

FORM FOUR END OF SECOND TERM EXAM

Kenya Certificate of Secondary Education

BIOLOGY

Paper - 231/2

July/August 2018

Marking Scheme

1. a. i. Mitochondria **1 mark**

ii. Site for respiration. **1 mark**

b. i. Adenosine Triphosphate. **1 mark**

ii. Oxygen **1 mark**

c. H Cristae **1 mark**

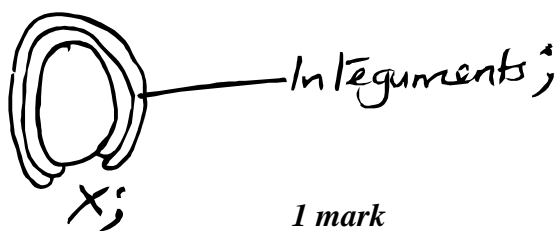
To increase the surface area for attachment of respiratory enzymes. **1 mark**

d. i. Spermatozoa **1 mark**

ii. Spermatozoa rely on their own means of propulsion (swimming) to move up the female reproductive tract hence uses/ requires a lot of energy while ova are propelled by cilia present on the inner lining of the oviduct. **2 marks**

2. a. D - polar nuclei ; Rejct polar nucleus. **1 mk**
E - Egg cell / ovum ; **1 mark**

b.



d. Dissolves the tissue of the stigma, style and ovary as it grows through them ; forms a pathway for the male gametes nuclei to reach the embryo sac; **2 marks**

e. - Protandry;
- protogyny;
- self- sterility ;
- Heterostyly ;
any 2 max 2

3. a. Terrestrial ecosystem. **1 mark**

b. i. Vultures **1 mark**

ii. - At each trophic level, some energy is lost as heat during excretion , sweating.
- Some of the food is used during respiration to produce energy.

- Some of the parts of the organisms are not eaten.

- Some energy is lost as undigested or indigested food materials.

c. i. Primary consumer. **1 mark**

ii. Secondary consumer **1 mark**

d. Green plants → caterpillars → Birds → Snakes → Vultures **1 mark**

Green plants → insects → Birds → Snakes → Vultures **1 mark**

Decaying leaves → Caterpillars → Birds → Snakes → Vultures **1 mark**

(any correct)

e. i. Saprophytic bacteria
Saprophytic fungi **1 mark**

ii. Decomposition - Decomposers act upon the remains of plants and animals causing decay hence release inorganic materials (nutrients) which are later re - used by producers to form new organic compounds. **1 mark**

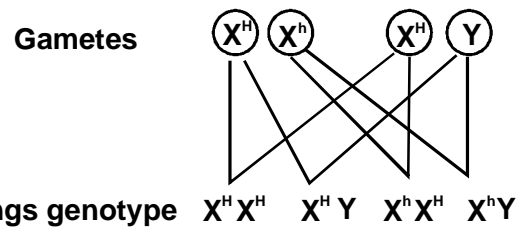
4. a. - To collect only the number of specimen needed to avoid wastage ;
 - Not to destroy the natural habitat of the specimens.
 - Dangerous / injurious specimens to be handled with care ; Forceps and hand gloves should be used for protection when collecting dangerous specimens.
 - Not to harm the specimen during the collection exercise ; to avoid distorting the features of the specimen.
 - live specimens should be returned to their habitats whenever possible ; to maintain ecological balance
 -Highly mobile animals to be immobilized using suitable chemical substance / chloroform. ;
any 3 correct - 3 marks

- b. i. For sucking small animals e.g ants and termites from rock surfaces or bark of trees.
1 mark
 ii. For catching flying insects **1 mark**
 iii. For immobilizing highly mobile animals
1 mark

5.a. Females have two X chromosomes in a gamete while males have only one X chromosome;
 the gene for haemophilia is located on the X chromosome (such that in heterozygous condition a female does not show the trait (2 marks)

- b) H - Normal gene
 h - gene for hemophilia

Parental phenotype **Carrier** **Normal**
Parental genotype: $X^H X^h$ × $X^H Y$



c. Color blindness, premature baldness , hair in the pinna and in the nose, muscular dystrophy (2 marks)
 (Any two)

6. a.
 As in the graph.
 Plotting (1 mark)
 Curve (1 mark)
 Scale (2 marks)
 Axes (2 marks)
 Labeling (1 mark)

(Award if both axes are labeled)

b. i. As the temperature increase the amount of water particles moving across the cell membrane increase, temperature increases the mobility of moving particles ; As temperature increase the pore on the cell membrane open wider allowing more particles to move across.

ii. As temperature increase the amount of water particles moving across the membrane decrease; Temperature above 400C denatures the cell membrane;

c. i. Osmosis; movement of water molecules from their region of high concentration to a region of low concentration across a semi-permeable membrane;

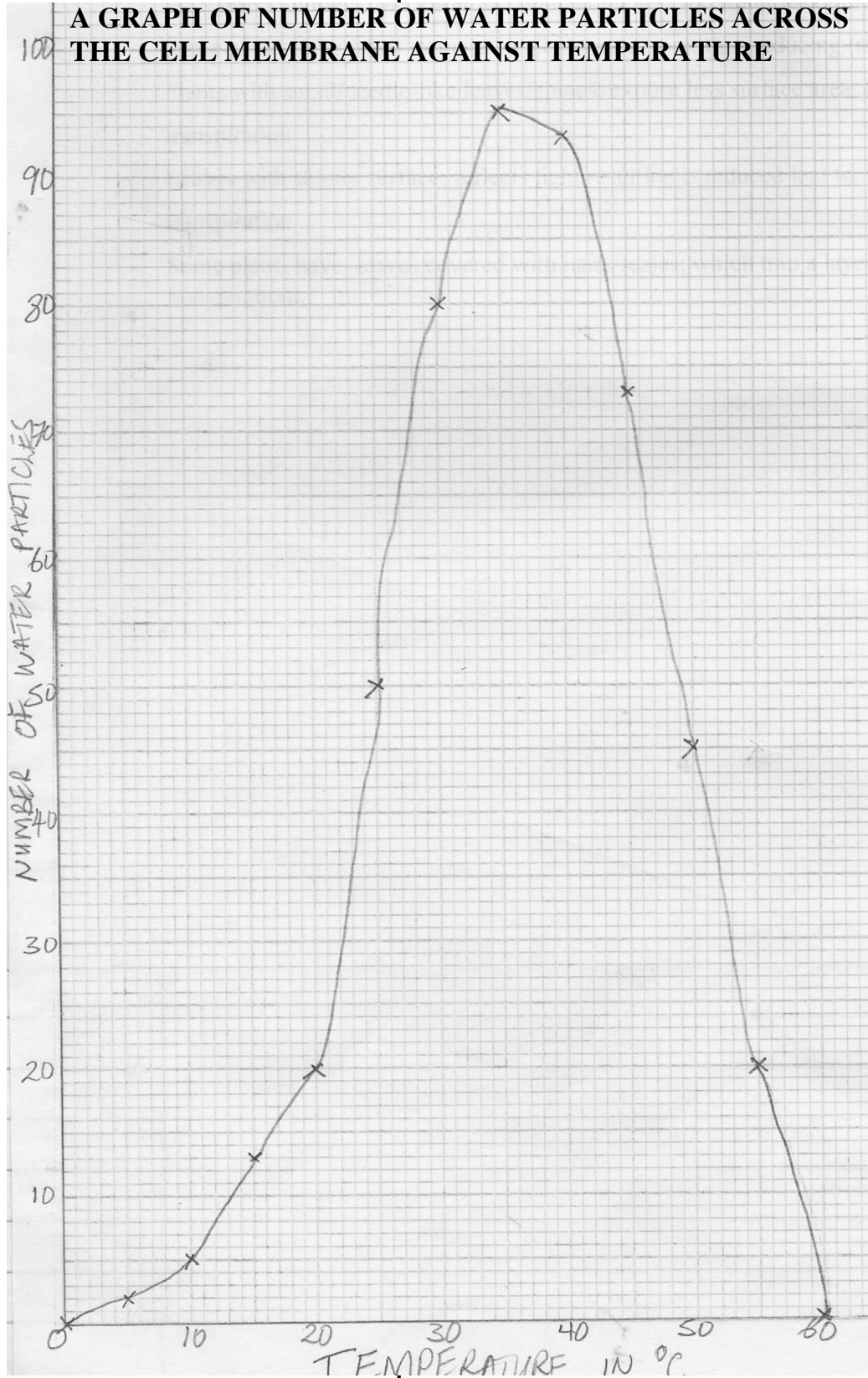
ii. Concentration gradient ; the higher the difference in concentration the faster the rate of osmosis;

- d. i. Turgid
 ii. Turgor pressure / wall pressure;

e. i. the cell, would swell and eventually burst;

ii. Plant cells have a cell wall which prevent the from bursting while animal cells have only a cell membrane.

A GRAPH OF NUMBER OF WATER PARTICLES ACROSS THE CELL MEMBRANE AGAINST TEMPERATURE



7. a. How are xerophytes adapted to their habitat? (10 marks)

- Leaves covered with thick /waxy cuticle ; that is water proof / impermeable; to water ; allowing for reduced rate of transpiration.
- Sunken stomata ; water vapour accumulates in the pits ; reducing the rate of transpiration.
- Have few or no stomata on the upper surface of the leaf / more stomata on the lower surface sheltered from direct sunlight ; the fewer the stomata the less the water loss from the plant.
- Some plants have small stomata / small stomata pore ; thus reducing transpiration rate.
- Plants with small / needle like leaves / spines ; expose less surface area ; hence reduce the rate of transpiration.
- Leaves with shiny surface ; reflects light resulting in reduced leaf temperatures ; thus reducing the rate of transpiration.
- Some plants have leaves covered with hairs / scales ; which trap a layer of moisture; reducing the rate of transpiration. (10 marks)

b. Thermoregulation

- Blood vessels ; (arterioles and capillaries) dilate when the body temperature is high; to bring more blood closer to the surface of the skin; so that more heat is lost to the surrounding; when the temperature is low the vessels constrict ; and less blood flows near the surface of skin; when it is cold the erector pili muscle of the hair contract" the hair rises or become erect.; the hair traps air which is a bad conductor of heat; this helps to reduce heat loss to the surrounding ; When it is hot the erector pili muscle relax; Hair lies flat close to the skin ; and does not trap air ; and therefore heat is lost from the body ; sweat glands produce sweat which moves to the surface of the skin (through sweat ducts) when the body temperature is high; The sweat evaporates and cools the body by taking away heat from the body. (latent heat of vapourisation) The skin has the adipose tissue ; (which is a fatty layer that acts) as an insulator ; hence controlling body temperature.(Total 13 max 10 marks)

8. a. **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 is made possible by carbon dating ; they form fossil records which

reveal trends in evolution over time; in the organism concerned e.g humans. This gives direct evidence of the type of organisms that existed at a certain geological age ;

b. Geographical distribution of organisms ; The theory of continental drift supposes that at some time the present day continents were one single land mass; which later broke up in to parts which drifted apart forming the present day continents ; Closely related organisms 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 llama in South America.

c. 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 show 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;

d. Comparative anatomy ; - Anatomy is the study of structures of living organisms ; (Comparative anatomy is the comparison of internal structures of various organisms.) Some show basic structural similarities and this suggests that the organisms 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 difference since they have different embryonic origin ; but have gone through convergent evolution ; and modified to perform similar functions. This 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 indicate that they were present in their ancestral forms which have since evolved. E.g. coccyx , tails in human, body hair, reduce wings in flightless birds like kiwi.

e. Comparative serology - Serology is the study of blood / serum protein; Comparative serology is comparison of different blood proteins in different organisms; this study shows that organisms that 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 common antibodies hence more related ; Less amount of precipitate shows that few or none antigen is common in organisms hence are far apart ; i.e. no common ancestry.

f. Cell biology - is the study of cells making up living organisms ; Similarities in structures and functions of cells point to a common ancestry ; the differences 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. (Total 37 max 20)