

553/1
BIOLOGY
THEORY
Paper 1
2½ hours
JULY 2023

PROPOSED GUIDES

Uganda Certificate of Education
BIOLOGY THEORY MOCK EXAMINATIONS

2 hours 30 minutes

INSTRUCTIONS:

- Answer **all** questions in section **A** and **B** plus any **two** in section **C**.
- Answers to section **A** should be written in the boxes provided on the right side.
- Answers to section **B** should be written in the spaces provided.
- Answers to section **C** should be written in the answer booklet / sheets provided.

For Examiner's Use Only

SECTION	MARKS
A: 1-30:	
B: No. 31:	
No. 32:	
No. 33:	
C: No.	
No.	
TOTAL	

SECTION A (30 MARKS)

Write the letter representing the most correct alternative in the box provided

1. In flowering plants a transpiration stream is maintained by.

A. Diffusion.
B. Active transport.
C. Osmosis.

D. Capillarity.

☐

2. During exhalation in human being

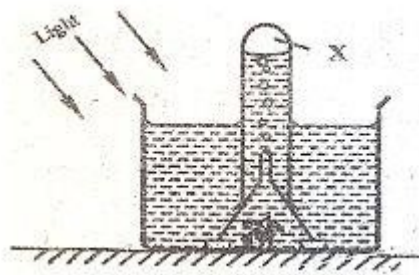
A. The rib cage move upwards and downwards.
B. Volume of the thoracic increases.

C. Diaphragm muscles relax.

D. Intercostal muscles contract.

☐

3. Figure below is an experimental set up to demonstrate photosynthesis.



Gas X produced in the experiment is tested by the use of

A. lighted splint

B. lime water
C. litmus paper
D. sodium bicarbonate

☐

4. The characteristic common in insect pollinated flowers is.

A. Stigma and pollen grain often being sticky.

B. Filaments being flexible and anthers loosely attached.
C. Production of small and smooth pollen grains.
D. Having small greenish bracts.

☐

5. Of the following characteristics, the one that suits an amphibian for aquatic life is.

A. Moist skin without scales.

B. Webbed toes.

C. Possession of muscular hind limbs.
D. Possession of wings.

☐

6. The following are caused by oestrogen EXCEPT.

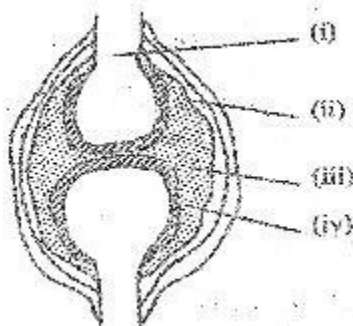
A. Growth of uterine wall.

B. Stopping further secretion of FSH.
C. Release of a ripe ovum from ovary.
D. Healing the uterus lining.

☐

7. The part of a tooth that contains living tissue is called.
A. Enamel.
B. Cement.
C. Crown.
D. Pulp cavity. ☐
8. The ratio of offspring phenotypes when a roan bull and roan cow are crossed is
A. 2 red: 1 roan: 1 white.
B. 1 red: 2 roan: 1 white.
C. 1 red: 1 white.
D. 1 red: 1 roan: 2 white. ☐
9. Which of the following is a result of having a human diet deficient of iodine?
A. Goiter
B. Scurvy.
C. Anaemia.
D. Rickets. ☐
10. The association between a fungus growing on the leaves of a living potato plant is described as.
A. Saprophytic.
B. Predation.
C. Parasitism.
D. Commensalism. ☐
11. Of the following, mitosis differs from meiosis in that it produces.
A. Two daughter cells with half the chromosome number. .
B. Four daughter cells with half the chromosome number.
C. Four daughter cells with equal chromosome number.
D. Two daughter cells with equal chromosome number. ☐
12. Which of the following conditions for germination is of Least importance?
A. Oxygen.
B. Light
C. Moisture.
D. Moderate temperature. ☐
13. The importance of sweating in humans is to
A. get rid of excess salts.
B. get rid of excess water.
C. Cool the body.
D. Lose urea from the body. ☐
14. Which of the following features are suitable for a mammalian respiratory surface?
A. Moist, many blood vessels.
B. Dry, many blood vessels.
C. Dry, large surface area.
D. Moist, reduced surface area. ☐
15. Digestion of starch in the mammalian alimentary cannal occurs in.
A. mouth and small intestine.
B. stomach and duodenum.

- C. mouth and stomach.
D. mouth and stomach.
16. Mature mammalian red blood cell contain no nucleus so as to
A. allow the cell carry more dissolved food substances.
B. allow the cell carry more oxygen.
C. ease the cell passage through capillary livings.
D. create more space for antibodies.
17. During panting in a dog,
A. more gaseous exchange occurs.
B. latent heat of vaporization is lost.
C. More air is inspired.
D. Relaxation from exhaustion is abled.
18. Figure 3 shows a joint in a mammalian skeleton.



Which one of the following pairs consists of parts which reduce friction during movement in the joint?

- A. I and II
B. I and III
C. II and III
D. III and IV
19. The amount of nitrogen in the atmosphere can be increased through.
A. Denitrification.
B. Nitrification.
C. Excretion.
D. Putrifaction.
20. The following are liver functions EXCEPT;
A. secretion of insulin
B. Storage of vitamins.
C. Production of bile.
D. Regulation of glucose level.
21. Which of the following flowering parts are referred to as essential?
A. Androecium and corolla.
B. Androecium and gynaecium.
C. Androecium and calyx.
D. Gynoecium and corolla.

22. In spirogyra, sexual reproduction occurs through.
- A. Budding.
 - B. Fragmentation**
 - C. Binary fission.
 - D. Conjugation.
23. Which one of the following is a response by a mammalian body to a lowering environmental temperature?
- A. Reduced metabolic rate**
 - B. Shivering.
 - C. Sweating.
 - D. Vasodilation.
24. A person of blood group O is referred to as a universal donor because the person
- A. Donates blood to all other blood groups
 - B. Donates blood to only blood group AB.
 - C. Has blood without antigens to be attacked by recipients antibodies.**
 - D. Has blood without antibodies to attack recipients antigens.
25. The rigidity of a plant cell is enabled by.
- A. Osmosis.
 - B. Cell sap.
 - C. Cell wall.**
 - D. Protoplasm.
26. In the infants rennin contained in the stomach is for.
- A. Converting proteins to polypeptides.**
 - B. Activation of pepsin enzyme.
 - C. Converting liquid milk protein to solid milk protein.
 - D. Activation of protein digestion.
27. The following results were obtained during an analysis a soil sample.
- | | |
|----------------------------------|---------------------|
| Clay soil used | =100cm ³ |
| Water used | =200cm ³ |
| Water + clay soil after stirring | =276cm ³ |
- What was the percentage of air in the soil used?
- A. 24%**
 - B. 92%
 - C. 8%
 - D. 12%
28. A cross between white flowered plant and a red flowered plant produced a plant that had pink flowers. This indicates a condition of
- A. Incomplete-dominance.**
 - B. Dominance.
 - C. Mutation.
 - D. Recessive ness.



29. The modified structure used for vegetation reproduction of Irish potato plant is the;

- A. Leaf
- B. Bud
- C. Root

D. Stem

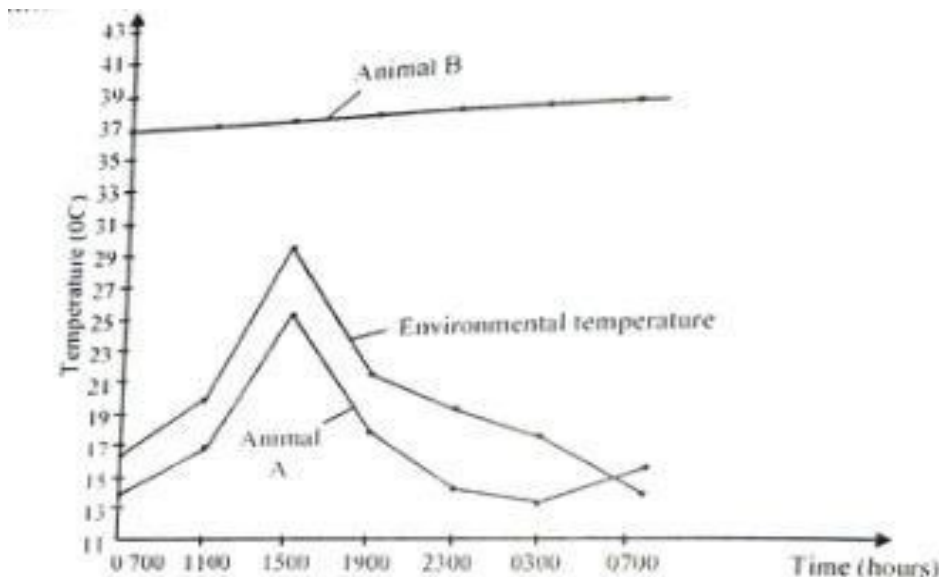


30. Which of the following is found in animal cells only?

- A. Flagella.**
- B. Central vacuole
- C. Protoplasm.
- D. Cell membrane.

SECTION B

31. The figure below shows graphs of body temperature of animals A and B plus the environmental temperature plotted against time of the day.



a) What is the relationship between environmental temperature and the body temperature of animals?

(1 mark)

A Body temperature varies with environmental temperature

(1mark)

B Body temperature remains constant as environmental temperature varies

- b) Explain the relationship between environmental temperature and the body temperature of animal.

(1 mark)

A Cannot generate heat internally hence depending on environmental temperature

(1 mark)

B Can generate heat internally hence maintaining body temperature fairly constant.

- c) From the graphs predict and explain how active the animals A and B would be at night time.

A: Would be less active: because of low environmental temperature and low body temperature; inactivating enzymes; that lower metabolism; lowers response to stimuli; making the organism inactive

**B: Would be more active: because despite low environmental temperature its body temperature is maintained high by internal heat generated; activating enzymes; that increase metabolisms; increase response to stimuli; making the organism active
(MAX 5 marks)**

- d) What advantage does this give one animal over the other in respect of being active

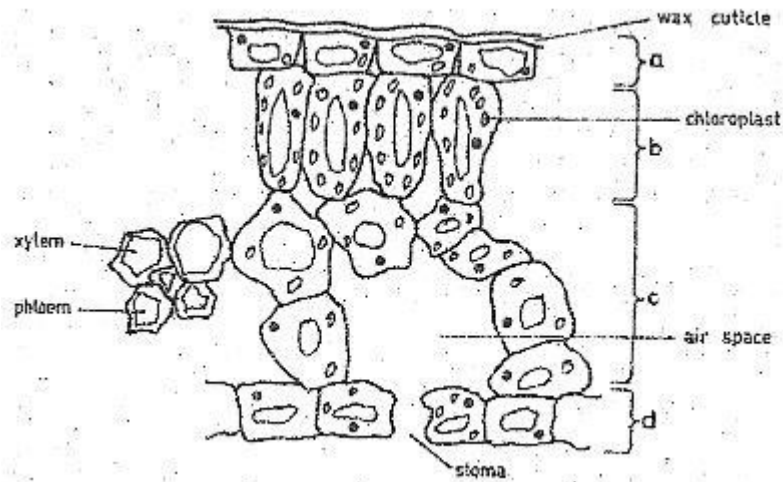
Animal A has the following advantages of Animal B

- **Able to live in a wide range of habitats**
- **Can remain active all the time**
- **Activated enzymes; operate optimally and efficiently**
- **Response very fast to stimuli thus fit for survival**
- **All this is due to internally generated heat that maintain the body temperature at optimum value for efficient metabolisms
(5 marks)**

- e) How are mammals in cold areas adapted to temperature control?

- **Thick Insulating Fur: These are excellent insulators. This fur traps warm air close to the body, reducing heat loss and keeping the animal warm**
- **Smaller Appendages: have relatively shorter ears, tails, and limbs compared to their counterparts in warmer regions. Reducing the surface area of these appendages helps minimize heat loss.**
- **Hibernation and Torpor: They enter a state of reduced metabolic activity, conserving energy and surviving on stored body fat until the temperatures rise again.**
- **Possess thick fat layer in adipose tissues for insulation**
- **High metabolic rate to generate heat**
- **Can migrate to warmer places to avoid cold areas during winter (06 marks)**

32. The figure below shows an internal structure of a leaf.



(a) Name the layers marked a, b, c and d on the diagram. **(2 marks)**

a Upper epidermis;

b Palisade layer;

c Spongy mesophyll layer ;

d Lower epidermis;

(b) Give the differences between layers b and c
(3 marks)

Layer b	Layer c
i.Numerous chloroplast	Few chloroplast
ii.Small air spaces	Large air spaces
iii.Regular/cylindrical in shape	Irregular in shapes
iv closely packed	Loosely packed

ANY 3 CORRECTLY CONTRASTING

(c) Using evidence from the diagram, describe how the structure of a leaf is suited for photosynthesis. **(4 marks)**

- **Cuticle is thin to reduce diffusion distance; and transparent to allow maximum penetration of light;**
- **Upper epidermis is thin to reduce diffusion distance; and transparent to allow maximum penetration of light;**
- **Palisade cells are closely packed to increase surface for trapping sunlight; and loaded with numerous chloroplasts for maximum;**

trapping of sunlight

- ***Airspaces are large in mesophyll layer for temporary storage of gases to allow efficient exchange; and small in palisade layer for absorption of carbondioxide and diffusion of oxygen;***
- ***Xylem for transporting water and mineral salts;***
- ***Phloem for transporting manufactured food;***
- ***Stoma for gaseous between the leaf and environment;***

(d) What is the importance of wax on layer a ? (1 mark)

Protect inner cells of the leaf;

33. (a) Name a vitamin, an enzyme and a mineral element that are involved in the blood clotting process. (3 marks)

Vitamin K;

Enzyme(s)Thromboplastin/Thrombokinese;

Mineral element Calcium ion;

(b) Give reasons why knowledge about human blood groups is important during transfusion. (3 marks)

Correctly match donor to recipient blood group;

Prevent agglutination;

Analyse carefully and avoid Rhesus factor and mismatching antibodies and antigens;

(c) State two ways by which white blood cells fight micro-organisms. (2 marks)

Engulfing; phagocytosis of germs/antigens;

Producing antibodies;

(d) Name the diseases of blood described by the following symptoms (2 marks)

i. Inability of the blood to clot

Haemophilia;

ii. Crescent-shaped red blood cells with abnormal hemoglobin

Sickle cell anaemia;

SECTION C (attempt any two questions from this section)

34. a) State the wastes that are eliminated by the kidney. (2 marks)

Urea; Excess water; mineral salts/ions; Any two.

b) Describe how urine is formed by the kidneys. (13 marks)

Urine is formed from blood circulating through the kidney by two processes

- a) **Ultra filtration;**
- b) **Selective reabsorption;**

ULTRA FILTRATION

Blood from afferent arteriole flows into the glomerulus under high pressure; The high pressure forces some components of blood plasma into the capsular space of bowman's capsule;

All material that has passed through into the bowman's capsule is called the glomerular filtrate /renal fluid; Glomerular filtrate contains urea and many useful substances like glucose, mineral salts, vitamins all dissolved in large amount of water;

Plasma proteins and blood cells are too large to pass through the walls of blood capillaries and bowman's capsule hence they remain in blood capillaries;

SELECTIVE REABSORPTION

After filtration the following are reabsorbed in different parts of the nephrons.

- i. **In the Proximal convoluted tubules;**
 - **By active; transport all glucose, some vitamins and mineral ions are reabsorbed;**
 - **By osmosis; some water is reabsorbed;**
- ii. **In the loop of Henle;**
 - **Continued reabsorption of water by osmosis takes place;**
 - **Sodium chloride ions also actively reabsorbed;**
- iii. **Distal convoluted tubules;**
 - **Some water is reabsorbed by osmosis;**
 - **Depending on pH, acidic or alkaline salts may be reabsorbed;**
- iv. **In the collecting duct;**
 - **Water is reabsorbed depending on concentration of blood;**

The remaining filtrate is called URINE; and it contains some water, salts and Urea; Max 13 marks

35. a) Differentiate between continuous and discontinuous variation, giving an example of each, in humans.

Continuous Variation refers to the range of phenotypic traits that show a wide range of intermediate forms. Continuous variation is typically controlled by multiple genes and influenced by environmental factors while **Discontinuous Variation** refers to the existence of distinct, non-overlapping phenotypic categories or discrete groups within a population. Each category represents a specific phenotype or trait, and individuals fall into one of these discrete groups. (4 marks)

- (b) Distinguish between incomplete dominance and co-dominance in heredity. (4 marks)

Incomplete dominance occurs when the heterozygous genotype (having two different alleles for a specific gene) results in an intermediate phenotype that is a blend of the two homozygous phenotypes. In this case, neither allele is completely dominant over the other, and their effects are partially expressed in the heterozygous individual.

While Codominance occurs when both alleles in a heterozygous individual are fully and simultaneously expressed, without any blending of phenotypes. Each allele is visibly seen in the phenotype, leading to the coexistence of two distinct traits.

- (c) A man of blood group A married a woman of blood group B and they produced a child of blood group O among others. What were the genotypes of the parents and their offspring?

Let A represent the allele for blood group A;

Let B represent the allele for blood group B;

Let O represent the allele for blood group O;

Parental phenotype; blood group A X blood group B

Parental genotype; AO BO

Meiosis;

Gametes; A O B O

Random Fertilizations;

Offsprings; AB AO BO OO

Genotypes of parents AO; BO;

Genotypes of offsprings AB; AO; BO; OO:

(Show your working)

(7 marks)

36. a) Describe the changes that starch undergoes in the human digestive system.

In the Mouth;

- ***Physical digestion occurs by chewing which breaks down large particles into smaller units;***
- ***Salivary glands secrete saliva into the mouth;***
- ***The saliva contains an enzyme called salivary amylase or ptyalin; which digests starch molecules converting it to maltose;***

In the duodenum;

- ***Pancreatic amylase; which breaks down the remaining starch from digestion in the mouth into maltose;***

In the ileum;

- ***Presence of food in the ileum stimulates the release of intestinal juice called succusentericus;***
- ***Maltase; breaks down maltose into glucose;***
- ***Sucrase; which breaks down sucrose into glucose and fructose;***
- ***Lactase; which breaks down lactose to glucose and galactose;***

(MAX 8 marks)

b) In what ways is the structure of the ileum suited for its function? (7 marks)

- ***Ileum is very long thus presenting a large surface area for absorption of food;***
- ***Its walls are folded to give large surface area for absorption of food;***
- ***Its inner lining contains villi which increase the surface area for absorption of food;***
- ***Each villi contains many microvilli which further increase the surface area for absorption of food;***
- ***Villi contain numerous blood capillaries which transport food faster to the liver, hence maintaining high concentration gradient between endothelium and lumen food content;***

- ***Villi contain lacteal which transport absorbed lipids to the lymphatic system;***
- ***Villi has thin wall (single epithelial lining) for rapid absorption of food particles from lumen to the capillaries and lacteal;***

37. (a) Explain how flowers are adapted to wind pollination

- ***They have small petals; that easily expose the stamen and pistil out for wind pollination;***
- ***They produce light pollen grains; which can easily be carried by wind and attached to the stigma;***
- ***They have feathery stigmas; to trap pollen grains carried by the wind;***
- ***They produce a lot of pollen grains; to increases chances of pollination;***
- ***They have long stamens and pistils; hanging outside the petals; to release and receive respectively pollen grains easily;***

1mk @ max 10. Features description is tied to functions earning two marks.

(10 marks)

(b) What are the benefits of sexual reproduction in plants?

- ***The main benefit is improving fitness and selection advantage in the following ways;***
- ***Hybrid vigor that produces better varieties of plants;***
- ***Variation that produces different traits for natural selection to act on;***
- ***Dispersal by seeds hence avoiding crowding lower population density-dependent relationships like competition; Dispersal can lead to the colonization of new habitat;***
- ***Continuous Assortment; recombination; random pollination; and fertilization ensures stability and longevity of plant species;***

(MAX 5 marks)

Good luck