Marking Scheme KCSE 2016

BIOLOGY 2016

PAPER 1

No.1.(a) State two ways in which the muscles of the mammalian heart are special. (2 marks)

- *Muscles are myogenic - able to initiate their own concentration.*
- *Presence of intercalated discs hence Interconnencted.*
- *Can contract continuously without fatigue.*

(b) Name the type of muscles found in the following organs. (2 marks)
Stomach.....
Bone .....

- ***Stomach*** *- Visceral muscles/ smooth muscle.*
- ***Bone*** *- Skeletal muscles*

No. 2.Why are plants able to accumulate most of their waste products for long? (1 mark)

- *Most of the waste products are harmless;*
- *Waste products are converted into harmless products;*

No. 3.State the important of tactic response among some members of the kingdom protista. (2 marks)

- *Move towards favorable environment; accept converse*

4. (a) Name one defect of the circulatory system in humans. (1 mark)

- *Thrombosis/Varicose veins/Arterion sclerosis/ Antheroma*
- *Antherosclerosis*
- *Accept cerebral vascular thrombosis*

(b) State three functions of blood other than transport. (3 marks)

- *Regulation of the body temperature*
- *Regulation of pH of fluids*
- *Defense against disease – causing organism/ pathogens/ infection.*
- *Prevent excessive bleeding by enhancing clotting/ prevent excessive loss of blood*

No. 5. State the economic importance of anaerobic respiration in plants. (2 marks)

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

No.6.Explain continental drift as an evidence of evolution. (3 marks)

- *Current continents existed as one large land mass/ Pa.gea/ Laurentia Gondwanaland; the present continents drifted leading to isolation of organisms.Organisms in each continent evolved along different lines hence emergence of new species,*

No. 7.(a) Explain how the following prevent self-pollination.

(i) Protandry (1 mark)

- *Male reproduction organ/ anthers androecia/ stamens mature earlier than female reproduction organ/ carpels/ stigma/ pistil/ gynoecium.*

(ii) Self- sterility.

- *Pollen grains are sterile to stigma of some plants/ flowers*

No. 8.State three functions of Golgi apparatus.(3 marks)

- *Form vesicles that transport materials to other parts of the cell e.g. proteins.*
- *Transportation secretions to the cell surface for secretion e.g. enzymes and mucus. Packaging of materials such as glycoproteins.*
- *They form lysosomes*

No. 9.(a) Name two structures for gaseous exchange in aquatic plants. (2 marks)

- *Pneumatophores*
- *Aerenchyma tissues*
- *Cuticle*

(b) What is the effect of contraction of the diaphragm muscles during breathing in mammals? (3 marks)

- *Leads to the flattening of the diaphragm. This increases the volume of the ribcage and lowers pressure inside compared to atmospheric pressure leading to respiration*

No. 10.(a) State two disadvantages of sexual reproduction in animals. (2 marks)

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

(b) State two functions of the placenta in mammals. (2 marks)

- *Exchange of nutrients / oxygen / metabolic wastes between the mother and foetus circulation systems.*
- *Secretion of progesterone hormones*

No. 11.Name two benefits that a parasite derives from the host (2 marks)

- *Obtains food/ nutrients*
- *Shelter*

No. 12.Other than using the quadrant, give two methods of estimating population of grass.(2 marks)

- *Belt transect*
- *Line transects*

No. 13.(a) State two factors that affect enzymatic activities (2 marks)

- *Temperature PH co- factors, co- enzymes; enzyme product concentration; substance concentration/ metabolic poison*

(b) Explain how one of the factors stated in (a) above affects enzymatic activities. (1 mark)

- *Temperature- increase in temperature increases rate of enzymatic activity up to an optimum*
- *Low temperature decreases enzymatic activity/ too high temp above optimum point denatures enzymes.*
- *Ph- Enzymes work best at optimum ph/extreme ph denatures enzymes.*
- *Enzyme conc – Increase in conc. increase enzymatic activity.*
- *Co- enzymes – complements enzymes increasing rate of activity*
- *Substrate concentration increase enzymatic activity up to certain level.*

No. 14.Give three factors that determine the amount of energy a human being requires in a day.(3 marks)

- *Body size*
- *Sex*
- *Age*

No. 15. (a) What is seed dormancy (1 mark)

- *State during which a seed cannot germinate/ state of rest before seed germination; rej inability to germinate*

(b) Name a growth inhibitor in seeds (1 mark)

- *Absisicic acid*

No. 16.State one use of each of the following excretory products of plants: (2 marks)

(a) colchicine

- *Inducing polyploidy/ treatment*

(b) papain

- *Meat tenderizer*

17. State the name given to the study of:-

(i) The cell (1 mark)

- *Cytology: Rej cell biology*

(ii) Micro-organisms (1 mark)

- *Microbiology*

No. 18.Distinguish between haemolysis and plasmolysis. (2 marks)

- *Haemolysis – process by which red blood cells take in water till they burst; while Plasmolysis – loss of water from plant cells until the cell membrane is detached from the cell wall/ until the cell become flaccid.*

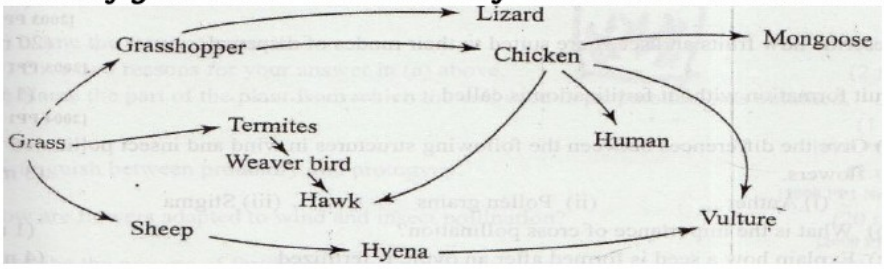
19. Explain why it is not advisable to be in a poorly ventilated room with a burning charcoal stove.(3 marks)

- *Charcoal in limited supply of air produces carbon(ii) oxide, which combines with haemoglobin forming Carboxylhaemoglobin which is a stable compound and does not dissociate easily, reducing capacity of the haemoglobin to carry oxygen leading to suffocation hence death*

No. 20. State three factors that contribute to the deceleration phase in the population curve of an organism. (3 marks)

- *Overcrowding*
- *Accumulation of toxic wastes*
- *Limited resources such as nutrients*

No. 21. The figure below illustrates a food web in a certain ecosystem.



From the food web:

(a) Draw the shortest food chain; (1 mark)

- *Grass grasshopper lizards*

b) Identify the organisms with the highest

(i) Number of predators; (1 mark)

- *Chicken*

(ii) Biomass. (1 mark)

- *Grass*

No. 22.State three characteristics of the class Crustacea. (3 marks)

- *Fused head and thorax/ capholothorax (often) protected by carapace.*
- *Gaseous exchange through gills*
- *Two pairs of antennae*
- *Five more pairs of limbs/ five to twenty pairs of limbs;* ***rej*** *five*
- *A pair of compound eyes*
- *Three pairs of mouth parts (consisting of labial pulps /maxillae/ mandible)*

No. 23. (a) Name one salivary gland in humans. (1 mark)

- *Sublingual; submaxillary/ submandibular; parotid*

(b) State two functions of saliva (2 marks)

- *Lubricating food; Digestion of starch; Moistens food; Provides alkaline medium;*
- *Softens food/ Dissolves food.*

No. 24.How does nutrition as a characteristic of living organisms differ in plants and animals?(2 marks)

- *Plants make their own food from carbon (IV) oxide and water in the presence of light /photosynthesize/ autotrophic; while animals eat readymade food (some plants and animals heterotrophic;*
- *If photosynthesis described all raw materials must be mentioned;*
- *Carbon (IV) oxide the (IV) must be bracketed.*
- *If sources of food for animals are mentioned then both plants and animals must appear.*

No. 25. Distinguish between diffusion and osmosis. (2 marks)

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

No. 26. State the functions of the following parts of a light microscope. (2 marks)

(a) Objective lens

❖ *Magnification of the object/ image*

(b) Diaphragm

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

27. (a) What is single circulatory system? (1 mark)

❖ *Blood goes through the heart once in very complete circulation*

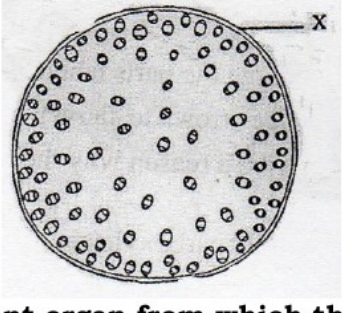
(b) Name an organism which has a single circulatory system. (1 mark)

❖ *Fish*

(c) Name the opening to the chamber of the heart of an insect. (1 mark)

❖ *Ostium*

No. 28.The diagram below shows a transverse section of a plant organ



(a) Name the plant organ from which the section was obtained

❖ *Stem*

(b) (i) Name the class to which the plant organ was obtained. (1 mark)

❖ *Monocotyledonae*

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

❖ *Vascular bundles are scattered and not arranged in a ring*

❖ *Absence of pith/ cambium*

(c)Name the part labeled X (1 mark)

❖ *Epidermis*

No. 29(a). State a characteristic that is common to all cervical vertebrae (1 mark)

- *Have short neural spines*

No. 29(b).Name two tissues in plants that provide mechanical support (2 marks)

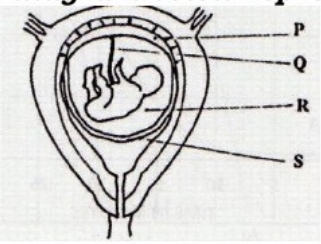
- *Xylem tissues*
- *Collenchyma tissues*
- *Sclerenchyma tissues*
- *Parenchyma tissues*

No. 30. State two advantages of hybrid vigour (2 marks)

- *Resistance to pests/ disease/ adverse weather conditions*
- *Increase yield*
- *Earlier maturity/ early maturity*

BIOLOGY PAPER 2

No. 1 . The diagram below represents human foetus in a uterus.



a) **Name the part labeled S. (1 mark)**
- *Chorion*

b) (i) Name the types of blood vessels found in the structure labeled Q. (2 marks)
- *Arteries; veins*

(ii) State the differences in composition of blood found in the vessels named in (b)(i)above. (2 marks)
- *More food nutrients; more oxygen in veins less food nutrients more excretory products in arteries*

(c) Name two features that enable the structure labeled P carry out its function. (2 marks)
- *Highly vascularized; large surface area*
- *Presence of secretory cells*

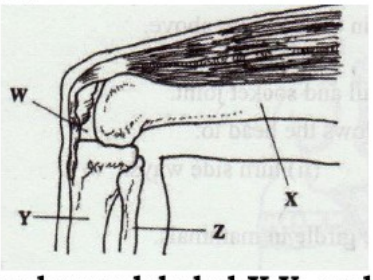
(d) State the role of the part labeled R (1 mark)
- *Cushion/ absorb shock*

No. 2. (a) How is sex determined in man? (4 marks)
- *Males have two dissimilar chromosomes X and y/ heterogametic;*
- *Females have two similar chromosomes X and X/ homogametic;*
- *Male gamete/ sperms have either X or y chromosome, while all ova have X chromosome;*
- *if a sperm with X fuses with an ovum a female is formed and if a sperm with Y fuses with an ovum a male is formed;*

(b) (i) Differentiate between sickle cell anaemia and sickle cell trait. (2 marks)
- *Sickle-cell trait is heterozygous while sickle cell anaemia is a homozygous condition*

(ii) Explain why people with sickle cell trait have an adaptive survival advantage over normal individuals in malaria endemic regions. (2 marks)
- *People with sickle cell trait are resistant to malaria; because the plasmodium cannot survive in sickle shaped red blood cells; rej thrive for survive*

No. 3.The diagram below represents bones at a joint found in the hind limb of a mammal.



(f) Name the bones labeled X,Y, and Z (3 marks)

- ***X****- Femur*
- ***Y****- Tibia*
- ***Z****- Fibula*

(g) (i) Name the substance found in the place labeled W. (1 mark)

- *Synovial fluid*

(ii) State the function of the substance named in (b) (i) above (1 mark)

- *Lubrication of the joint/ shock absorption*
- *Distribution of pressure*

(h) Name the structure that joins the bones together at the joint. (1 mark)

- *Ligament*

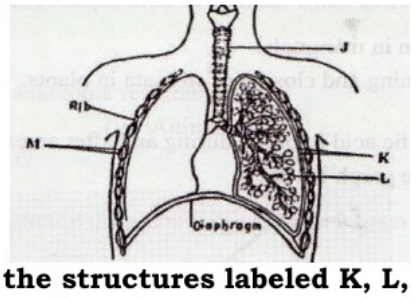
(i) State the differences between ball and socket joint and the one illustrated in the diagram above. (1 mark)

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

(j) Name the structure at the elbow that performs the same function as the same function as the patella. (1 mark)

- *Olecranon process*

No. 4. The diagram below represents some gaseous exchange structures in humans.



(a) Name the structures labeled K, L, and M . (3 marks)

- *K- Pleural membranes*
- *L- Alveolus*
- *M- Intercostal muscles*

(b) How the structure labeled J is suited to its function? (3 marks)

- *Has C- shaped cartilage rings that support it preventing it from collapsing and allow free flow of air*
- *Inner lining has mucus secreting cells that trap fine dust particles and micro-organisms*
- *Inner lining has hair like structures called cilia that enhance upward movement of the mucus to the larynx*

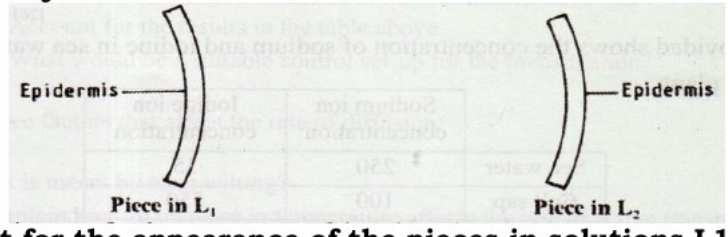
(c) Name the process by which inhaled air moves from the structure labeled L into blood capillaries (1 mark)

- *Diffusion*

(d) Give the scientific name of the organism that causes tuberculosis in humans (1 mark)

- *Mycobacterium tuberculosis (underline separately). Reject if not done so.*

No. 5. A freshly obtained dandelion stem measuring 5 cm long was split lengthwise to obtain two similar pieces. The pieces were placed in solutions of different concentrations in petri dishes (L1 and L2) for 20 minutes. The appearance after 20 minutes is as shown



(a)Account for the appearance of the pieces in solutions L1 and L2 (6 marks)

- *L_1 - Inner cells gained water by Osmosis; hence increased in length; epidermal cells did not gain water because they are covered by a water proof cuticle leading to curvature.*
- *L_2 - Inner cells lost water by osmosis; leading to (flaccidity) decrease in length; epidermal cells did not lose water due to waterproof leading to curvature*

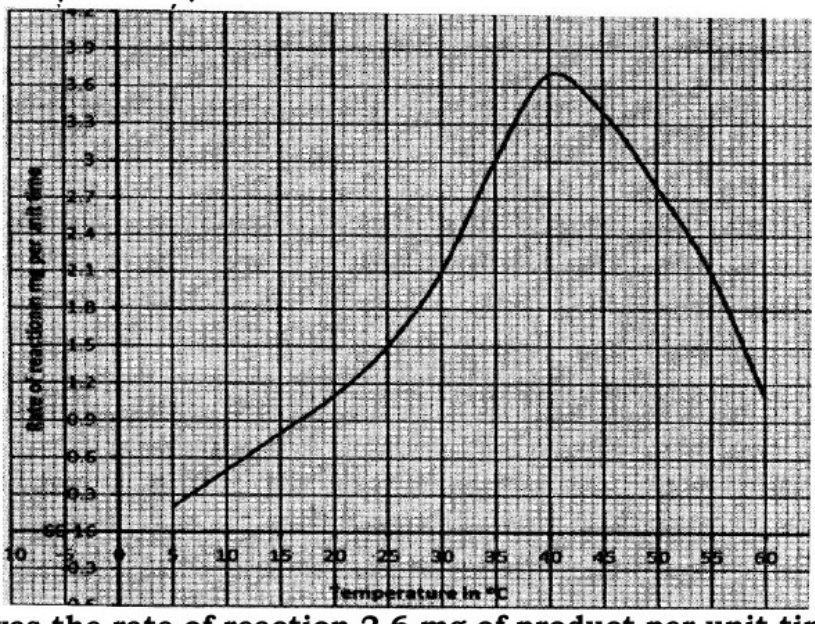
(b)State the significance of the biological process involved in the experiment (2 marks)

- *Absorption of water by the roots*
- *Opening and closing of the stomata*

No. 6.An experiment was carried out to investigate the effect of temperature on the rate of reaction catalyzed by an enzyme. The results are shown in the table below.

Temperature (°C)	*Rate of reaction in mg of products per unit time*
5	*0.2*
10	*0.5*
15	*0.8*
20	*1.1*
25	*1.5*
30	*2.1*
35	*3.0*
40	*3.7*
45	*3.4*
50	*2.8*
55	*2.1*
60	*1.1*

(a) On the grid provided draw a graph of rate of reaction against temperature. (6 marks)



(b) When was the rate of reaction 2.6 mg of product per unit time? (2 marks)

- *33^{0}C and 51.5 (± 0.5^{0}C)*
- *32.5 - 33.5 and 51.0 – 52.0*

(c) Account for the shape of the graph between

(i) 5°C and 40° C (2 marks)

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

(ii) 45° C and 60° C (3 marks)

- *As temperature increase rate of reaction decreases less/products are formed (unit per time) because enzymes become denatured by high temperatures above 40^0, hence cannot act on substrate.*

(d) Other than temperature name two ways in which the rate of reaction between 5°C and 40°C could be increased. (2 marks)

- *Increase in enzyme and substance concentration*
- *Use of cofactors and co-enxymes*

(e) (i) Name one digestive enzyme in the human body which works best in acidic condition. (1 mark)

- *Pepsin,*
- *Chymosin*
- *Renin*

(ii) How is the acidic condition for the enzyme named in (e) (i) above attained? (2 marks)

- *Wall of stomach/ gastric gland/ oxyntic/ pariental/ cell produced Hydrochloric*

(f) The acidic conditions in (e) (ii) above is later neutralized
(i) Where does the neutralization take place? (1 mark)

- *Duodenum*

(ii) Name the substance responsible for neutralization. (1 mark)

- *Bile juice/ e.g. $NaHCO_3$*

No. 7. Using a relevant example in each case, describe simple and conditional reflex actions.(20 marks)

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

No. 8.Describe how a mammalian heart is structurally adapted to its function.(20 marks)

- *Cardiac muscles which contract and relax continually without fatigue/ myogenic*
- *Cardiac muscles are interconnected / a synclination form of network of fibres to rapidly and uniformly spread the contractions*
- *Divided into four chambers for Atria to receive blood and ventricles to pump blood out of the heart*
- *Divided into two sides by a longitudinal septum to prevent mixing of oxygenated and deoxygenated blood / for double circulation*
- *Ventricles have thicker walls to generate high prevention pressure to pump blood*
- *Wall of the left ventricle is thicker than that of right ventricle to pump blood over a long distance.*
- *Have valves to prevent back flow of blood*
- *Cuspid valves have strands of connective tissues / tendinious codes / valve tendons to prevent turning in/out during systole / when ventricles contract*
- *Has coronary artery to nourish / supply oxygen to the heart/ muscles; has a coronary vein to remove metabolic wastes carbon(iv)oxide*
- *Enclosed by a pericardium to keep it in position / prevent over dilation*
- *Pericardium secretes pericardial fluid to reduce friction / absorbs shock*
- *Has Sino Artrio Node (SAN) which acts as a pacemaker*
- *Has Atrio Ventricular Node (AVN) which relays contraction waves from SAN to the puncinje tissues*
- *Has puncinje tissue / bundle of HIS to relay waves from AVN to the ventricular myocardium*
- *Cardiac muscles have numerous mitochondria to generate energy for the muscular contractions*
- *Has venacava and pulmonary vein to supply blood to the heart.*
- *Has aorta and pulmonary artery to transport blood away from the heart.*