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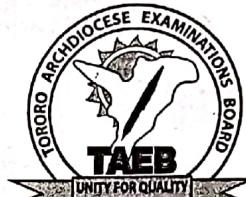
Candidates Name: MUTO DERRICK

Signature: 

Random No.	Personal No

(Do not write your school/ centre name or number anywhere on this booklet.)

P530/1
BIOLOGY
(Theory)
Paper 1
Jul/ Aug 2022
2 ½ hours



TORORO ARCHDIOCESE EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS 2022

BIOLOGY

(THEORY)

Paper 1

2 hours 30 minutes.

INSTRUCTIONS TO CANDIDATES.

This paper consists of sections A and B.

Answer all questions in both sections.

Write answers to section A in boxes provided and answers to Section B in the spaces provided.

No additional sheets of paper should be inserted in this booklet..

For Examiners' Use Only			
Section	Question	Marks	Examiner's Sign & No.
A	1 -40		
B	41		
	42		
	43		
	44		
	45		
	46.		
	Total		

Turnover

SECTION A (40 MARKS)

Write the letter corresponding to the right answer in the box provided. Each question in this section carries one mark.

1. A plant cell is magnified x2000 and the length of one chloroplast is 16mm. What is the actual length of the chloroplast in micrometer?

- A. 16
- B. 8
- C. 1600
- D. 32000

$$\frac{M_s = \text{apparent size}}{\text{Actual size}} = \frac{16,000}{2,000} = 16 \times 1000 \mu\text{m}$$

Note

B

$$1\text{cm} = 10,000 \mu\text{m}$$

$$1\text{mm} = 1000 \mu\text{m}$$

2. Which of the following is true about the fluid mosaic model of the plasma membrane.

- A. The less saturated the fatty acid tails of the phospholipids, the more fluid the membrane.
- B. The less saturated the fatty acid tails of the phospholipids, the less fluid the membrane
- C. The higher the temperature the less fluid the membrane.
- D. The lower the temperature, the more fluid the membrane

B

3. Dogs have 78 chromosomes in their diploid cells, if a dog's cell enters meiosis how many chromosomes and chromatids are present in each daughter cell.

- A. 39 chromosomes and 39 chromatids.
- B. 39 chromosomes and 78 chromatids
- C. 78 chromosomes and 78 chromatids
- D. 78 chromosomes and 156 chromatids

D

4. Cell division without a corresponding increase in cytoplasm is called?

- A. Cleavage
- B. Gastrulation
- C. Organogenesis
- D. Induction.

A

5. Rigidity of herbaceous plants results from?

- A. Osmotic pressure
- B. Root pressure
- C. Capillarity
- D. Turgor pressure

D

6. Which of the following is the advantage of breathing air over breathing water?

- A. Air is less than water, so it takes less energy during ventilation.
- B. Oxygen diffuses faster in air than water .
- C. The oxygen content of air is greater than that of an equal volume of water.
- D. Air breathing leads to high evaporation rate from the respiratory surface.

C

7. Oxygen diffuses into blood in the lungs because relative to alveolar air the;

- A. Carbon dioxide concentration in the blood is high.
- B. Carbon dixide concentration in blood is low.
- C. Oxygen concentration in the blood is high.
- D. Oxygen concentration in the blood is low.

D

8. Which of the following structures contains transitional epithelium?

- A. Stomach
- B. Ligaments
- C. Urinary bladder
- D. Skin

C

9. The source of oxygen produced during photosynthesis is.

- A. Carbon dioxide
- B. Glucose
- C. Water
- D. Spongy mesophyll

C

10. In dog fish, which of these fins does not counteract yawning and rolling?

- A. Anterior dorsal fin
- B. Posterior ventral fin
- C. Pectoral fins
- D. Posterior dorsal fin

C

11. Birds reared by a foster mother of another species later attempt to mate with birds of a foster mother species. This is an example of.

- A Simple reflex.
- B Conditioned reflex.
- C Imprinting
- D Trial and error learning

C

aerobic

-12 corrected

12. The final hydrogen acceptor in aerobic respiration in animals is.

- A. Ethanol
- B. Pyruvate
- C. NAD
- D. Lactate

B

13. Continuous variation is as a result of.

- A. Dominant genes
- B. Codominant genes
- C. Polygenes
- D. Recessive genes.

C

14. Which of these tissues is most lignified?

- A. Metaxylem
- B. Primary phloem
- C. Cambium
- D. Protoxylem

A

15. Which of the following may lead to genetic death in a population?

- A. Haemophilia
- B. Sickle cell trait
- C. Infertile males
- D. Albinism

C

16. An example of intracellular endoparasite is?

- A. Schistosoma mansoni
- B. Fasciola hepatica
- C. Trypanosoma gambiense
- D. Plasmodium falciparum

D

17. Brightly coloured plumage in male birds and its absence in female counterparts is an example of.

- A. Polymorphism
- B. Sexual dimorphism
- C. Mimicry
- D. Industrial melanism.

B

18. When leaves wilt photosynthesis stops due to;

- A. Break down of chlorophyll
- B. Flaccidity of mesophyll cells
- C. Closure of the stomata
- D. Deficiency of water.

C

19. If a long-day plant has a critical length of 9 hours, which one of these in a 24 hour cycle would prevent flowering in such a plant.

- A. 16 hours light / 8 hours dark
- B. 14 hours light/ 10 hours dark
- C. 15.5 hours light / 8.5 hours dark
- D. 8 hours light / 8 hours dark / flash of light / 8 hours dark.

A

20. The table below shows the rate of breathing and volume of air exchanged with each breath for a person at rest and during exercise.

State of individual	Breaths per minute	Volume of each breath(cm ³)
At rest	12	500
During exercise	24	1000

The increase in volume of air exchanged per minute when an individual does exercise from rest is.

$$\text{rest } 12 \times 500 = 6000 \text{ cm}^3$$

$$\text{exercise } 24 \times 1000 = 24,000 \text{ cm}^3$$

- A. 500cm³
- B. 6000cm³
- C. 1500cm³
- D. 1800cm³

D

21. In the alternation of generations in the life cycle of plants;

- A. the sporophyte is always dominant
- B. Gametophyte is always short lived
- C. Gametes are produced by meiosis
- D. Spores are always haploid

D

22. Following depolarization, repolarisation begins by.

- A. Diffusion of potassium out of the cell.
- B. Diffusion of sodium ions out of the cell
- C. Entry of potassium ions into the cell
- D. Entry of sodium ions into the cell.

A

23. Which one of the following phyla has aceolomate organisms?

- A. Platyhelminthes.
- B. Nematoda
- C. Annelida
- D. Arthropoda.

A

24. The organ of Corti is composed of.

- A. Tectorial membrane , basilar membrane auditory nerve.
- B. Tectorial membrane , endolymph, Reissners membrane
- C. Tectorial membrane , basilar membrane, sensory hair cells.
- D. Tectorial membrane, median canal, basilar membrane.

C

25. In animal cells, permeability of the plasma membrane to most biological molecules is reduced by.

- A. Proteins
- B. Phospholipids
- C. Glycolipids
- D. Cholesterol

B

26. During water stress, the rate of photosynthesis is reduced due to shortage of.

- A. Cabon dioxide
- B. Mineral salts
- C. Water
- D. Sunlight

A

27. Notochord is absent in the following organisms except.

- A. Amphioxus
- B. Hydra
- C. Cockroach
- D. Earth worm

A

28. The best cell for studying lysosomes would be.

- A. Nerve cell
- B. Muscle cell
- C. White blood cell
- D. Mesophyll cell

C

29. Which of the following cells would possess the largest number of mitochondria?

- A. Muscle cell
- B. Alveolar cell
- C. Hepatocyte
- D. Osteoblasts.

C

30. Which of the following cells is affected by corona virus?

- A. Alveolar cells.
- B. Hepatocytes
- C. Myocytes
- D. Chondroblasts

A

31. An efficient homeostatic system should have the following characteristics **except**.

- A. High sensitivity to deviations
- B. Minimum deviations from the set point
- C. Immediate correction of a deviation
- D. Wide deviations from the set point.

D

32. Which of the following mammals is most likely to have a high number of juxtamedullary nephrones.

- A. Man
- B. Beaver
- C. Camel
- D. Cow

C

33. Eutrophic lakes are characterized by.

- A. High oxygen concentration
- B. Low rate of photosynthesis
- C. High concentration of nutrients
- D. Low concentration of nutrients

C

34. Food chains are sometimes short because.

- A. Each plant species is fed on by a single species of herbivore
- B. Most of the energy is lost during transfer to the next trophic level
- C. Predators are diverse and less abundant than prey
- D. Most species are inedible

B

35. Which of the following protozoa lack locomotory structures?

- A. Euglena
- B. Plasmodium
- C. Ameoba
- D. Paramecium

B

36. Which of the following statements are correct for both enzymes and proteins?

- A. Both catalyse reactions
- B. Both require receptors
- C. Both initiate reactions
- D. Both are proteins

D

37. Which of the following is not a secondary messenger for hormones?

- A. Cyclic Adenosine Monophosphate (cAMP)
- B. Cyclic Guanosine Monophosphate (cGMP)
- C. Calcium
- D. Adenylate cyclase

D

38. Which of the following factors can cause a change in the gene pool of a small population?

- A. Random mating
- B. Migration
- C. Genetic drift
- D. Mutation

C

39. Which of the following is true for a resting muscle fibre.

- A. Sarcomere are regions between two H zones
- B. M line proteins called A band separate the thick filament.
- C. Dark A bands contain overlapping thick and thin filaments with a central thin H zone composed of only thick filaments.
- D. I band are composed of the same thick filaments as seen in A bands.

C

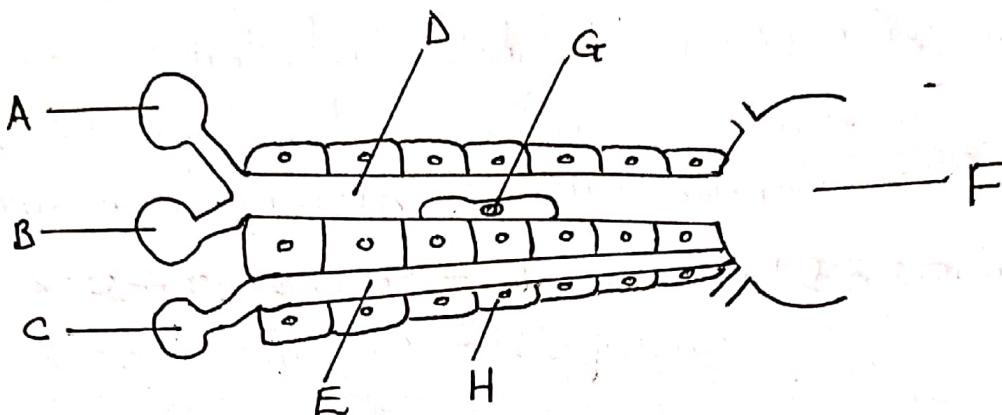
40. Which of the following organelles is associated with the final stage of most cell secretions?

- A. Smooth endoplasmic reticulum
- B. Rough endoplasmic reticulum
- C. Ribosome
- D. Golgi apparatus.

D

SECTION B.

41. The figure below shows the microscopic structure of a liver lobule.



- (a) Name the structures.

- A. Branch of hepatic artery / hepatic arteriole, (3 marks)
Res - Hepatic artery
- B. Branch of hepatic Portal vein / Hepatic portal vein,
Res - Hepatic portal vein
- C. Bile ductule, Res - bile duct
- D. Sinusoid / sinusoid capillary
- E. Bile canaliculus, Res - Bile duct, bile canaliculi
- F. Central vein / intra lobular vein

- (b) State one way in which the following structures are suited to their functions. (2 marks)

- (i) D - Has pores/perforations to allow for exchange of large molecules such as proteins between blood and liver cells
- (ii) G - Numerous lysosomes with hydrolytic enzymes for digesting pathogens and old red blood cells

- (c) (i) State the roles of cell H in glucose metabolism. (2marks)

- Converts glucose to glycogen,
- Converts glucose to fats and proteins,
- Converts glycogen to glucose,
- Converts proteins and fats to glucose,

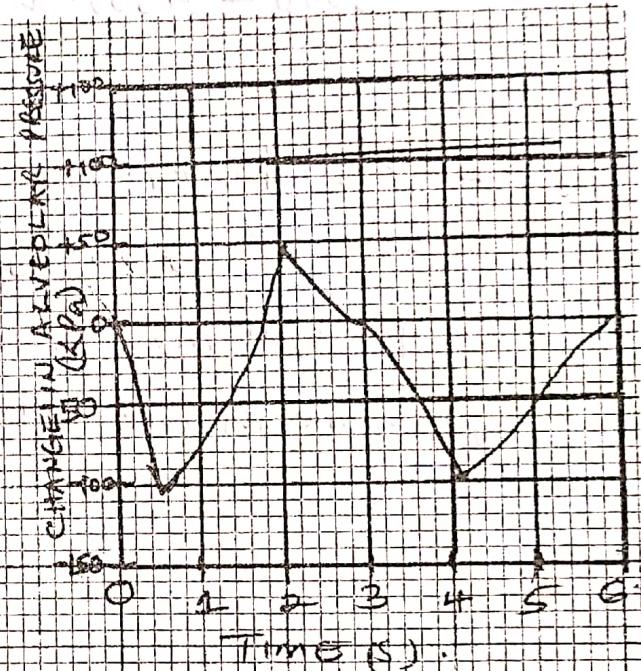
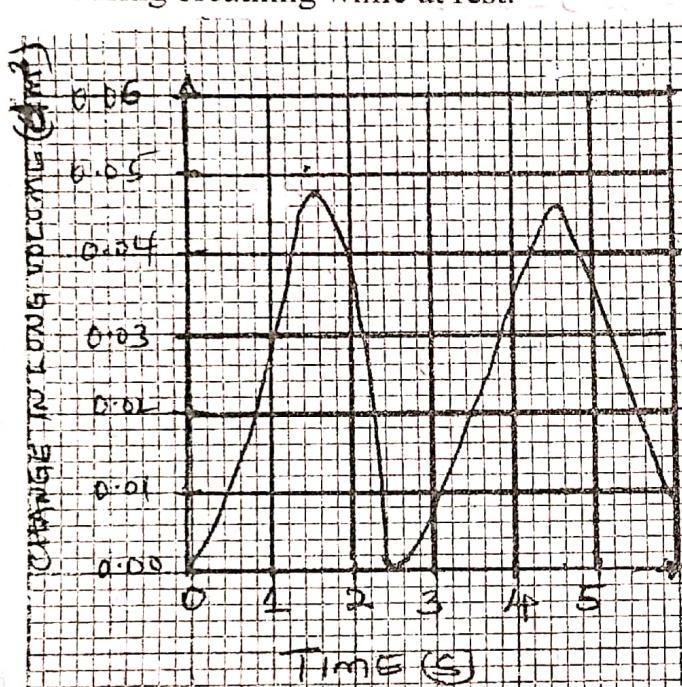
(ii) How is cell H adapted to its functions?

(3 marks)

reaching

- Numerous mitochondria to provide ATP for powering metabolism
- Numerous ribosomes for synthesis of proteins
- Numerous enzymes for detoxification and transamination
- Numerous microvilli to increase SA for absorption of substances from blood
- Prominent golgi apparatus for preparation of substances for secretion

42. The figure below shows volume and pressure changes in the lungs of a person during breathing while at rest.



(a) From the graph in figure above determine the breathing rate of this person give your answer in breaths per minute. (2 marks)

- In 2.5 seconds, one breathing cycle is completed.
In 60 seconds ($\frac{60}{2.5}$) breathing cycles are completed.

$$= 24 \text{ breaths per minutes}$$

- (b) If the volume of air in the lungs when the person inhaled was 3000cm^3 . Calculate the volume of air in the lungs after the person has exhaled, show your working. (2 marks)

- Volume of exhaled air (Read from graph) $0.48\text{dm}^3 / 480\text{cm}^3$

- Total volume inhaled $3.0\text{dm}^3 / 3000\text{cm}^3$

Volume of air in lungs = volume inhaled - volume exhaled,
 $= (3.0 - 0.48)\text{dm}^3 = 2.52\text{dm}^3 / 2520\text{cm}^3$
 $(3000 - 480)\text{cm}^3 = 2520\text{cm}^3$

- (c) Explain how the muscles create the change in pressure in the alveoli over 0 to 0.5 seconds. (3 marks)

- External intercostal muscles contract, internal intercostal muscles relax, rib cage move up wards and outwards, Diaphragm muscles contract, lung volume increases, and pressure in the alveoli reduces. 1 mark (a)

- (d) Suggest how each of the following features contribute to the efficiency of gaseous exchange in the alveoli.

- (i) The wall of each alveolus is not more than 0.3 micrometers thick. (1 mark)

- Thin to reduce diffusion distance for faster diffusion of gases. Rej - If thin is missing

- (ii) There are 300 million alveoli in each lung. (1 mark)

- Numerous to increase the surface area for diffusion of gas. Rej - If numerous does not appear

- (iii) Each pulmonary capillary is very narrow. (1 mark)

- slows the speed of red blood cells to give time for diffusion of gases,
- positions red blood cells closer to blood capillary walls to reduce diffusion distance for gases,
- squeezes the red blood cells in a single file exposing a large S.A for diffusion of gases,

43. (a)(i) State three differences between the life cycle of a Bryophyte and that of a Pteridophyte. (3 marks)

Bryophyte	Pteridophyte
(i) Gametophyte is bigger	Gametophyte is smaller
Sporophyte depends on the gametophyte	Sporophyte is independent
(ii) Gametophyte is long lived	Gametophyte is short lived
Sporangium is at the tip of gametophyte	Sporangium is under the surface of leaves

- (ii) State two features which indicate evolutionary advancement of

Spermatophytes over Bryophytes and Pteridophytes. (2marks)

- Seeds which can be dispersed over long distances
- pollen tube eliminates the need for water during fertilisation
- production of pollen grains which can be transported over long distances to promote cross breeding,
- Gametophyte is retained within the sporophyte for protection

- (b) Explain how plants overcome the following challenges during colonization of land. (2 marks)

- (i) Dessication.

- Thick cuticle to reduce evaporation of water from the leaves
- Roots for absorption of water from the soils

- (ii) Nutrition.

- leaves with chloroplasts for trapping light energy for photosynthesis
- Association with nitrogen fixing bacteria to fix nitrogen
- Formation of mychorrhizal association to enhance absorption of mineral salts from the soil

- (c) Explain how evolution of flowers led to success of angiosperms on land. (3 marks)

- Brightly coloured petals to attract pollinators,
- Nectar to attract pollinators,
- Nuts protect seeds and enable dispersal,
- pollen can be dispersed over long distances to effect fertilisation,

44. (a)(i) What is meant by a pest. (2 marks)
- Is an organism which is harmful to man, destroys man's property or annoyance to man, e.g. insects, weeds, rats,

one mark for definition, one mark for example

- (ii) Outline some problems which may arise from use of chemicals to control pests on plants. (3 marks)

- Pest resurgence which increases the cost of production
- Bioaccumulation and biomagnification which kills organism at higher trophic levels,
- Pollution of water bodies leading to eutrophication,
- Can cause cancer to humans.

- (b) Explain the effects of the following pollutants on the ecosystem.

- (i) Chlorofluorocarbons. (2 marks)

- Dissociate when exposed to ultraviolet radiations releasing chlorine radicles which damages the ozone layer.

- (ii) Discharge of hot water into a water body (2 marks)

- Reduces solubility of oxygen in water leading to anoxic conditions,

(iii) Artificial light. (1 mark)

- Disorients migrating animals at night.

- Stimulates release of cortisol hormone which disrupts sleeping patterns.

45. (a) Explain why two sister chromatids are genetically identical before crossing over while a pair of homologous chromosomes are not. (4 marks)

- Sister chromatids are obtained from replication of the same chromosomes during interphase while each pair of homologous chromosomes are obtained from maternal paternal gametes during fertilisation.

(b) In cats, males are XY and females are XX. A gene on X chromosome controls fur colour in cats. The alleles G codes for ginger fur while allele B codes for black fur. These alleles are codominant. Heterozygous females have ginger and black patches of fur and their phenotype is described as tortoise shell.

(a) Explain what is meant by codominant alleles. (1 mark)

- These are alleles which are both expressed equally in the heterozygous state; such that the organism contains bears a mixture of characteristics from both parents.

(b) (i) Explain why male cats with a tortoise shell do not usually occur. (2 marks)

- Male cats are heterogametic so they lack an alternative X-chromosome to carry the second allele.

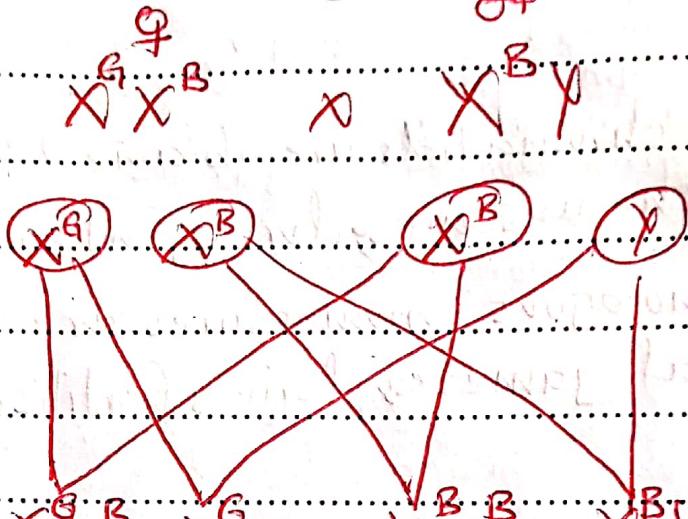
- (ii) A tortoise shell female was crossed with a black male. Use a genetic diagram to show all the possible genotypes and the expected offspring phenotype ratio from this cross. (3 marks)

parental phenotype Tortoise shell \times Black

parental genotype $X^G X^B$ \times $X^B Y$

meiosis

Gametes



F₁ genotype $X^G X^B$ $X^G Y$ $X^B X^B$ $X^B Y$

F₁ phenotype Tortoise shell female Ginger male Black female Black male

phenotype ratio Tortoise shell (♀) : Ginger (♂) : Black (♀) : Black (♂)

46. (a)(i) Describe how a mature sperm cell is produced from a primary Spermatocyte. (4 marks)

- Primary spermatocyte undergo first meiotic division, to form primary spermatocytes, the primary spermatocytes undergo the second meiotic division, to form haploid spermatids, the centriole of the spermatid develops into a tail, golgi body converted to acrosome, nucleus become condensed and elongated, mitochondria replicate and group around the flagellum, forming mature spermatozoa / sperm.

(b) Explain importance of the following reactions during fertilization

(4 marks)

(i) Acrosome reaction. - During fertilisation, the acrosome undergoes lysis and releases hydrolytic enzymes which digest the zona pellucida, and enables the sperm nucleus to enter into the egg to effect fertilisation.

(ii) Cortical reaction. -

- Release of cortical granules after fertilisation causes hardening of the zona pellucida, to prevent entry of other sperms/polyspermy. - Accept - Fusion of cortical granules with the egg membrane causes thickening of the egg membrane to prevent polyspermy/entry of other sperms

(c) State two differences between fertilization in flowering plants and in

mammals.

(2 marks)

- In flowering plants male gamete is carried by the pollen tube to the female gamete while in mammals the sperm swims to the egg.
- In flowering plants two male gametes are released involved in fertilisation leading to double fertilisation while in mammals only one male gamete is involved.

END