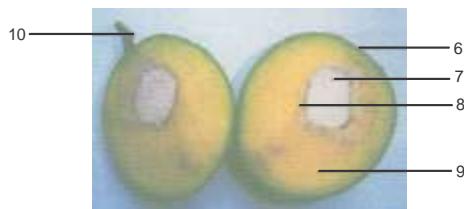
Cut a small piece of B1 and chop it into small pieces. Place the chopped pieces into a test tube and add 1ml of hydrogen peroxide. Record your observations in the table below. Repeat the above procedure with specimens B2 and C and record your observations in the table.



PHOTOGRAPH Q



PHOTOGRAPH S



PHOTOGRAPH T



PHOTOGRAPH R

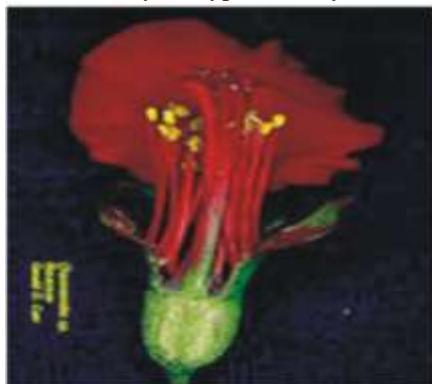
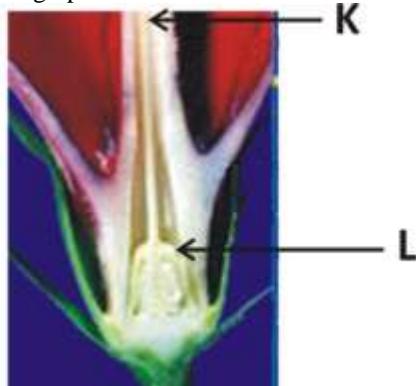
Specimen	Observations
B1	
B2	
C	

- b) Account for your observations involving each specimen. (2 marks)
- c) i) Cut another piece of specimen B1 chop it into small pieces, and place into a test tube and add 1ml of hydrogen peroxide. Cover the mouth of the test tube with your thumb for one minute. Introduce a glowing wooden splint into the test-tube. Record your observations and account for them. (2 marks)
- Observations
- Account for observations
- ii) Write down an equation to show the reaction that occurred when hydrogen peroxide was added to B1 in (a) (i) above. (1 mark)
- iii) Repeat the procedure in c(i) with distilled water instead of hydrogen peroxide. Record your observations and account for your observations. (2 marks)
- Observations:
- Accounting for observations
- d) Explain why it is necessary to chop the specimens into small pieces before carrying out the experiment. (2 marks)
- e) Give a reason why hydrogen peroxide should not accumulate in living tissues. (1 mark)

2. The photographs below show different plants.

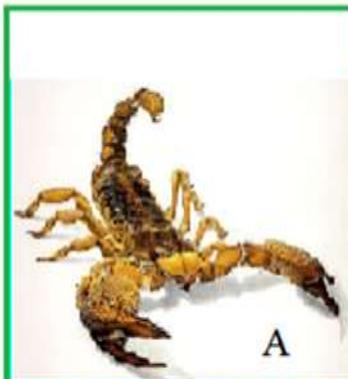
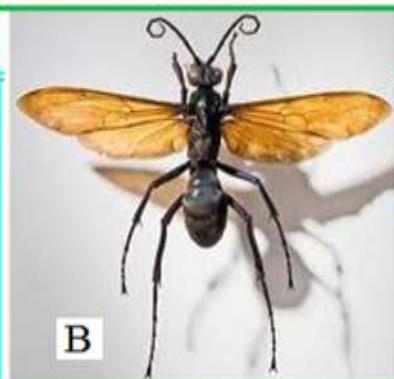
**A****B**

- a) Name the class of the plants from which the photographs were taken. (1 mark)
- b) Name the agent of pollination for the flowers in the photographs above. (1 mark)
- c) State one observation on the photographs that support your answer in (b) above. (1 mark)
- d) (i) Identify the type of ovary shown in the photographs below. (2 marks)

**X****Y**

- ii) Name the parts labeled **K** and **L**. (2 marks)
- e) Identify the type of section shown in the photographs X and Y above. (1 mark)

3. Below are drawing of various organisms. Examine them.

**A****B****D****C****E**

- i) Name the phylum to which B belongs (1 mark)
 ii) Give three reasons for your answer in (a) (i) above (3 marks)
- b) Name the class to which specimen A belongs. (1 mark)
 c) Give three differences between specimen B and E (3 marks)

Use the dichotomous key provided to identify the organism.

a) Jointed legs present.....	go to 2
b) Jointed legs absent.....	go to 7
a) Have 3 pairs of legs.....	go to 3
b) Have more than 3 pairs of legs.....	go to 5
a) With wings.....	go to 4
b) Without wings.....	Anoplura
a) Have one pair of wings.....	Diptera
b) Have two pairs of wings.....	Hymenoptera
a) Have four pairs of legs.....	Arachnida
b) Have more than 10 pairs of legs.....	go to 6
a) With one pair of legs per segment.....	Chilopoda
b) With two pairs of legs per body segment.....	Diplopoda
a) With body enclosed in a shell.....	Mollusca
b) Body surface with spiny projections.....	Echinodermata.

Identify steps followed to identify organism A, B, C, and E

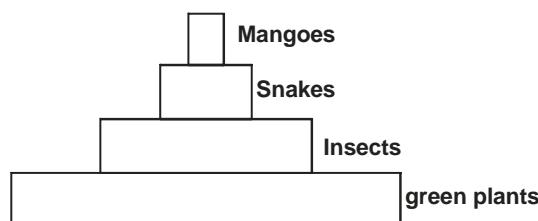
(5marks)

Specimen	Steps followed	Identity
A		
B		
D		
E		

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015*Kenya certificate of secondary education (k.c.s.e)***BIOLOGY (231/1)****MARKING SCHEME**

1. a) Ribosomes
b) Endoplasmic Reticulum
2. a) i) Diffusion
ii) Active transport
b) i) The valonia cell sap has a larger concentration of sulphate ions than the sea water.
ii) The valonia cell sap has a higher concentration of the chloride ions than the sea water.
3. a) Diffusion
b) Inside - colour turns blue-black
c) Inside - Iodine molecules diffused across the visking tubing (outside - banana molecules are large hence couldn't pass through visking tubing)
4. a) Turns food to facilitate mixing with saliva.
Facilitates formation of food onto boluses for easy swallowing.
Pushes food into the back of the mouth **Any 1st two**
b) The egg white is digested; to soluble products;// Protein is digested; to amino acids by enzyme protease;
5. A - Hydrogen ions
B - Carbon I(V oxide Rej CO₂)
C - Starch
6. a) Transpiration is the loss of water in vapour form (mainly through stomata) while gullation is loss of water in form of water droplets (through hydathodes)
b) Fig 1 - Reticulate
Fig 2 - Annular
7. a) Produce antibodies to counteract disease causing micro-organisms.
Amoeboid shape to engulf pathogens
Produces antitoxine to neutralize effect of toxins. **Any 2**
b) O+ has Rhesus factor/antigen while O- lack Rhesus factor /antigen.
8. a) Air gets into the intergral parts by the spiracles.
Spiracles are found in the thorax and abdomen; therefore since there are no structures for G.E on the head, its not possible to drown it by holding head in water.
b) Starch - sugar interconversion theory
Photosynthetic theory
Potassium-ion theory
9. a) $RQ = \frac{\text{Vol. CO}_2 \text{ produced}}{\text{Vol. O}_2 \text{ consumed}}$
 $= \frac{1}{1.43} = 0.699 \square$
 $\approx 0.7 \square$
b) To know the type of respiration
To know the type of food substrate being oxidised.
10. a) Uric acid
b) Ammonia
c) Urea
11. i) Plasma proteins are too large to filter through the blood capillaries in the glomerulus;
ii) Along the tubules water is reabsorbed while urea is not;
iii) The individual is suffering from diabetes mellitus; The pancreas doesn't secrete sufficient insulin which stimulates liver cells to convert excess glucose to glycogen /fats hence excess glucose is excreted in urine;
12. a) i) Moneral
ii) Lack of nuclear membrane (nuclear envelope/prokaryotic);
b) Places living organisms into correct groups;
Brings together living organisms with similar characteristics but separate those with different features;
Help in understanding of evolutionary relationships;
To avoid chaos and confusions; **First two**
13. a) The whole name was in capital letter;
The names were not underlined separately;
b) American periplants
14. Predation; Disease; Parasitism; Competition; food scarcity /or availability

15. a)



- b) Decrease in number of individuals in successive topic level/Increase in size of organism/animals in successive topic level; Decrease in amount of energy/biomass in successive topic level; **Max 2**

16. a) Prophale;

- b) Chromosomes have aligned themselves at the centre of the spindle fibres;

17. Destruction of the tender blood vessels of the foetus due to higher blood pressure of the maternal circulation.

Agglutination of foetal red blood cells due to incompatible blood groups of mother and foetus, both A BO and Rhesus antigen;

Transfer of pathogens from blood of mother into foetus is likely;

Waste products in the maternal blood will also get into foetal circulation; Their concentration may prove too high for the foetus; **First two**

18. Lack sap, racuole;

Have their cell wall;

Dense cytoplasm

Are non-specialised;

19. Cell Region of root tip

A N

B K

C L

D M

20. Stores genetic information in a coded form;

Enables transfer of genetic information unchanged to daughter cells

Through replication;

Translates genetic information into the characteristics of an organism through protein synthesis;

First two

21. a) RNA/Ribonucleic acid;

b) Presence of Uracil;

c) T - C - A-G-T-G-S;

22. Distortion of parts of preserved structures during sedimentation which may give wrong impression of the structure;

Destruction of fossils by geological activities such as earthquake faulting;

23. Tail power

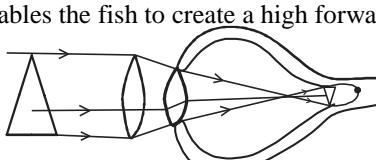
$$= \frac{\text{length from tail tip to anus} \times 100}{\text{length from tail tip to the mouth tip}}$$

$$= \frac{8 \times 100}{24}$$

$$= 33.3\%$$

- ii) It enables the fish to create a high forward thrust that propels the fish forward;

24.



converging /
convex lens

25.a) Distinguish between exocrine and endocrine glands (1mk)

Exocrine glands secrete its products into a duct whereas endocrine gland secrete hormones directly into the blood stream;

b) i) It receives sound waves from the air and transforms the sound waves into vibrations;

ii) It equalises air pressure between the middle ear and the outer ear to prevent distortion of the ear drum;

26. Support the animal body weight and give the body this shape;

Protect delicate organs eg heart; lungs and brain from mechanical injury;

Provide surface for attachment of muscles;

Some bones such as the sternum produce blood cells;

Act as a reservoir of calcium and phosphate ions in the body;

It allows body movement with the help of muscles;

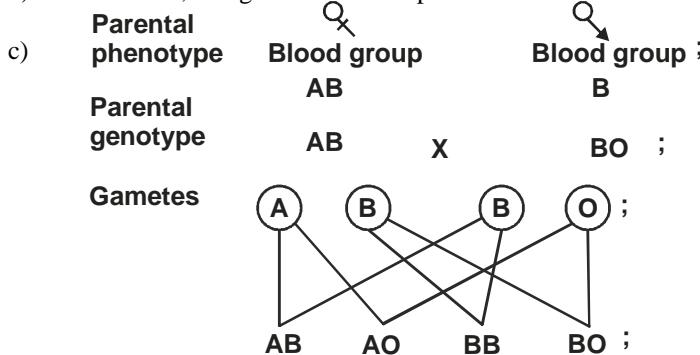
27. Ball and socket;

Hinge joint;

Pivot;

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015*Kenya certificate of secondary education (k.c.s.e)***MARKING SCHEME****BIOLOGY (231/2)**

1. a) R and C alleles are co-dominant;
R and C are dominant after B;
b) A test cross; a dog with red hair tips is crossed with a black dog (homozygous) recessive;

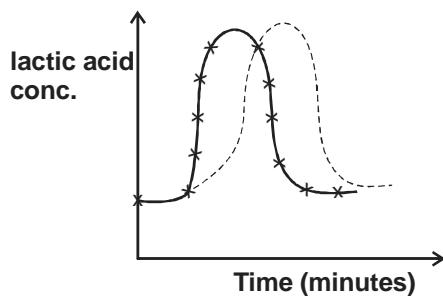


$$\text{Probability} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

2. a) i) Feeding/Nutrition;
ii) Nitrogen fixing bacteria (*Acvc:* **Rhizobium**)
iii) Denitrifying bacteria *Acc:* (*Pseudomonas denitrificans*)
iv) Nitrates
- b) i) Capture - recapture
ii) Line transect /Belt transect;
- c) Enrichment by nutrients to the water; resulting in excessive growth of algae;
3. a) i) Small intestines/ileum;
ii) Presence of finger like projections (Villi)
- b) i) Absorption of products of digestion (eg glucose, vitamins)
Its walls secret mucus that lubricates the chime;
ii)
- Has smooth muscles; that relax and contract to aid in peristalsis;
- Has goblet cells; that secret mucus to prevent autodigestion;
- Has lacteal; for absorption of fatty acids and glycerols.
- Vascularises; to enhance a steep concentration gradient for rapid absorption of digested materials.
4. a) Haptotropism/Ihigmotropism;
b) High concentration of Auxin (hormone);
Promotes faster cell elongation/expansion than the side in contact with the object; lower concentration of auxin on the side in contact leads to lower cell expansion;
- c) Enables the plants to obtain mechanical support
Negative haptotropism enables roots to move in between rocks;
- d) -Hydrotropism
- Geotropism
- Phototropism
5. a) Kidney;
b) R - Medulla; rej wrong spelling
S - Pelvis;
- c) i) Desert Rat Fish
-Large medulla -Small medulla
- Long loop of Henle - Short loop of Henle
- Small cortex surface - Large cortex surface
ii) Large medulla surface for maximum reabsorption of water; due to extensive /long loop of Henle;
d) Adrenal gland;

SECTION B

6.



- b) i) 10 - 25 minutes
- ii) Period of rapid increase in lactic acid concentration
- c) i) 10 - 20 seconds
- ii) Period when lactic acid level starts to increase
- d) i) 75 minutes ie from 25th - 100th minute
- ii) It is the time lactic acid took to decrease from the highest level to normal.
- e) It has the same basic shape but peaks slightly ahead of the lactic acid and curve in time.
- f) Because it is still diffusing out of the muscles where it was made a few minutes earlier.
- g)
 - Muscle cramps
 - Pain as the muscles contract

7. a) Adaptations of the mammalian lungs to gaseous exchange

- Surrounded by pleural membranes; to protect them from mechanical damage.
- Spongy and elastic; for contraction and relaxation hence allowing inflation and deflation.
- The pleural membranes secrete pleural fluid; that prevents them from friction with inner wall of thorax during inhalation and exhalation.
- Has numerous alveoli; to increase surface area for gaseous
- Highly vascularised /many blood capillaries; for faster transportation of respiratory gases.
- Contained in the thoracic cavity that is spacious; for excellent ventilation.
- Alveoli have thin epithelium; for fast diffusion of gases.
- Alveoli living are moist; for dissolution of respiratory gases.
- Have macrophages; that engulf and destroy any microorganisms that were not filtered in the respiratory passages.
- Its alveoli have surfactant fluid on the epithelial lining; that prevents their collapse during exhalation.

b) Role of the mammalian liner in carbohydrates metabolism.

- The liver plays an important role in regulating blood glucose level; under the influence of insulin; and glucagon hormone liver cells/hepatocytes regulate blood glucose level;
- When blood glucose level is above normal/above $90\text{mg}/100\text{cm}^3$ of blood; the pancreas secretes hormone insulin; which acts on hepatocytes to convert excess glucose for storage; converts excess glucose to fats for storage; Increase oxidation rate of excess glucose to energy, carbon IV oxide and water;
- The glucose level is thus lowered to normal;
- When blood glucose level is below normal/below $90\text{mg}/100\text{cm}^3$ of blood; the pancreas secretes glucagon hormone;
- Glucagon stimulates the liver cells/hepatocytes to: convert stored glycogen to glucose; convert stored fats to glucose; decrease the metabolism of glucose to yield energy; blood sugar level rise to normal;

8. Describe the effects of various abiotic factors in a terrestrial ecosystem to plants.

- i) **Temperature**- changes in temperature affect the rate of biochemical reactions (enzymatic or metabolic) eg photosynthesis
- ii) Light (intensity, duration and wavelength)
- Plants (green) need light energy for photosynthesis
- plants need light for flowering
- some seeds like lettuce need light for germination
- iii) Wind
- influences the rate of transpiration
- disperses fruits, seeds and spores for reproduction
- is an agent of pollination
- iv) Humidity
- influences the rate of transpiration in plants
- v) pH

-
- plants require specific pH to grow well (ie acidic, alkaline or neutral)
 - vi) Salinity
 - influences the distribution of some plant species in the ecosystem eg Only those with salt tolerant tissues grow in saline areas
eg Mangroves
 - vii) Topography
 - influences the growth of plants ie plants in the leeward side have stunted growth while plants on the windward side have normal growth.
viii) Rainfall (water)
 - affects the distribution of plant species in different areas.
 - water is needed for seed germination; absorption of minerals;] as a raw material for photosynthesis; and as a solvent for mineral salts
 - influences turgidity to bring about support in plants
 - water is needed for dispersal of some seeds and fruits.
 - ix) Pressure (Atmospheric pressure)
 - influences carbon IV oxide availability which affects photosynthesis.
 - affects the rate of transpiration
 - influences the amount of O₂/O₂ concentration hence affecting respiration.
 - x) Mineral salts
 - plants thrive best where there are enough mineral salts and in their correct proportions.
 - affect the distribution of other plant species ie insectivorous plants grow in soils deficient in nitrates hence device other methods of acquiring the nutrient.

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015*Kenya certificate of secondary education (k.c.s.e)***MARKING SCHEME**

1.

Specimen	Observations
B1	A lot of foam/effervescence formed
B2	No foam formed/effervescence formed
C	Very little foam/effervescence formed

b) **Accounting for observations**

B1 produced a lot of foam, None in B2 and very little in C because B1 contained active catalyse which was hydrolysing. Hydrogen peroxide; Catalyse in Be had been denatured /destroyed by boiling so no foam formed; C had very little effervescence because tissue C contained very little catalyse due to less metabolism in the organ; **3mks**

c) i) Glowing splint rekindles; **1mk**During hydrolysis of hydrogen peroxide water + oxygen are produced. **1 mk**ii) $2\text{H}_2\text{O}_2 \xrightarrow{\text{Catalyse}} 2\text{H}_2\text{O} + \text{O}_2$ **1 mk**iii) No net change/No effervescence observed. **1mk**Catalyase does not hydrolyse water. **1mk**d) To increase the surface area; for enzymatic reaction; **2 mks**

e) Hydrogen peroxide is very toxic and if allowed to accumulate in the body tissues it would poison the cells leading to stoppage of metabolism and death of the cells and the organism.

2. - Monocotyledonae

Reason - Floral parts in three's or multiples of three (Can specify the floral part)
- Parallel venation leaves.

B - Dicotyledonae

Reason - Floral parts in 5's or multiples of fives. (Can specify the floral part)
- Leaves net venation

b) Insect

c) Brightly coloured petals, to attract insects.

d) X- Inferior ovary/epigenous ovary

Y- Superior ovary/hypogenous

K- Style

L- Ovary

e) Longitudinal section

3.

a) B- Arthropoda

Reason

- Has exoskeleton
- Jointed appendage
- Segmented body
- Has compound eye
- Has antennae

b) A-Arachnida

c)

B	E
Has wings 3 body parts Large compound eyes Long antennae	Wings absent 2 body parts Small compound eyes Short antennae

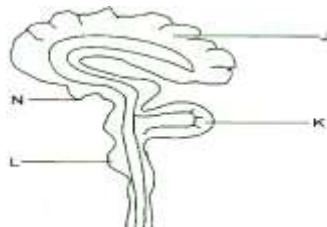
d)

organism	Steps followed	Identity
A	1a,2b,5a	Arachnida
B	1a,2a,3a,4b	Hymenoptera
D	1a,2b,5b,6a	Chilopoda

BELOW ARE REVISION EXERCISES

MERU JOINT EVALUATION.**231/ 1****BIOLOGY****PAPER 1 (THEORY)****JULY/ AUGUST 2015**

1. Name the organelle that is involved in each of the following: (2 marks)
 a) Manufacture of lipids. (1 mark)
 b) Formation of lysosomes. (2 marks)
2. State the functions of the following parts of human digestive system. (2 marks)
 i. Colon
 ii. Rectum
3. a) Give two advantages of metamorphosis in insects. (2 marks)
 b) Name the hormone responsible for metamorphosis in insects. (1 mark)
4. Name a hereditary defect of blood that interferes with the following in the human body: (1 mark)
 a) Respiration (1 mark)
 b) Blood clotting (3 marks)
5. State three protective functions of mammalian blood. (2 marks)
6. State three roles of fruits to plants. (2 marks)
7. The diagram below shows a vertical section through human brain.



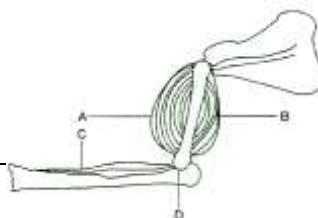
- a) Name the part labeled K (1 mark)
- b) State why the part labeled J is large and highly folded. (1 mark)
- c) Give a letter on the diagram which:
 i. Serve as endocrine gland (1 mark)
 ii. Control breathing, swallowing and blood circulation (1 mark)
8. State the roles played by the following structures in gaseous exchange.
 i. Operculum (1 mark)
 ii. Epiglottis (1 mark)
9. What is meant by the term adaptive radiation. (2 marks)
10. Name the disease characterized by:
 i. Glycosuria (1 mark)
 ii. Diuresis (1 mark)
11. The diagram below shows a transverse section of plant stem.



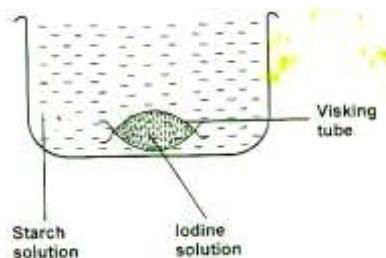
- a) Suggest the habitat of the plant from which the section was obtained. (1 mark)
- b) Give a reason for your answer in (a) above. (1 mark)
12. Explain why plant roots require oxygen for uptake of ions. (2 marks)
13. State three main differences between the classes gymnospermae and angiospermae. (3 marks)

Gymnospermae	Angiospermae

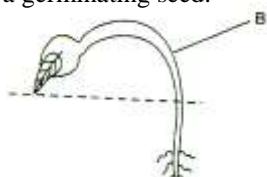
14. Diagram below shows a section of mammalian skeleton.



- (a) Name bone labeled C (1 mark)
 (b) What happens to structure A and B as the arm is straightened. (1 marks)
 (c) Name type of joint represented by D (1 mark)
15. Give an example of bacteria that:
 a) Converts nitrites to nitrates. (1 mark)
 b) Converts ammonia in soil into nitrates. (1 mark)
 c) Reduces or breakdown nitrates into Nitrogen gas. (1 mark)
16. State three factors that affect the rate of respiration. (3 marks)
17. Identify three causes of chromosomal mutations. (3 marks)
18. State functions of the following named parts of a microscopes.
 i. Condenser (1 mark)
 ii. Diaphragm (1 mark)
 (b) Under which of the following microscope magnification would one see a larger part of a specimen, X40 or X400? Explain your answer. (2 marks)
19. Study the following diagram and answer the questions that follow:



- i. Name the physiological process being investigated. (1 mark)
 ii. State expected results at the end of the experiment. (1 mark)
 iii. Explain your answer in (ii) above. (1 mark)
20. State one function of each of the following hormones:
 i. Oxytocin (1 marks)
 ii. Progesterone (1 marks)
 iii. Prolactin (1 mark)
21. a) Name the strengthening materials found in each of the following cells:
 i. Collenchyma (1 mark)
 ii. Sclerenchyma (1 mark)
 (b) State where glenoid cavity is found in the human skeleton. (1 mark)
22. The diagram below shows a germinating seed.



- i. Name the type of germination exhibited above (1 mark)
 ii. Name the part labelled B (1 mark)
 iii. State two functions of part labelled B. (2 marks)

23. State two ways on how epithelial cells found in trachea are adapted to their functions.
 24. Give three differences between white blood cells and red blood cells.

White blood cells	Red blood cells

MERU JOINT EVALUATION.

231/2

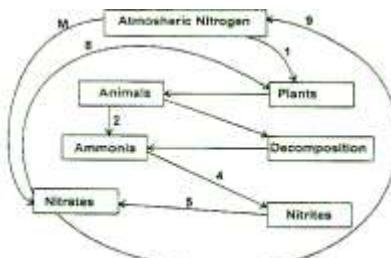
BIOLOGY

PAPER 2 (THEORY)

JULY/ AUGUST 2015

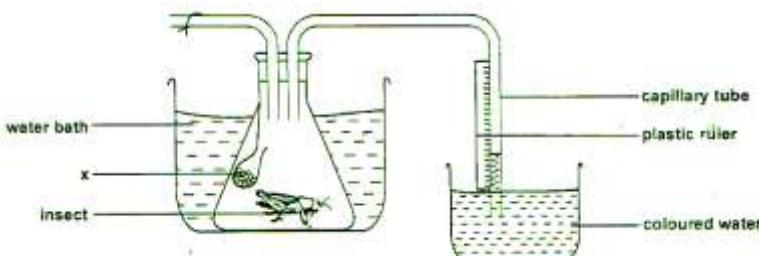
1. The equation below shows a chemical reaction that takes place in green plants under certain conditions.
 $\text{Carbon(iv)oxide} + \text{water} \rightarrow \text{glucose} + \text{X}$
- a) What is the name of substance X. (2 marks)
 b) Other than the reagent, state two conditions necessary for this reaction. (2 marks)
 c) Name two types of cells in which this process occurs. (2 marks)
 d) Name the process represented by the equation given above. (2 marks)
 e) State two importance of the process above. (2 marks)

2. (a) Name one disorders in human caused by gene mutation. (1 mark)
 (b) Describe the following chromosomal mutations.
 i. Inversion
 ii. Translocation
 (c) In maize the gene for purple colour is dominant to the gene for white colour. A pure breeding maize plant with purple Grains were crossed with heterogynous plant.
 i. Using letter N to represent the gene for purple colour, work out the genotype. (4 marks)
3. The diagram below represents a simplified nitrogen cycle in an ecosystem.

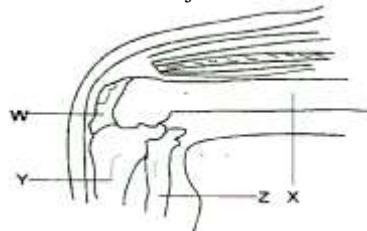


- (a) Name the process represented by letters 2,4,8 and 9. (2 marks)
 (b) Explain how process M takes place. (2 marks)
 (c) Explain why process 1 is described as a symbiotic relationship. (2 marks)
 (d) Explain the human activity which interferes with process 1 and 5. (2 marks)

4. The diagram below illustrates an experiment to determine the rate of respiration in small insect.



- a. Name the chemical compound labeled X and state its functions. (2 marks)
 b. Why is it necessary to place the flask in a water bath? (1 mark)
 c. What changes would you expect to observe in the level of coloured water in the capillary tube after the experiment has run for five minutes. (1 mark)
 d. Explain the changes you have stated in (c) above. (3 marks)
 e. State how you set up a control experiment. (1 mark)
5. The diagram below represents bones at a joint in the hind limb of a mammal.



- (a) Names the bones labeled (3 marks)
 (b) (i)Name the substance found in the place labeled W. (1 mark)
 (ii)State the functions of the substance named in (b)(i) above. (1 mark)
 (c) Name the structure that joins the bones together at the joint. (1 mark)
 (d) State the difference between ball and socket joint and the one illustrated in the diagram above. (1 mark)
 (e) Name the structure at the elbow that performs the same function as the patella. (1 mark)

- SECTION B:(40 MARKS)**
 6. A hungry person had a meal, after which the concentration of glucose and amino acids in the blood were determined. This was measured hourly as the blood passed through the hepatic portal vein and the iliac vein in the leg. The results were as shown in the table below.

Time (hrs)	Concentration of contents in hepatic portal vein (mg/100ml)		Concentration of contents in the iliac vein of the leg (mg/100ml)	
	Glucose	Amino acids	Glucose	Amino acids
0	85	1.0	85	1.0
1	85	1.0	85	1.0
2	140	1.0	125	1.0
3	130	1.5	110	1.5
4	110	1.5	90	3.0
5	90	3.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0

- (a) Using the same axes draw graph of concentration of glucose in the hepatic portal vein and the iliac vein in the leg against time. (7 marks)
- (b) Account for the concentration of glucose in the hepatic vein from:
- (i) 0-1 hour (2 marks)
 - (ii) 1-2 hours (3 marks)
 - (iii) 2-4 hours (3 marks)
 - (iv) 5-7 hours (2 marks)
- (c) Account for the difference in the concentration of glucose in hepatic portal vein and the iliac vein between 2 and 4 hours.
- (d) Using the data provided in the table explain why the concentration of amino acids in the hepatic portal vein took longer to increase. (1 mark)
- 7 (a) Describe how insect pollinated flowers are adapted to pollinate. (10 marks)
- (b) Describe the exoskeleton and its functions in insects. (10 marks)
- 8 (a) Describe how oxygen in the alveoli reaches the red blood cells. (4 marks)
- (b) Explain how xerophytes are adapted to their habitats (16 marks)

MERU JOINT EVALUATION.**231/ 3****BIOLOGY****PAPER 3 (PRACTICAL)****JULY/ AUGUST 2015**

1. You are provided with a specimen labelled Z which was grown in the dark. Examine the specimen.
- (a) Draw and label all the observable parts of the specimen (5 marks)
- (b) State the functions of any three parts you have labelled (3 marks)
- | Name of the part | Function |
|------------------|----------|
| | |
- (c) Remove the grains from the specimen. Crush it and carry out the following tests. Record your observations and conclusions in the table below.
- | Test | Observation | Conclusion |
|---|-------------|------------|
| Add a drop of iodine solution to a portion of the crushed grain on the white tile | | |
| Place another portion of the crushed grain in a test tube. Add 1 cm ³ of Benedict's. Shake the mixture and heat. | | |
- (d) Account for your results in (c) above. (4 marks)
2. You are provided with a specimen labelled K.
- (a) Using observable features only, identify the class to which the specimen belongs. (1 mark)
- (b) List the observable features used to identify the class which the specimen belongs. (4 marks)
- (c) State the specimen on the lateral side from the head end to the tail end. Repeat the stroking from the tail to the head end.
- i. Record your observations. (2 marks)
 - ii. Observe the arrangement of the scales. Record your observations. (2 marks)
 - iii. State the significance of the arrangement of the scales. (2 marks)
- (d) Measure in millimeters the length of the:
- i. Specimen from the tip of the mouth to the top of the tail. (1 mark)
 - ii. Tail from the anus to the tip of the tail (1 mark)
 - iii. Using the measurements in d(i) and (ii) above, calculate the tail power. (2 marks)
3. Fill in the table below appropriately.
- (b) Name type of placentation found in specimen M4. (1 mark)

SPECIMEN	MODE OF DISPERSAL	ADAPTATION
M1		
M2		
M3		
M4		

WESTLANDS DISTRICT JOINT EXAMINATION 2015*kenya certificate of secondary education***231/1****BIOLOGY****PAPER 1****JULY / AUGUST 2015****2 HOURS.**

- Give two reasons why Cavolus Lennaeus preferred the use of Latin language in scientific of living organisms. (2 marks)
- (a) A certain animal has no incisors, no canines, 6 premolars and 6 molars in its upper jaw. In the lower jaw, the animal has 6 incisors, 2 canines, 6 premolars and 6 molars. Write its dental formula. (1 mark)
- (b) Name two salivary glands in human beings. (2 marks)
- State how the following parts of the reproductive system of mammals are adapted to their functions.
 - Fallopian tube. (1 mark)
 - Epididymis (1 mark)
- Below is a diagram of a plant structure.

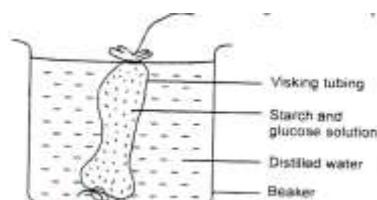


- (a) Identify the structure. (1 mark)
- (b) Name the type of lignification pattern indicated in the diagram. (1 mark)
- (c) Apart from transport, state the other function of the structure in plants. (1 mark)
- (a) State the importance of gaseous exchange in animals. (1 mark)
- (b) State two precautions followed when collecting biological specimens. (2 marks)
- (a) Name one cardiovascular disease in humans. (1 mark)
- (b) If the nerve supply to the heart of a mammal is severed, the rhythmic heart contraction and relaxation will go on and heart continues to beat. Explain. (1 mark)
- (a) State the function of the nucleolus in a cell. (1 mark)
- (b) A form one student trying, to estimate the size of onion epidermal cells observed the following on a microscope field of view. The marks are millimetre marks of a ruler.



If the student counted 15 cells across the field of view, calculate the size of one cell in micrometres. (2 marks)

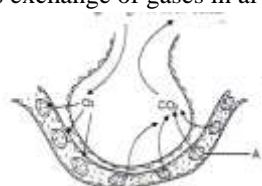
- An experiment set up shown below was used to investigate a certain process.



After 20 minutes, a student tested the sample from the boiling tube for starch and glucose and recorded the results as shown in the table below.

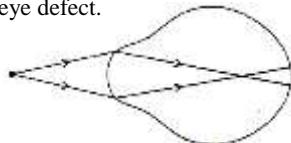
Time/min	Start	After 20 minutes
Starch	Absent	Absent
Glucose	Absent	Absent

- (a) What physiological process was being investigated? (1 mark)
- (b) Explain the presence of glucose in the beaker after 20 minutes. (2 marks)
- The diagram below shows exchange of gases in alveoli.



- (a) State how the alveoli are adapted to their function. (3 marks)
- (b) Name the cell labelled A. (1 mark)
- (a) Explain why the body temperature of a healthy person rises slightly during hot humid day. (2 marks)

- (b) Name the hormone that is produced when the osmotic pressure of the body fluid rises above normal. (1 mark)
11. The diagram below shows an eye defect.



- (a) Identify the eye defect. (1 mark)
 (b) How can the above defect be corrected? (1 mark)

12. The following table shows the estimate number of organisms recorded in a dam.

Organisms	Number
Small fish	3500
Microscopic algae	12000
Crocodile	100
Large fish	950
Mosquito larvae	8900

- (a) Construct a possible food chain for the dam. (1 mark)
 (b) Construct a pyramid of numbers for the given information. (1 mark)
 (c) Explain the shape of pyramid. (2 marks)

13. In evolution:

- (a) What are vestigial structures? (1 mark)
 (b) Distinguish between homologous and analogous structures. (1 mark)
 (c) Name two examples of analogous structures. (2 marks)

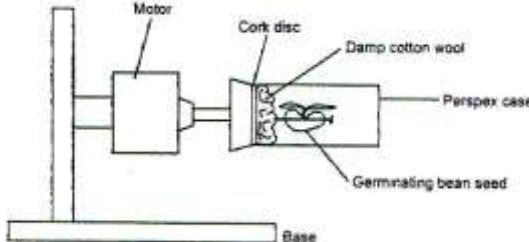
14. Equal amounts of crushed Irish potato was placed in equal volumes of hydrogen peroxide solution at indicated PH. The volume of the gas was measured and recorded in the table below.

PH	4.0	7.0	9.0
Volume of gas (cm) ³	2.7	5.7	7.7

- (a) Name the gas that was produced. (1 mark)
 (b) Account for the difference in the volume of gas produced at PH 4.0 and PH 9.0. (2 marks)

15. (a) State two events that occur during anaphase II of meiosis.
 (b) What is heterostyly?

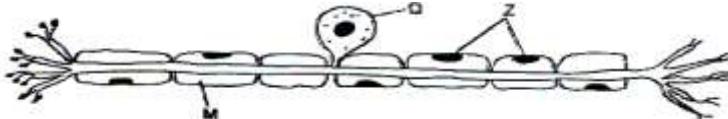
16. In the experiment below, a germinating bean seed was pinned horizontally inside a klinostat.



- (a) State the response that was being investigated in the experiment. (1 mark)
 (b) Using a diagram, explain what you would expect to observe after 3 days if the klinostat was rotating slowly. (3 marks)

17. Explain the adaptation of collenchyma as a tissue in plants. (2 marks)

18. The diagram below represents a nerve cell.

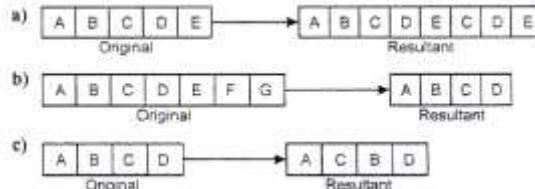


- (a) (i) Identify the type of neurone above. (1 mark)
 (ii) Give a reason for your answer in (i) above. (1 mark)
 (b) Name the parts labelled: Q,Z (2 marks)

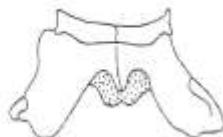
19. What happens to lactic acid after being produced in the body during anaerobic respiration? (3 marks)

20. (a) Name the products of light stage of photosynthesis. (1 mark)
 (b) State the part of the chloroplast where carbon (IV) oxide fixation occurs. (1 mark)

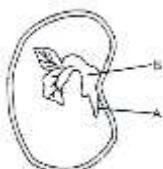
21. Below are some representations of chromosomal mutations. Identify each one of them. (3 marks)



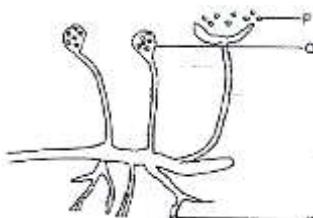
- 22.



- (a) Identify the bone drawn above. (1 mark)
 (b) Name the type of joint formed by the bone above. (2 marks)
23. The diagram below shows the internal structure of a broad bean seed. Study and answer the questions that follow.

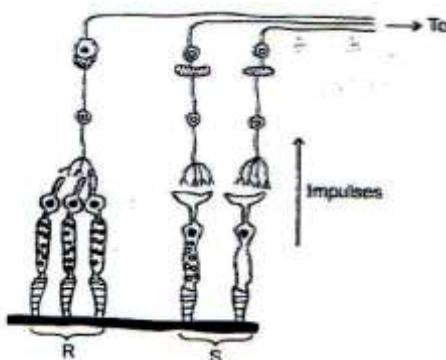


- (a) Name the part labelled B. (1 mark)
 (b) Why is it important that the part labelled A develops first during germination. (2 marks)
24. State the role of the following hormones in metamorphosis. (2 marks)
- (a) Juvenile hormone.
 (b) Ecdysone
25. State two structural modifications of xerophytes. (2 marks)
26. The diagram below illustrates the structure of bread mould.



- a) To which kingdom does the organism shown belong? (1 mark)
- b) Name the part labelled P and Q (1 mark)
- c) State the function of structure labelled K. (1 mark)

27. The diagram below shows photoreceptor cells in the retina



- (a) Name the parts labelled R and S. (2 marks)
 (b) i) What is the visual acuity? (1 mark)
 ii) Which of the two structures R and S show retinal convergence? (1 mark)

WESTLANDS DISTRICT JOINT EXAMINATION 2015

Kenya certificate of secondary education

231/2

BIOLOGY

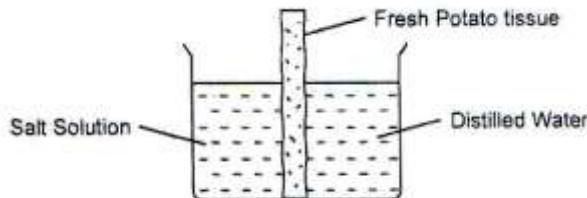
PAPER 2

JULY / AUGUST 2015

2 HOURS.

1. A common species of rats has individuals with white, black or grey coats. During a study, a rat with white coat was crossed with a rat with black coat. Both parents were homozygous. All the offsprings in the F1 generation had grey coats. Using letter B to represent the gene for black coat and W for white coat, answer the questions that follow.
- a) Work out the phenotypes of the F1 generation. (4 marks)

- b) Give a genetic explanation of the nature of the offsprings in the F1 generation. (2 marks)
- c) State the significance of a test cross in genetics. (1 mark)
- d) Name one example of a characteristic in man that is transmitted by multiple alleles. (1 mark)
2. a) State four structural differences between skeletal muscles and smooth muscles. (4 marks)
- b) Name the cartilage found between the bones of the vertebral column. (1 mark)
- c) What are the functions of the cartilage named in d (ii) above. (3 marks)
3. The diagram below shows experimental set up to demonstrate a physiological process.



- a) State the physiological process being investigated. (1 mark)
- b) Explain the results obtained if the set up was left to stand for 30 minutes. (5 marks)
- c) State two functions of active transport in animals. (2 marks)
4. a) State the functions of the following parts of the ear. (1 mark)
- i) Tympanic membrane (1 mark)
- ii) Eustachian tube (1 mark)
- iii) Vestibular apparatus (1 mark)
- b) i) Define tropic response (1 mark)
- ii) What is the importance of tropic responses? (3 marks)
- c) State one role of meninges. (1 mark)
5. a) Name the two substances which are found in the intercellular air spaces in a green leaf during a hot sunny day. (2 marks)
- b) Name the gaseous exchange structure found in the: (1 mark)
- i) Stem of a mesophyte plant. (1 mark)
- ii) Root of aquatic halophytes. (1 mark)
- iii) Terrestrial insects. (1 mark)
- c) State three ways in which the gill filaments are adapted to their functions. (3 marks)

SECTION B: (40 MARKS)

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

6. An experiment to determine the relationship between moisture content of seeds and respiration rate during germination of wheat grains was carried out and the following results were obtained.

% moisture content	6.5	7.0	7.5	8.0	8.5	9.0
Respiration rate	0.3	0.4	0.4	0.5	1.5	6.5

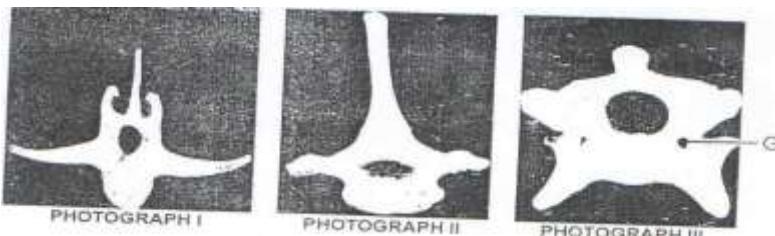
- a) On a graph paper, plot a graph of respiration rate against the percentage moisture content. (6 marks)
- b) Account for the shape of your graph at a moisture content of: (1 mark)
- i) 6.5-7.5(3 marks)
- ii) 7.5-9.0(3 marks)
- c) Suggest how respiration rate might have been determined. (1 mark)
- d) How would the moisture percentage of seeds affect grain storage? (2 marks)
- e) How does lack of moisture affect germination? (1 mark)
- f) Name and explain two other factors that affect the germination process. (4 marks)
7. (a) Identify each of the following responses described below: (1 mark)
- i) Whenever a bell is rung, a dog is presented with a meal. After several days of practice, the dog would salivate once the bell is rung even if food is not available. (1 mark)
- ii) A person coughs whenever a foreign particle irritates the respiratory tract. (1 mark)
- iii) State four differences between the responses you have stated in a (i) and (ii) above. (4 marks)
- (b) During a voting exercise, tension was high. One of the aspirants was furious and wanted to face a very aggressive opponent. Explain the physiological changes that occur in his body to prepare him for the fight. (14 marks)
8. (a) Transpiration in plants is a necessary evil. State four advantages of this process to plants. (4 marks)
- (b) Explain how structural features in terrestrial plants affect their rate of transpiration. (16marks)

WESTLANDS DISTRICT JOINT EXAMINATION 2015*kenya certificate of secondary education***231/3****BIOLOGY****PAPER 3****JULY / AUGUST 2015**

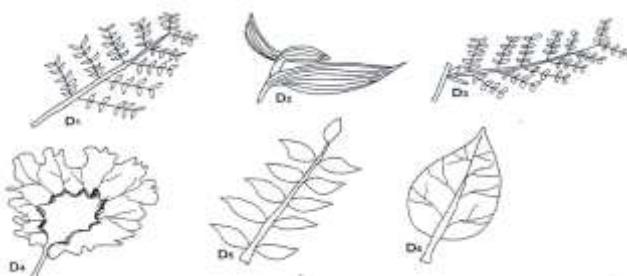
1. a) State one role played by specimen Q in the life of the plant from which it was obtained. (1 mark)
- b) Cut two equal cubes whose sides are about 1cm from specimen Q. Place one of the cubes into a boiling tube labelled A. Crush the other cube using a mortar and pestle. Place the crushed material in another boiling tube labelled B.
- i) Record your observations. (2 marks)
- ii) Account for your results in (c) (i) above. (2 marks)
- iii) Write an equation for the breakdown of hydrogen peroxide. (1 mark)
- c) Peel half of specimen Q and crush in a mortar then add little water to make a thick paste. Use the reagents provided to test for the various food substances in the extract obtained from the crushed material.
- Record the procedures, observations and conclusions in the table below. (9 marks)

Food substance	Procedure	Observations	Conclusion

2. Below are photographs I, II and III of anterior view of three different types of vertebrae obtained from the same mammal. Study them carefully and answer the questions that follow.



- a) Identify each of the vertebrae. Give a reason in each case.
- i) Vertebrae in photograph I (1 mark)
Reason (1 mark)
- ii) Vertebrae in photograph II (1 mark)
Reason (1 mark)
- iii) Vertebrae in photograph III (1 mark)
Reason (1 mark)
- b) State three differences between the vertebrae in photograph I and II. (3 marks)
- c) Identify the part labelled G in the vertebra in photograph III. (1 mark)
- d) Name the region of the body of the mammal from which the vertebra in photograph III was obtained. (1 mark)
- e) Explain how the vertebra in photograph I is normally adapted to perform its function. (3 marks)
3. You are provided with seven photographs of plant specimens. They are labelled specimen D₁, D₂, D₃, D₄, D₅, D₆.



- a) Use the dichotomous key to identify the taxonomic group of seven specimens in the photographs provided. (10 marks)
- The dichotomous key
- | | |
|--|---------------|
| 1. a) Leaves compound | go to 2 |
| b) Leaves simple..... | go to 5 |
| 2. a) Leaves pinnate | go to 3 |
| b) Leaves bipinnate..... | go to 4 |
| 3. a) Leaflets attached to many small
Stalks that joint a main one..... | go to 3 |
| b) Leaflets attached at one stalk..... | Rosaceae |
| 4. a) Leaflets with pointed apex | Bignoniaceae |
| b) Leaflets with rounded apex..... | Mimosaceae |
| 5. a) Leaf with network vein | go to 6 |
| b) Leaf with parallel vein..... | Commelinaceae |

6. a) Leaf margin smooth Anacardiaceae
 b) Leaf margin rough..... Geranaceae
 a)

Specimen	Steps followed	Identity
D ₁		
D ₂		
D ₃		
D ₄		
D ₅		

- b) Name the class of the plant from which specimen D₂ was obtained. (1 mark)

VIHIGA COUNTY JOINT EXAMINATION 2015

Kenya certificate of secondary education (k.c.s.e)

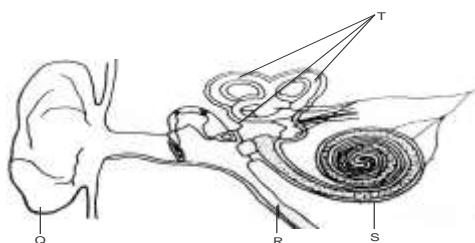
231/1

BIOLOGY

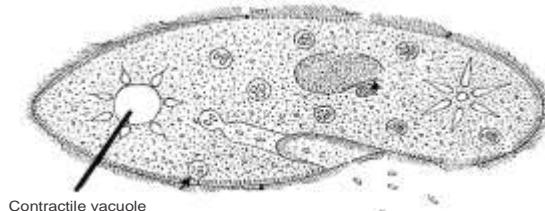
PAPER 1

JULY/AUGUST 2015

1. List two skills acquired during the study of Biology. (2 marks)
 2. The diagram below represents a section through the mammalian ear.



- a) Name the structures labelled R and T. (2 mark)
 b) State how the structures Q and S are adapted to their functions. (2 mark)
 3. Give **two** ways in which endosperms lose heat to the external environment. (2 marks)
 4. What is natural selection? (2 marks)
 5. The diagram below represents a certain aquatic organism.

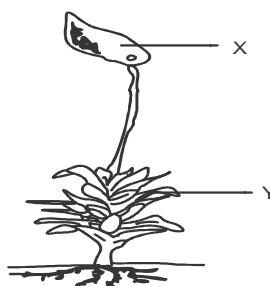


- a) Identify the kingdom to which it belongs. Give a reason for your answer.
 Kingdom (1 mark)
 Reason (1 mark)
 b) How is the above organism adapted for locomotion? (2 marks)
 6. The diagrams below shows a cell obtained from a mammalian and immersed into a certain solution for 30 minutes.



- a) Identify the cell above. (1 mark)
 b) Account for the shape of the cells:
 i) At the beginning of the experiment. (1 mark)
 ii) At the end of the experiment. (2 marks)
 7. State with a reason what would happen to a cell if its nucleus was removed.
 8. a) Write a **chemical equation** representing the light stage of photosynthesis. (1 mark)
 b) State the site where each of the following stages of photosynthesis takes place.
 Dark stage (1 mark)
 Light stage..... (1 mark)
 9. a) Name **two** nutrients that do not require digestion before they are absorbed. (2 marks)

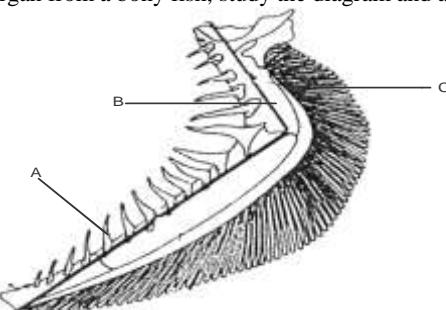
- b) What is assimilation? (1 mark)
10. a) Give reasons why the left ventricle muscles are thicker than the right ventricle muscles. (2 marks)
- b) State the form in which carbon (IV) oxide is transported in the blood.
11. The diagram below represents a certain organism.



- a) Identify the taxonomical division to which it belongs (1 mark)
- b) Name the reproductive structures found in the part labelled X (1 mark)
- c) Give one function of the part labelled Y . (1 mark)
12. Explain how the following adaptations reduce transpiration in xerophytes.
- a) Reversal stomatal opening (2 marks)
- b) Thick wall cuticle (2 marks)
13. In an experiment, 20 live blowfly larvae were placed into a tube at point X as shown in diagram I. After one hour, the larvae were found to have distributed themselves as shown in the diagram II below.

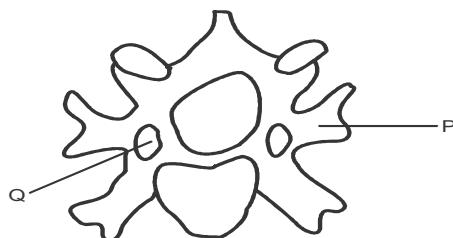


- a) Name the type of response being investigated in diagram II. (1 mark)
- b) State **two** survival values of the response named in (a) above to the larvae. (2 marks)
14. a) What is sex linkage? (2 marks)
- b) Name **two** sex-linked characteristics in humans. (2 marks)
15. Name **three** mechanism that hinder self-fertilization in flowering plants. (3 marks)
16. Explain why individuals with smaller sizes require more energy per kg of body weight than those with larger sizes? (2 marks)
17. State the importance of placenta and amniotic fluid during pregnancy.
- Placenta (1 mark)
Amniotic fluid (1 mark)
18. a) Distinguish between **divergent** and **convergent** evolution. (2 marks)
- b) Give **two** examples of **Natural selection** in action today. (2 marks)
19. Name the meristematic tissues responsible for:
- a) Primary growth (1 mark)
- b) Secondary growth (1 mark)
20. The diagram below represents an organ from a bony fish, study the diagram and answer the questions that follow.



- a) State the functions of each of the following A and B. (2 marks)
- b) How is the structure labelled C adapted to its functions? (1 mark)
21. Give the functions of the following parts of a light microscope.
- i) Objective lens (1 mark)
- ii) Condenser (1 mark)
22. During a strenuous exercise, the chemical process represented by the equation below takes place in human muscles.
- $$\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{CH}_3\text{CH}(\text{OH})\text{COOH} + 150\text{KJ}$$
- a) Name the process represented above. (1 mark)
- b) Distinguish between **glycolysis** and **Kreb's cycle**. (2 marks)
- c) Give **two** economic importance of the above process in plants. (2 marks)
23. During estimation of cell sizes using a light microscope, a student found out the diameter field of view to be 2.7mm and diameter of the field had 9 cells. The magnification was X50. Calculate the actual length of one cell in microns. (3 marks)

24. State the functions of the following fins of a bony fish.
 i) Dorsal fin (1 mark)
 ii) Pelvic and pectoral fin (1 mark)
25. The diagram below represents the anterior view of a vertebra. Study it and answer the questions that follow.



- a) i) Name the identity of the vertebra. (1 mark)
 Identity
 ii) State the function of each of the structures labelled P and Q. (2 marks)
26. a) What is transpiration? (1 mark)
 b) Give the importance of transpiration in plants. (2 marks)
27. Distinguish between **habitat** and **ecological niche**. (2 marks)

VIHIGA COUNTY JOINT EXAMINATION 2015

Kenya certificate of secondary education (k.c.s.e)

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BIOLOGY

PAPER 2

JULY/AUGUST 2015

TIME: 2 HRS

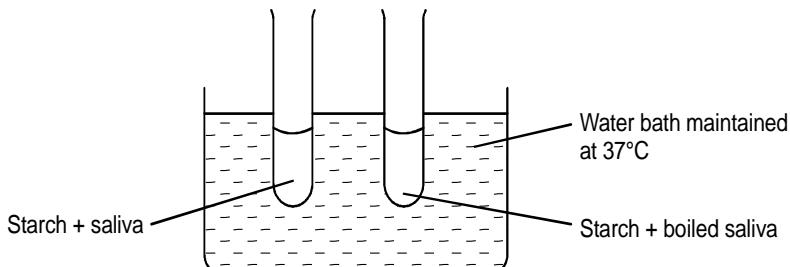
SECTION A (40 MARKS)

Answer ALL the questions in the spaces provided

1. a) Name a metabolic waste product transported in blood but is not eliminated by the kidneys in humans. (1mark)
 b) Give **two** significances of leaf fall in plants. (2 marks)
 c) The table below shows a description of sizes of glomeruli and renal tubules of two animals x and y. Which are adapted to living in different environments.

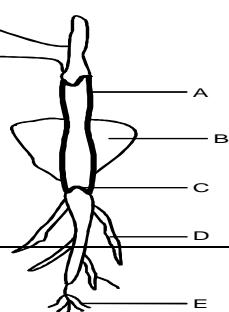
	Animal X	Animal Y
Glomeruli	Large and few	Small and many
Renal tubules	Short	Long

- i) Name the likely habitat in which animal X lives. (1 mark)
 ii) Name the main nitrogenous waste product produced by animal Y. (1 mark)
 d) Explain why eating a meal with too much salt leads to production of small volume of concentrated urine. (3 marks)
2. In an experiment to investigate an aspect of digestion, two test tubes A and B were set up as shown in the diagram below.



The test tubes were left in the water bath for 30 minutes. The content of each test tubes was then tested for starch using reagent X.

- a) Give the identity of reagent X. (1 mark)
 b) What was the aim of the experiment. (1 mark)
 c) What results were expected in test tubes A and B. (2 marks)
 d) Account for the results you have given in (c) test tubes A and B. (3 marks)
 e) Why was the water bath maintained at 37°C. (1 mark)
3. The diagram below represents a maize seedling.



- a) Name the structures labelled A and C. (2 marks)
- b) State the functions of B, C and D. (2 marks)
- c) Name the type of germination exhibited by a bean..... (1 mark)
- d) Name one condition within the seed necessary for seed germination. (1 mark)
- e) What is the role of oxygen in seed germination? (1 mark)
4. a) Explain why blood from a donor whose blood group is A cannot be transfused into a recipient whose blood group is B. (6 marks)
- b) State **two** ways by which the white blood cells defend the body against infection. (2 marks)
5. a) A black mouse was crossed with a brown mouse. A half of the offspring were black and the other half brown. Using letter B to represent the gene for black colour and b for the gene of brown colour, work out the genotype ratio of F1 generation. (5 marks)
- b) State **one** method of establishing unknown genotypes. (1 mark)
- c) Give the difference between co-dominance and partial dominance. (2 marks)

SECTION B (40 MARKS)

Answer question 6 compulsory in the spaces provided and either question 7 or 8 on the spaces provided after question 8.

6. An experiment to investigate the population growth of a certain type of paramecium was carried out. Two Petri dishes labelled X and Y were used. Into the Petri dish labelled X, 60ml of a culture medium was added while 15ml of the same culture medium was added to Petri dish labelled Y. Equal numbers of paramecium were introduced in each Petri dish. The set ups were incubated at 35°C. The number of paramecium in each Petri-dish was determined at regular intervals for a period of 60 hours and the results recorded in the table below.

Time in hours	Population of paramecium	
	In Petri dish X	In Petri dish Y
0	40	40
5	40	40
10	200	120
15	320	200
20	800	600
25	1400	680
30	1720	600
35	1600	560
40	1800	600
45	1760	600
50	1400	600
55	1000	480
60	600	400

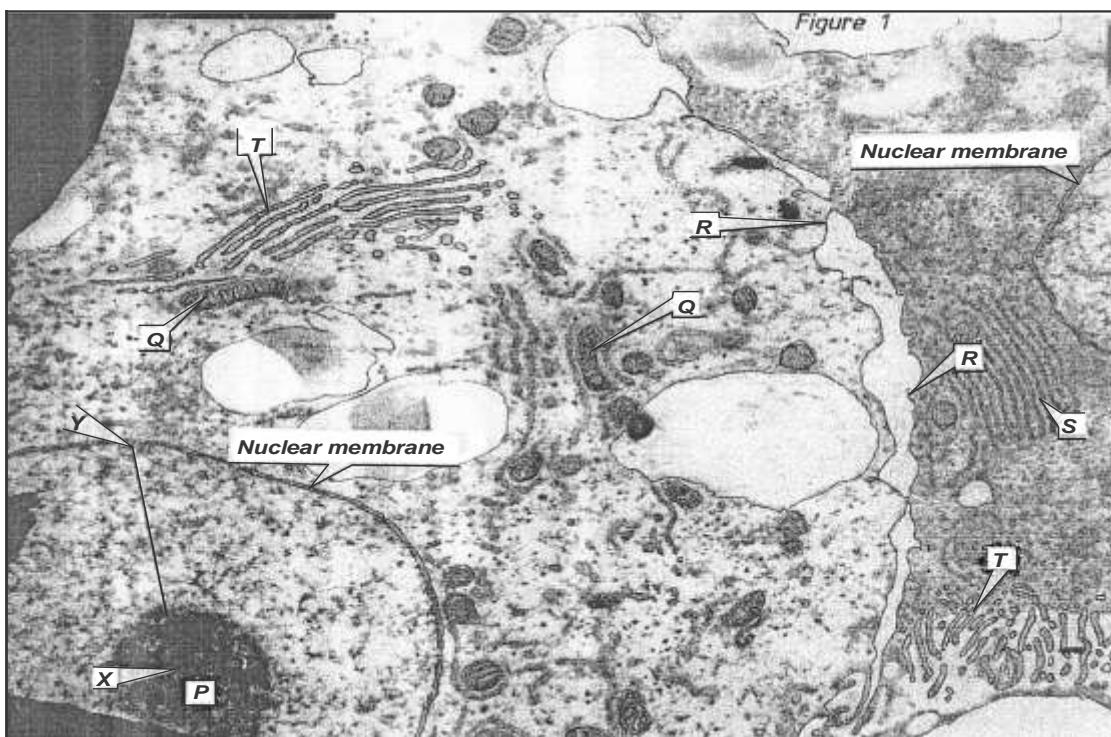
- a) Using the same axes, draw graphs of relative number of paramecium against time. (7 marks)
- b) After how many hours was the difference in the two populations greatest. (1 mark)
- c) Determine the rate of population growth between 12 and 22 hours in petri dish Y. (2 marks)
- d) Account for the shape of curve X between;
- i) 0 - 5 hours (2 marks)
 - ii) 10 - 30 (2 marks)
 - iii) 45 - 60 hours (2 marks)
- e) State two factors that affect human population growth in Kenya. (2 marks)
7. a) Discuss how gaseous exchange occurs in Tilapia. (10 marks)
- b) Describe the process of inhalation in mammals. (10 marks)
8. a) Describe phototropism and its significance to survival of flowering plants. (10 marks)
- b) Describe a reflex action that will lead to withdrawal of a hand from a hot object. (10 marks)

VIHIGA COUNTY JOINT EXAMINATION 2015**Kenya certificate of secondary education (k.c.s.e)****231/3****BIOLOGY****Paper 3****(Practical)****July/August 2015**

- 1.** You are provided with a specimen labeled X. Use it to answer the questions that follow.

- Identify the class to which the organisms belongs. (1 mark)
- List **three** observable features used in the identity. (3 marks)
- Stroke the specimen from head to tail then from tail to head and record your observations. (2 marks)
 - Head to tail (2 marks)
 - Tail to head (2 marks)
 - State the significance of the observations made above. (2 marks)
- Measure in millimetres the length of the specimen from:
 - The tip of the mouth to the tail tip length (2 marks)
 - The anal point to tail tip length (2 marks)
 - Using the measurements in (i) and (ii) above, calculate the tail power. (2 marks)
 - State the importance of tail power. (2 marks)

- 2.** The photomicrograph represents the adjacent cells under an electron microscope. Study it and answer the questions that follow.

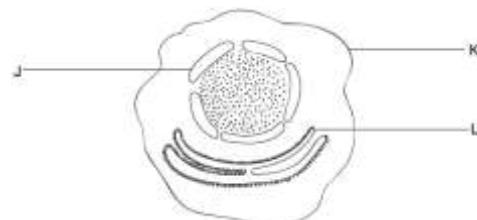


Magnification = X 20,000

- Identify the kingdom of the organism from which this cell were obtained. Give reasons for your answers. (3 marks)
 - Kingdom
 - Reasons
 - Name the organelles labelled P, R and S. (3 marks)
 - State the functions of Q and T. (2 marks)
 - Using a ruler, measure the radius of the nucleus between point X and Y in millimetres. Calculate the actual radius of the nucleus in micrometres. (4 marks)
- 3.** You are provided with a piece of a plant material labelled M.
Using a hand lens, observe the section carefully.
- With a reason (s) state the class to which specimen M was obtained. (2 marks)
 - i) Carefully make a longitudinal section of M to obtain two equal parts. Place one half in solution L1 and the other one in L2. Allow the set ups to stand for 30 minutes. Remove the pieces from the solutions after 30 minutes and dry them using a blotting paper. Draw the shapes of the piece from L1 and L2. (2 marks)
 - ii) Account for the observations in b(i) above. (4 marks)
 - i) Press each piece gently between the fingers, Record your observations. (2 marks)
 - ii) Explain what happens to red blood cells if placed in L1 and L2. (4 marks)

MAKUENI COUNTY KCSE 2015 PREPARATORY EXAMINATION 2015**Kenya Certificate of Secondary Education****231/1****BIOLOGY****Paper 1****Answer *all* the questions.**

- 1.** The diagram below illustrates a cell.

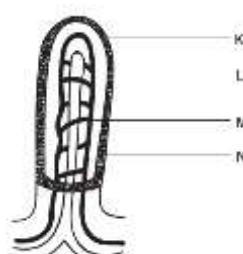


- (a) State the functions of the parts labelled J and L. (2 marks)
 (b) Describe the structure of the part marked K. (1 mark)

- 2.** State the functions of the following parts of a root:

- (a) Piliferous layer (1 mark)
 (b) Endodermis (1 mark)

- 3.** The diagram below shows a structure found in the mammalian digestive system.

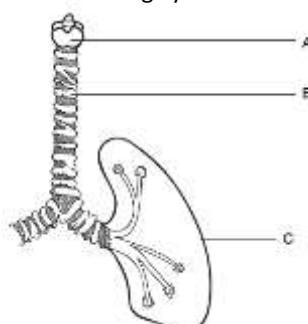


- (a) What is the name of the structure? (1 mark)
 (b) State the role of the part marked L. (2 marks)
 (c) Name the parts marked K and N. (2 marks)

- 4.** State the uses of the following plant excretory wastes:

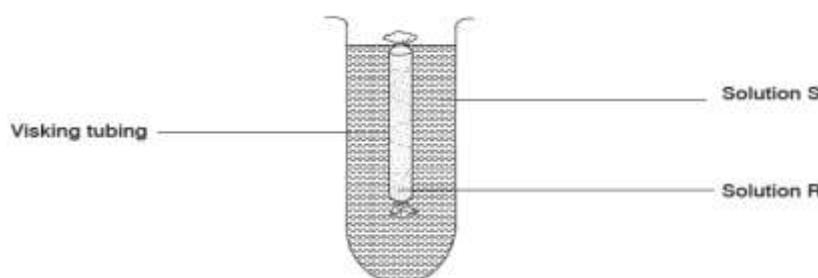
- (a) Gum Arabic (1 mark)
 (b) Tannins (1 mark)

- 5.** The diagram below shows part of the human breathing system.



- (a) Name the parts labelled A and C. (2 marks)
 (b) State one function of the part marked B. (1 mark)

- 6.** A visking tubing is selectively permeable. In the experiment shown below to demonstrate osmosis, the following results were obtained.



Initial mass of visking tubing + contents = 10.0 g

Mass of visking tubing + contents after experiment = 11.8 g

Account for the results of the experiment.

(3 marks)

7. In mice, the coat colour is determined by the dominant allele for brown colour B and recessive allele for white colour b. What proportion of the offspring produced from a cross between two mice of heterozygous colour would have brown coats?

(1 mark)

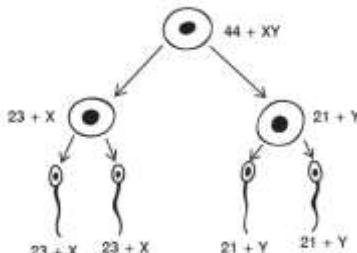
8. Distinguish between convergent evolution and divergent evolution.

(2 marks)

9. (a) What is double fertilization?

(1 mark)

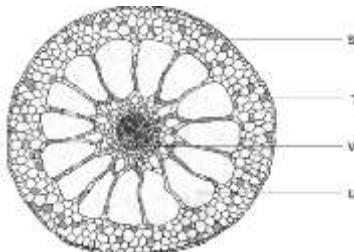
- (b) The diagram below shows the chromosome complement of cells during the development of abnormal sperms.



A sperm with chromosome complement 23 + X fertilizes a normal haploid egg. What is the chromosome number and sex of the resulting zygote?

(1 mark)

10. The illustration below shows the cross section of a stem of a hydrophyte.



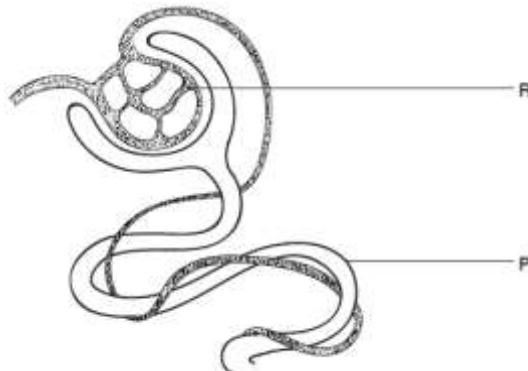
- (a) Name the parts marked **S** and **U**.

(2 marks)

- (b) State **one** function of the part labelled **U**.

(1 mark)

11. The diagram below shows part of a nephron from the human kidney.



- (a) (i) Name the structure labelled **R**.

(1 mark)

- (ii) Name the process carried out at **P**.

(1 mark)

- (b) The hormone ADH affects water reabsorption from the nephron.

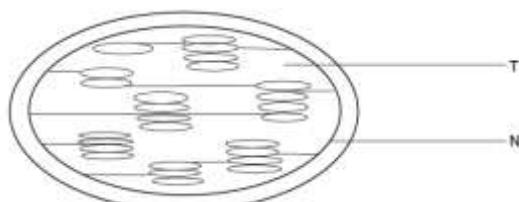
- (i) Which part of the brain releases ADH?

(1 mark)

- (ii) Name a part of the nephron where water is reabsorbed.

(1 mark)

12. The illustration below represents part of a cell organelle.



- (a) Name the organelle. (1 mark)
 (b) Name the structure labelled N. (1 mark)
 (c) Which stage of photosynthesis takes place in the part labelled N? (1 mark)

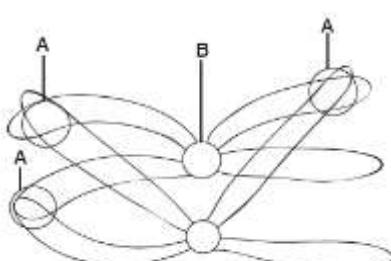
13. Herbivores have bacteria in their rumen and caecum that digest cellulose

- (a) What type of relationship is shown by the two organisms? (1 mark)
 (b) State how each organism benefits from the relationship.
 (i) Bacteria (1 mark)
 (ii) Herbivore (1 mark)

14. How is the skin of a frog adapted to gaseous exchange? (2 mks)

15. Name **three** classes of animals that excrete their nitrogenous waste in the form of uric acid. (3 mks)

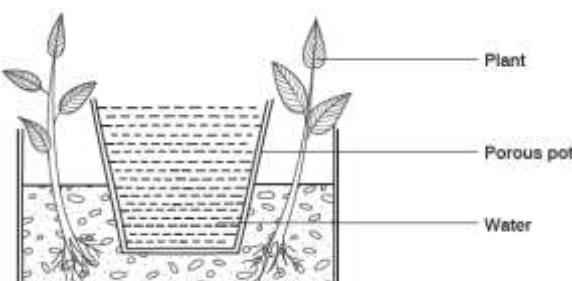
16. A student observed the chromosomes shown below under a microscope.



- (a) What process is taking place at point A? (1 mark)
 (b) Name the parts labelled A and B. (2 marks)

17. List **three** advantages of asexual reproduction. (3 marks)

18. Use the diagram below to answer the questions that follow.



- (a) What type of response is demonstrated in the diagram? (1 mark)
 (b) What is the significance of the type of response shown above? (1 mark)

19. Name a sex-linked human disorder located on the:

- (a) X-chromosome. (1 mark)
 (b) Y-chromosome. (1 mark)

20. Name the tissues in plants responsible for:

- (a) transport of water and mineral salts. (1 mark)
 (b) transport of carbohydrates. (1 mark)
 (c) primary growth. (1 mark)

21. Give three factors that determine the amount of energy a human being requires in a day. (3 marks)

22. Account for the following phases of a sigmoid curve representing the growth of an organism.

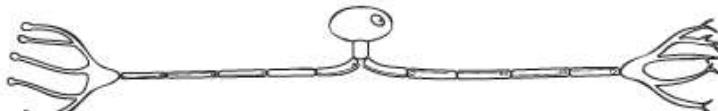
- (a) Lag phase (2 marks)
 (b) Plateau phase (2 marks)

23. (a) What is a single circulatory system?

- (b) Name an organism which has a single circulatory system. (1 mark)
 (c) Name the opening to the chamber of the heart of an insect. (1 mark)

24. Giving a reason in each case, name the class to which each of the following organisms belongs. (4 marks)

25. The diagram below represents a nerve cell. Use it to answer the questions that follow.



- (a) What type of nerve cell is shown in the diagram above?

(1 mark)

- (b) Give a reason for your answer in (a) above. (1 mark)

-
- (c) Name the nerve cell located in the grey matter of the spinal cord. (1 mark)
- 26.** State the significance of the following parts of a sperm cell.
- (a) Acrosome (1 mark)
(b) Mitochondria (1 mark)
(c) Tail (1 mark)
- 27.** State one function of each of the following hormones:
- (a) Insulin (1 mark)
(b) Glucagon (1 mark)
- 28.** A woman of blood group O has four children. All the children are of blood group A.
- (a) What is the blood group of the father of the children (1 mark)
(b) Use a genetic cross to show your working. (3 marks)
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MAKUENI COUNTY KCSE 2015 PREPARATORY EXAMINATION 2015

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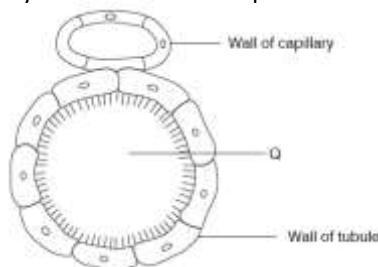
BIOLOGY

Paper 2

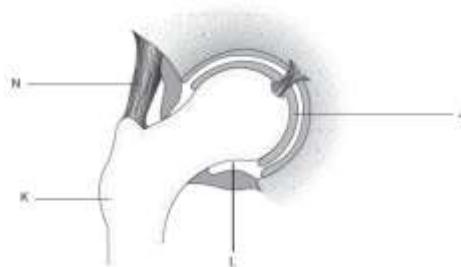
SECTION A (40 marks)

Answer **All** the questions in this section

- 1.** In tomatoes, hairy stems are produced by a dominant genotype 'H' and hairless stem by its recessive allele 'h'.
 (a) Using a punnet square, work out the outcome of a cross between two heterozygous hairy stemmed plants. (4 marks)
 (b) State the phenotypic ratio of the products. (1 mark)
 (c) What will be the genotypes if the smooth variety is crossed with one of its parents? (1 mark)
 (d) State **two** ways in which genetics can be applied in the field of Agriculture. (2 marks)
- 2.** (a) State the **two** principle functions of the kidney. (2 marks)
 (b) The figure below shows a highly magnified cross-section of a proximal convoluted tubule of a mammalian kidney. Study it and answer the questions that follow.



- (i) From the diagram, identify **three** structural features that adapt the proximal convoluted tubule to its function. (3 marks)
- (ii) Name the physiological process involved in the re-absorption of water and glucose from the proximal convoluted tubule to the bloodstream.
 Water (1 mark)
 Glucose (1 mark)
- (iii) Which fluid substance flows in the part labelled Q?
- 3.** (a) What is active transport? (1 mark)
 (b) State **three** factors that increase the rate of active transport. (3 marks)
 (c) Give four roles of active transport in living organisms. (4 marks)
- 4.** (a) State the difference between Lamarckian and Darwinian theories of evolution. (2 marks)
 (b) State **three** pieces of evidence that support the theory of evolution. (3 marks)
 (c) Explain continental drift as evidence of evolution. (3 marks)
- 5.** The diagram below shows some of the features of a synovial joint. Study the diagram carefully and answer the questions that follow.



- (a) Name the type of synovial joint. (1 mark)
 (b) Name the parts labelled J, K and L. (3 marks)
 (c) State **two** roles of the part labelled L. (2 marks)
 (d) Suggest **one** advantage of this type of joint. (1 mark)
 (e) Give the name of the bone adjacent to the proximal end of K. (1 mark)

SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8.

6. The data below shows growth of the pollen tube in a tradescantia style.

Time in minutes	Growth in millimetres
0	0
30	4
60	10
100	17
120	20
160	22
180	23

- (a) Plot a graph of the pollen tube growth against time. (6 marks)
 - (b) What was the length of the pollen tube at 90 minutes? (1 mark)
 - (c) Describe the growth of the pollen tube between 0 and 120 minutes. (3 marks)
 - (d)
 - (i) State the importance of a pollen tube to the plant. (1 mark)
 - (ii) Identify the shape of curve shown by the graph. (1 mark)
 - (e)
 - (i) Arthropods show a different growth pattern from the one shown above. What is the name of the growth pattern exhibited by arthropods? (1 mark)
 - (ii) Explain your answer in (e) (i) above. (4 marks)
 - (f)
 - (i) Distinguish between primary and secondary growth. (2 marks)
 - (ii) Give a reason why members of class monocotyledonae do not undergo secondary growth. (1 mark)
- 7.** Blood has two main functions namely protective and transport.
- (a) Explain how blood is involved in transport, stating the constituents of blood involved. (14 marks)
 - (b) Identify **two** sites in the mammalian body where red blood cells are manufactured. (2 marks)
 - (c) Describe how blood protects the body. (4 marks)
- 8.** How is the leaf of a mesophyte plant adapted to its function? (20 marks)