Proposed marking guide

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Signature: .....

Random No.					Personal No.		

(Do not write your School/Centre Name or Number anywhere on this booklet.)

P530/1
BIOLOGY
Paper 1
(Theory)
Nov./Dec. 2024
2 ½ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY

Paper 1
(Theory)

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of two Sections; **A** *and* **B**.

All *questions are* **compulsory**.

Write answers to Section **A** *in the 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 Signature & No.**
A	**1 - 40**		
B	**41**		
	42		
	43		
	44		
	45		
	46		
Total			

Turn Over

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. The epithelium with elongated cells arranged at right angle to the basement is

   A. glandular. B. cuboidal.
   C. squamous. D. columnar.

   B ✓

2. Which one of the following makes conifers better adapted to life on land than ferns?

   A. Having vascular tissues.
   B. Producing pollen grains.
   C. Possessing waxy cuticle surfaces.
   D. Developing true roots.

   A ✓

3. The following structures contain elastin protein except

   A. cartilage. B. tendon.
   C. ligament. D. aorta.

   B ✓

4. In the cell membrane, the phosphate group of the phospholipid

   A. forms ionic bonds with water.
   B. contains covalent bonds.
   C. is non-polar.
   D. is both saturated and unsaturated.

   A ✓

5. Which one of the following pathways taken by water from the soil involves use of plasmodesmata?

   A. Apoplast. B. Symplast.
   C. Cell to cell. D. Vacuolar.

   A ✓

6. Secondary productivity is lower than primary productivity because

   A. plants have poor energy containing organic molecules.
   B. the rate of assimilation of organic matter in plants is low.
   C. most of the food is used to produce energy in plants.
   D. digestion of plant materials occurs very slowly.

   D ✓

7. The selection pressure that could have favoured the evolution of long neck giraffe in its habitat is

   A. stabilising. B. disruptive.
   C. directional. D. artificial.

   C ✓

8. Biochemical analysis of a sample of DNA showed that 33 % of the nitrogenous base was guanine. What would be the percentage of adenine in the DNA sample?

A. 16.5 B. 33
C. 49.5 D. 66

A ✓

9. In which of the following processes is osmosis involved?

A. Movement of water through the xylem.
B. Passage of water across a cell of endodermis.
C. Movement of water from leaf epidermal cells.
D. Oozing out of water through the stomata.

B ✓

10. Figure 1 shows the effect of carbon dioxide on the oxygen dissociation curves of human blood.

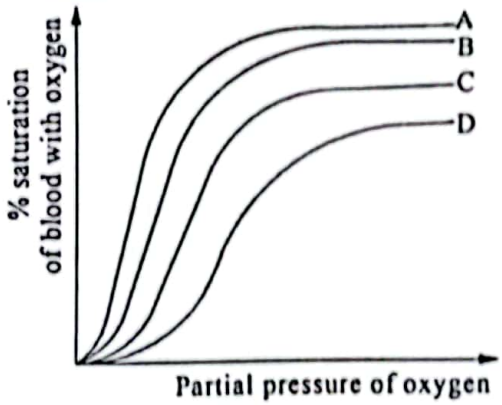

Fig. 1

Which one of the curves in figure 1 shows condition of low pH?

D ✓

11. CAM plants are physiologically suited to minimise excessive water loss by

A. reducing the number of stomata on their leaves.
B. reversing the normal stomatal rhythm.
C. possessing shallow roots for maximum absorption of surface water.
D. reducing their leaf size into spines.

B ✓

12. According to competitive exclusion principle,

A. the successful species can attain full population growth in presence of the outcompeted species.
B. full population growth of the successful species is attained much slower than when grown alone.
C. the population of the outcompeted species show no growth.
D. there is cyclical fluctuations of population of the two species with time.

B ✓

13. Which one the following characteristics is correct for all members of kingdom fungi? All

A. are saprotrophs.
B. have crosswalls.
C. produce spores asexually.
D. are eukaryotic.

D ✓

14. Blood from the placenta and fetal gut bypasses the fetal liver because

A. the liver is non-functional.
B. the liver has no regulatory function.
C. of the presence of the ductus arteriosus.
D. the fetus has no excretory products.

A ✓

15. What initiates the process of blood clotting at the site of a damaged tissue?

A. Collection of platelets.
B. Release of thromboplastin.
C. Presence of Ca^{2+} and Vitamin K.
D. Release of thrombin.

B ✓

16. Which one of the following is less likely to determine the existence of different herbivores species in the same habitat?

A. Having different structures of the gut.
B. Feeding at different times of the day.
C. Possession of different body sizes.
D. Having different breeding season.

C ✓

17. What is the final electron acceptor in lactic acid fermentation?

A. Pyruvate.
B. NAD.
C. Acetyl CoA.
D. Oxygen.

A ✓

18. A cross between two *Drosophila*, one with a black body and purple eyes and the other with a grey body and red eyes gave the following numbers of offspring.

47 black bodied with purple eyes.
3 black bodied with red eyes.
3 grey bodied with purple eyes.
47 grey bodied with red eyes.

The recombination frequency of the two genes is

A. 0.096
B. 0.09
C. 0.06
D. 0.03

C ✓

CamScanner

19. Which one of the following organelles is associated with the functioning of neutrophils?

A. Mitochondria.
B. Ribosomes.
C. Microbodies.
D. Lysosomes.

D ✓

20. Which one of the following is the role of calcium ions in the process of muscle contraction?

A. Causing depolarisation of the transverse tubule system.
B. Changing the configuration of troponin thus exposing myosin binding sites.
C. Binding to tropomyosin and breaking actin-myosin cross bridges.
D. Changing the configuration of myosin heads thus causing microfilaments to slide over each other.

B ✓

21. Figure 2 shows variation of the alveolar pressure of a human lung with time.

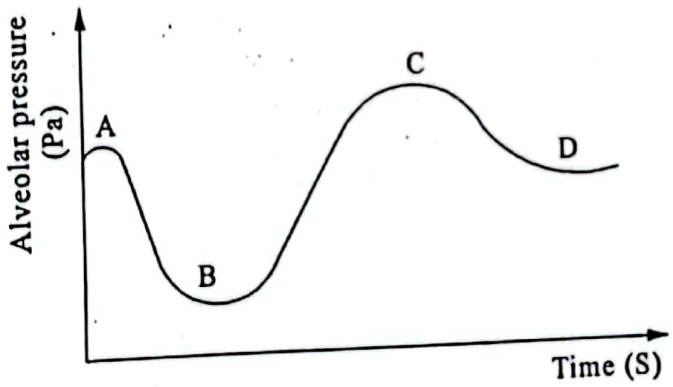

Fig. 2

Which part of the curve in figure 2 shows the stage of deepest exhalation?

C ✓

22. Which one of the following best explains why prolonged pesticide application in controlling pest populations causes pest resurgence?

A. Pesticide changes the colour of the pest and become invisible to predators.
B. Pests get used to surviving in pesticide environment.
C. Pesticide loses effectiveness in combating the pests.
D. Resistant mutants multiply.

D ✓

23. Figure 3 illustrates the Calvin cycle.

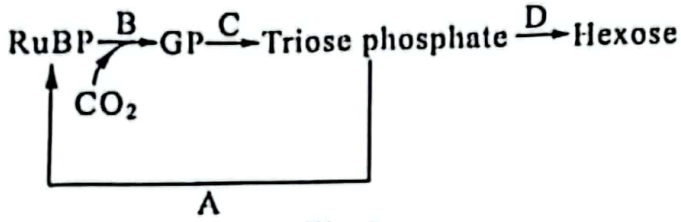

Fig. 3

Which one of the stages in figure 3 would be slowed down due to the presence of high levels of oxygen in a plant?

B ✓

24. In haploid parthenogenesis, eggs are produced by
A. meiosis and develop without being fertilised.
B. meiosis and develop after being fertilised.
C. mitosis and develop without being fertilised.
D. mitosis and develop after being fertilised.

A ✓

25. A scare crow standing in the garden of rice serves effectively against birds only for a short time because
A. continued stimulation gradually leads to ignored response.
B. receptors get adapted to stimulation and cease to respond.
C. it is non locomotary and has reduced coverage effect.
D. high visual acuity of birds makes the scare crow regarded harmless.

B ✓

26. What would be the pressure potential of a cell whose solute potential when in equilibrium with pure water is –1100 kPa?
A. 1100 kPa.
B. 1000 kPa.
C. –1000 kPa.
D. –1100 kPa.

A ✓

27. Which one of the following adaptations of Xerophytes does not minimise water loss?
A. Reduced numbers of stomata.
B. Thickened lamina.
C. Sunken stomata.
D. Short life cycle.

D ✓

28. Which one of the following stimulus distorts receptor hair cells in the organ of corti in the human ear?

A. Displacement of the fluid in tympanic canal.
B. Movement of the basilar membrane.
C. Movement of the fluid in vestibular canal.
D. Movement of the Reissner's membrane.

B ✓

29. The rate of photosynthesis in C_3 plants decreases when the oxygen concentration is high because

A. organic acids accumulate in the cells lowering the pH.
B. carbon dioxide concentration decreases with increase in oxygen concentration.
C. oxygen competes with carbon dioxide for RuBP carboxylase.
D. PEP carboxylase is more efficient at high oxygen concentration.

C ✓

30. Which one of the following is a major cause of increased metabolic rate during a sprint? Increased

A. movement of limbs.
B. blood flow to muscles.
C. body temperature.
D. demand for ATP.

A ✓

31. What is the triplet of bases on the coding DNA strand if the anticodon on tRNA is AUG during protein synthesis?

A. ATG. B. UAC.
C. TAC. D. UCG.

A ✓

32. Which one of the following causes lift force during flight in birds?

A. Faster flow of air below the lower surface of the wing.
B. Greater turbulence above the upper surface of the wing.
C. Increased pressure on the wing.
D. Reduced angle of attack below the wing.

C ✓

33. Digested food is absorbed over the body surface in tapeworms because they

A. posses no gut. B. lack the anus.
C. have flattened body. D. have a scolex with suckers.

A ✓

34. Which one of the following maintains a resting potential across the membrane of a neurone?

A. Active transport of sodium ions outside the membrane.
B. Active transport of potassium ions inside the membrane.
C. Rapid diffusion of sodium ions inside the membrane.
D. Rapid diffusion of potassium ions outside the membrane.

B ✓

Turn Over

35. Which one of the following is true about the cardiac muscle? The fibres

A. are connected by intercalated discs.
B. are voluntary.
C. are spindle shaped.
D. have no nucleus.

A ✓

36. Secretin is secreted in the duodenum in response to the

A. stimulation by the vagus nerve.
B. presence of partially digested fats.
C. presence of partially digested proteins.
D. presence of acidified chyme.

D ✓

37. Which one of the following is the best ecological reason for metamorphosis in insects?

A. Allows full differentiation of body tissues.
B. Enables the larvae and adult to have different body shapes.
C. Allows larvae to camouflage from predators.
D. Reduces competition between adults and juveniles.

D ✓

38. In which one of the following plants will the apical bud grow more vigorously than the lateral buds below it?

A. Tall unbranched plant.
B. Short branched plant.
C. Decapitated plant.
D. A plant treated with ABA.

A ✓

39. Which of the following increases the precision of cones?

A. Ability to rapidly resynthesise the photochemical pigment.
B. Many cones converging into one bipolar neurone.
C. Many cones are widely distributed on the retina.
D. One to one relationship with the optic nerve fibres.

D ✓

40. The onset of lactation is initiated by

A. secretion of oxytocin.
B. secretion of prolactin.
C. increase in levels of oestrogen.
D. decrease in levels of progesterone.

B. ✓

SECTION B (60 MARKS)

Write your answers in the spaces provided.

41. (a) Why is a cell membrane described as fluid – mosaic? *(02 marks)*

The membrane consists of a dynamic fluid bilayer of phospholipids containing free floating proteins, arranged in an irregular pattern. MaX 02

(b) Outline three functions of the membranes within cells. *(03 marks)*

– Isolation of enzymes so that other organelles are not damaged; – Isolating different chemical reactions to prevent interference.
– Offer large surface area for reaction.
– Act as an intracellular transport system.
– Different metabolic activities can take place at the same time Any 03

(c) How are the following cell organelles involved in enzyme secretion?

(i) Rough endoplasmic reticulum. *(02 marks)*

– Isolation and transport the protein which have been synthesized by the ribosomes.
– Intracellular transport system facilitating movement of materials from one point of the cell to another Any 02

(ii) Golgi apparatus. *(03 marks)*

– An assembly point through which raw materials for secretion are funnelled before being shed from the cell. – Add the carbohydrate component to the protein and package the finished product before it leaves the cell. MaX 03

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42. (a) State how respiratory surfaces enable organisms maintain a maximum possible rate of gaseous exchange. *(04 marks)*

Large surface area; facilitates high rate of exchange
Moist surface; oxygen easily dissolve.
Thin, to reduce diffusion distance
Permeable; respiratory gases easily diffuse through
Good blood supply; efficient delivery of respiratory gases

Any 04

(b) Explain the short term physiological adjustments that take place in the following systems when a person moves from a low altitude to a high altitude.

(i) Respiratory system. *(03 marks)*

Decrease in oxygen is sensed by peripheral chemoreceptors causes an increase in breathing rate

Max 03

(ii) Circulatory system. *(03 marks)*

- Increase in number of red blood and haemoglobin content of the body thus the oxygen carrying power of the blood goes up.
- Increased affinity of haemoglobin for oxygen so that it loads more oxygen in the lungs

Max 03

43. (a) What is parthenogenesis? *(01 mark)*

It the development of a new individual from an unfertilized egg. ✓ MaX 01

(b) The life cycle of a bean aphid involves both parthenogenesis and sexual reproduction. Of what advantage is each type of reproduction to the population of aphids?

(i) Parthenogenesis. *(02 marks)*

In the summer months, wingless female aphids produced futher generation of many wingless females by diploid parthenogenesis ✓, a rapid and efficient ✓ way of increasing numbers without necessitating the presence of males.

(ii) Sexual reproduction. *(02 marks)*

Male aphids produce haploid sperms which fuse with the haploid egg from female by Meiosis, which fuse during fertilization ✓ to form a diploid zygote that develop into adult aphid.

(c) Explain the role of parthenogenesis in the life cycle of bees. *(03 marks)*

The bee colony contains three distinct types of individuals, the queens, workers and drones ✓. The drones which are all fertile male develop from unfertilized haploid eggs laid by the queen by haploid parthenogenesis ✓ ✓

MaX 03

(d) State two sources of variation that arise between parents and offspring as a result of sexual reproduction (02 marks)

- Crossing over and independent assortment of homologous chromosomes during meiosis
- Random union of gametes during fertilization

Any 2 2

44. Figure 4 shows the rate of glucose reabsorption in, and excretion from the human kidney in relation to the glucose concentration per 100 cm^3 of plasma.

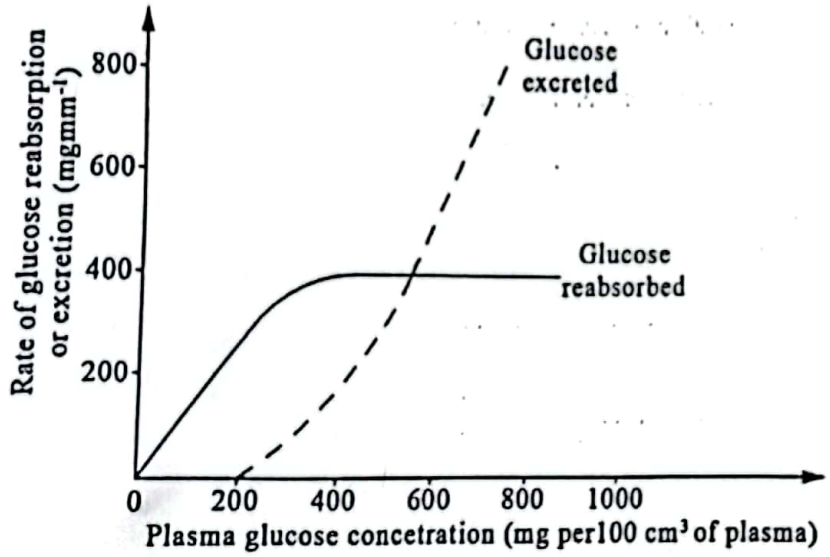

Fig. 4

(a) Compare the rate of glucose reabsorption with glucose excretion.

(i) Similarities. (02 marks)

Both increased from 200 to 300 mg per 100 cm^3 of plasma
Both are the same at 500 mg per 100 cm^3 of plasma

Max 02

(ii) Differences. (02 marks)

Rate of glucose reabsorption Attained maximum from 0 to 200 mg per 100 cm³ of plasma increased.	Rate of glucose excretion didn't there were no
From 200 to 500 mg/100cm³ is higher	From 200 to 500 mg/100cm³ is lower
from 600 to 700 mg/100cm³ is lower	from 600 to 700 mg/100cm³ is higher

1 mk 02

(b) Explain the changes in the rate of glucose reabsorption when the plasma glucose concentration is;

(i) between 0 and 200 mg per 100 cm³ of plasma. (02 marks)

Rate of glucose reabsorption increases rapidly because few glucose molecules quickly bind to the many free specific carrier proteins in the proximal convuluted tubule.

Max 02

(ii) over 400 mg per 100 cm³ of plasma. (02 marks)

Rate of glucose reabsorption remains constant because the carrier proteins are fully saturated with very many glucose molecules.

Max 02

(c) Suggest why glucose may be excreted in urine of a person. (02 marks)

- Dibetic person; produced insufficient levels of insulin hormone; hence failure to regulate glucose.

Max 02

45. (a) State two differences between growth in perennial plants and growth in animals. (02 marks)

- In plants, there are growth responses forexample tropism while in animals, no growth responses
- Plants consist of primary and secondary growth while animals don't
- In plants, growth control is unde- hormones eg ABA, GA while in animals growth is controlled by growth hormones

Any 02

(b) Explain the following observations:

(i) Increase in girth of stem only occurs in perennial dicotyledonous plants. (02 marks)

The Cambium tissue forms a complete ring which proliferates internally to form secondary xylem and externally to form secondary phloem.

Max 02

(ii) Cutting off the apex of a young tree makes it develop more branches. (03 marks)

Cutting the main stem removes the source of auxin, lateral growth take place, encouraging the sprouting of side branches lower down.

Max 03

(iii) Terrestrial plants dry up days after flooding of their habitat. (03 marks)

Flooding lowers the oxygen content of the soil, reducing rate of ATp production from aerobic respiration by root hair cells, reducing active uptake of solute into root cells, creating low concentration gradient, reducing water uptake by osmosis.

Max 03

46. Figure 5 shows the result of an experiment to investigate the effect of oxygen concentration on uptake of potassium ions and consumption of sugar by the cells of an excised (cut off) root of barley seedlings.

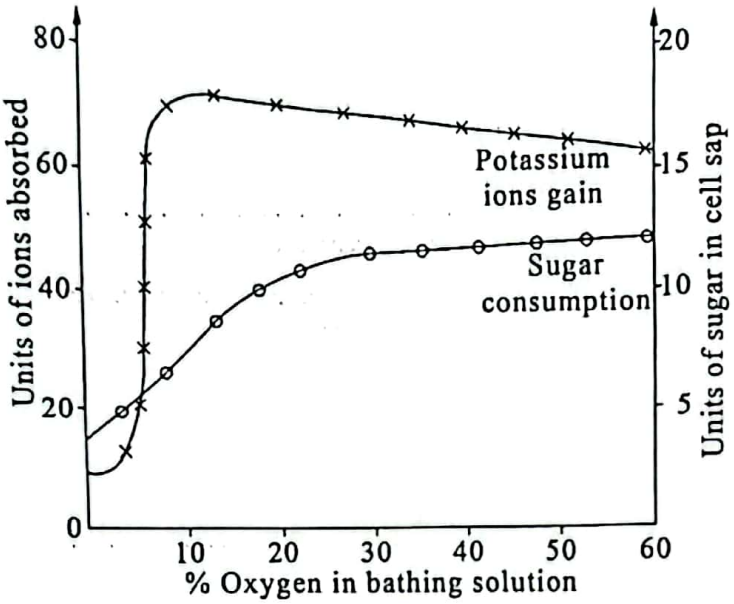

Fig. 5

(a) Explain the;

(i) effect of oxygen concentration on the uptake of potassium ions. (*03 marks*)

Increase in oxygen Concentration up to 15% leads to an increase on the uptake of potassium ions because oxygen was used in aerobic respiration to form energy for active transport from 15% to 60%, Increase in oxygen Concentration leads to adecrease in uptake of potassium ions due to accumulation of Carbondioxide, lowers PH, inhibiting respiratory enzy to ceasing kt

Max 3

(ii) relationship between units of potassium ions absorbed and units of sugar consumption into the cell sap. (*02 marks*)

As units of potassium ions absorbed increase, the units of sugar consumption also increase because sugars were used as respiratory substrate to produce energy for active uptake of potassium ions.

Max 2

(b) State one factor other than oxygen that affects uptake of mineral ions by plants. *(01 mark)*

— Temperature ✓ — Presence or absence of inhibitors
— PH of the medium — Substrate concentration

(c) Describe how the absorbed potassium ions reach the xylem vessels through apoplast pathway. *(04 marks)* Any Correct 04

Potassium ions enter the root hair cell sap by simple diffusion and active transport; The ions then diffuse into epidermal cell; reducing their ~~lowe~~ water potential (ψ); water enters them by osmosis via cell wall; then ions diffuse into cortical cells; lowering ψ, water enter by osmosis via cell wall; ions the diffuse into endodermal cells; lowers ψ; water enter by osmosis via cytoplasm; and vacuolar; apoplast stop due to presence of Casparian strip; pathway Containing suberin. endodermal Cells actively secrete the ions into xylem vessels;

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END

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