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BIOLOGY TEACHER
LIGHTCOLLEGE KATIKAMU SDA

P530/1

BIOLOGY (Theory)

Paper 1

July/ August 2023

2 ½ hrs

HES MOCKS 2023

UGANDA ADVANCED CERTIFICATE OF EDUCATION

BIOLOGY (Theory)

Paper 1 100%

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

*This paper consists of **two** sections **A** and **B***

Write all answers to section A in the answer grid provided by writing the correct alternative.

Write all answers to section B in the spaces provided. No additional sheets of paper should be inserted in this booklet

For examiner's use only		
SECTION	**QUESTION**	**MARKS**
A	**1 - 40**	40MKs
B	**41.**	10 MKs
	42.	10 MKs
	43.	10 MKs
	44.	10 MKs
	45.	10 MKs
	46.	10 MKs
TOTAL		100%

SECTION A

1. The association exhibited by an orchid living on a tree is
   A. Predator
   B. Mutualism
   C. Commensalism
   D. Parasitism

2. The property of water that pond skaters depend on for survival is that
   A. Water has a low viscosity
   B. Water has a high surface tension
   C. Water has high cohesive forces
   D. Water has a maximum density at 4°C

3. A single gene provides a code for synthesis of one
   A. polypeptide
   B. nucleotide
   C. amino acid
   D. DNA

4. Which of the following does not protect body surfaces:
   A. Skin.
   B. Mucus.
   C. Gastric acid.
   D. Salivary amylase

5. In the antibody-mediated immune system, plasma cells:
   A. have a thin layer of cytoplasm
   B. are derived from t-cells
   C. develop into B-cells
   D. have a highly developed rough endoplasmic reticulum

6. Adoptive transfer of acquired immune responsiveness involves the transfer of:
   A. Antibody
   B. Serum
   C. Phagocytes
   D. Lymphocyt

7. Which of the following organisms are not biological indicat
   A. Algae
   B. Lichens
   C. Frogs
   D. Rats

8. The rate of hydrolysis of starch by salivary amylase decreases as the concentration of chloride ions decreases. This is because the chloride ions are;

A. co-enzymes.
B. competitive inhibitors.
C. co-factors.
D. allosteric inhibitors.

C

9. The cell organelles that are most likely to be affected as a result of prolonged use of antibiotics in human cells are.

A. Mitochondria
B. Golgi apparatus
C. Centrioles
D. Rough endoplasmic reticulum

A

10. One of the following processes does not take place during cytokinesis in plants. Which one is it?

A. constriction of the cell by the contractile ring
B. deposition of calcium and magnesium pectates.
C. coalescing of phragmoplasts.
D. formation of Golgi vesicles.

D

11. In development, mammalian embryos successively develop notochord, somites, gill pouches and three sets of kidneys: pronephros, mesonephros and metanephros. This shows that

A. phylogeny recapitulates ontogeny
B. ontogeny recapitulates phylogeny
C. divergent evolution
D. adaptive radiation.

A

12. Which of the cells below undergoes diapedesis

A. Neutrophils
B. Eosinophils
C. Basophils
D. Monocytes

D

13. Cyclic photophosphorylation in plants occurs in the

A. Stroma
B. Thylakoid space
C. Thylakoid membrane
D. Integranal lamellae

C ✓

14. The time of decreased metabolism and lowered body temperature that may occur daily in some mammals is known as

A. Torpor
B. Aestivation
C. Hibernation
D. Winter sleep

C ✓

15. Haemophilia is a hereditary disease caused by recessive gene carried on the X-chromosome in humans. A man with normal blood clotting married a normal woman whose father was a haemophiliac. What is the probability of this couple producing a haemophiliac child?

A. 0
B. 1
C. ¼
D. ½

C ✓

16. Excellence in detecting movements at the lateral edges of the visual field is attributed to

A. rods and cones.
B. rods only.
C. cones only.
D. compound eyes

B ✓

17. The Nile perch maintains its water balance through

A. Drinking large volumes of water
B. Excreting hypertonic urine
C. Excreting excess salts across their gills
D. Reversing the activity of chloride pumps

D ✓

18. Rapid periods of genetic change followed by extended periods of stabilizing selection and evolutionary stasis describe

A. phyletic gradualism.

A ✓

B. punctuated equilibrium.

C. parapatric speciation.

D. sympatric speciation.

19. An animal possesses a body cavity, a layer of muscle that underlies the outer body wall, and a gut track without associated muscle or connective tissue. This animal's body organization is

A. diploblastic.

B. triploblastic acoelomate.

C. triploblastic pseudocoelomate.

D. triploblastic coelomate

D ✓

20. Secretions from the parietal cells of the gastric gland are responsible for

A. Protecting stomach walls from HCl and enzymes.

B. Stimulating the secretion of pepsinogen and HCl.

C. Conversion of inactive pepsinogen to active pepsin.

D. Catalyzing the breakdown of proteins to peptides.

C ✓

21. The hybrid offspring of a male donkey and a female horse is a mule which is robust but sterile. A "hinny", the offspring of a female donkey and a male horse, is also sterile. This is an example of

A. Hybrid vigour

B. Hybrid sterility

C. Hybrid viability

D. Hybrid breakdown

C ✓

22. Carbon dioxide in blood plasma is mostly transported in form of

A. Carboxyhaemoglobin

B. Carbamino haemoglobin

C. Hydrogen carbonate ions

D. Haemoglobinic acid

A ✓

23. Which of the following is released by the juxtaglomerular apparatus in the distal tubule following a decrease in blood pressure and volume?

A. Renin

A ✓

B. Angiotensinogen

C. Angiotensin

D. Aldosterone

24. African lungfish, which are often found in small, stagnant pools of fresh water, produce urea as a nitrogenous waste. What is an advantage of this adaptation?

A. Urea takes less energy to synthesize than ammonia.

B. Small, stagnant pools do not provide enough water to dilute ammonia, which is toxic.

C. Urea forms an insoluble precipitate.

D. Urea makes lungfish tissue hypoosmotic to the pool

B

25. A transverse section of an unnamed plant when examined under a microscope was found to have an epidermic with poorly developed cuticle, a wide cortex with large inter cellular air space and a small stele towards the center. The plant is most likely a;

A. hydrophyte.

B. xerophyte.

C. mesophyte.

D. halophyte.

A

26. The following consist of fixed action patterns except;

A. Biological rhythms

B. Courtship

C. Mating

D. Imprinting

C

27. The first heart sound is produced at the;

A. beginning of systole.

B. end of systole.

C. beginning of diastole.

D. end of diastole

B

28. A microscopic examination of a cell revealed mesosomes in the cytoplasm. Which of the following is most likely to be found in the cytoplasm such a cell

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

A ✓

29. Rotation of the fish about its longitudinal axis during swimming is counteracted by;

A. Dorsal and ventral fins
B. Ventral and pectoral fins
C. Pectoral and pelvic fins
D. Pectoral and ventral fins

C ✓

30. Membranes remain fluid even if cells are subjected to temperatures approximating to freezing because membranes contain;

A. cholesterol and saturated fatty acids
B. cholesterol and unsaturated fatty acids
C. cholesterol and proteins
D. cholesterol and alkyl chains.

B ✓

31. The following are functions of the ray initials apart from;

A. Deposition of tannins
B. Radial transport of water and food
C. Formation of new vascular tissue
D. Formation of new xylem parenchyma

A ✓

32. Which one of the following features of sponges makes them fit neatly into the animal kingdom?

A. Multi cellularity
B. Ability to recognize self and non-self-cells
C. Powers of locomotion
D. Tissues

A ✓

33. Which one of the following is the ultimate effect of cultivating invasive species?

A. Rapid growth of aliens
B. Outcompeting the indigenous species
C. Modifying the ecological set up
D. Production of toxins

B ✓

34. At which stage of meiosis does the formation of chiasma take place?

A. Leptotene
B. Zygotene
C. Pachytene
D. Diakinesis

C ✓

35. Impulses leading to contraction of the bronchial tree during inspiration are transmitted via the;

A. Vagus nerve
B. Intercostal nerve
C. Carotid bodies
D. Phrenic nerve

A ✓

36. The following are all secondary proteins apart from;

A. Myoglobin
B. Tropocollagen
C. Fibroin
D. Keratin

B ✓

37. The motor proteins used to move cilia and flagella in cells are;

A. Tubulin and fibrin
B. Kinesin and motorin
C. Dynein and kinesin
D. Elastin and collagen

C ✓

38. The micronucleus of a paramecium is exclusively for;

A. Sexual reproduction
B. Asexual reproduction

C ✓

C. Controlling cell division

D. Storing DNA

39. The best explanation for the increased sensitivity of a cat than a frog is difference in;

A. Diameter of axons

B. Myelinated axons

C. Body temperature

D. Size of the brain

B ✓

40. A cock deprived of a hen after being aroused sexually will display to a bucket or stone. This is an example of;

A. Releasing stimulus

B. Displacement activity

C. Vacuum activity

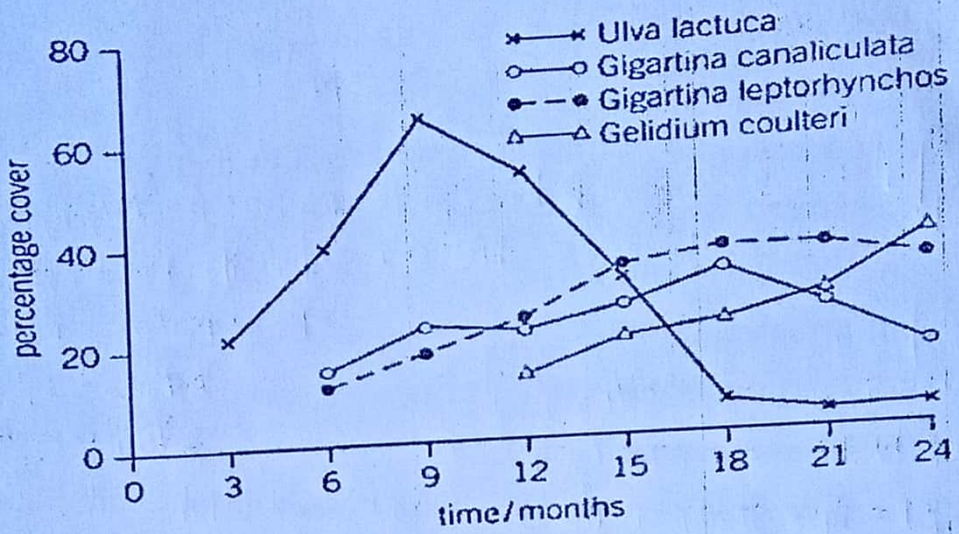
D. Motivational stimuli

C ✓

SECTION B (*60 marks*)

Write the answers to these questions in spaces provided.

41. Algae are photosynthesizing organisms. Some algae grow on rocky shores. A scientist investigated succession involving different species of algae. He placed concrete blocks on a rocky shore. At regular intervals over 2 years, he recorded the percentage cover of algal species on the blocks. His results are shown in the graph.



(a) Name the pioneer species. (1 mark) Reject wrong spelling

Ulva lactuca ✓ Reject ulva on its own. Accept lactuca on its own

(b) (i) The scientist used percentage cover rather than frequency to record the abundance of algae present. Suggest why. (1 mark)

Organisms too small to be identified ✓ Accept too many to count ✓ / Individual organisms are not well identified ✓ / difficult methods

(ii) Some scientists reviewing this investigation were concerned about the validity or the results because of the use of concrete blocks. Suggest one reason why these scientists were concerned about using concrete blocks for the growth of algae. (1 mark)

Concrete blocks are artificially made ✓ accept man made ✓ / not natural ✓ / Any descriptive feature of a concrete like texture ✓ flat ✓ composition chemically ✓

(c) Use the results of this investigation to explain the process of succession. (7 marks)

Concrete blocks absorbs moisture and air ✓ supports the growth of pioneer species/ulva lactuca ✓ which grows and decreases ✓ due to change in conditions such as humas, nutrients, new species/better competitors/~~Gargit~~ Gigartina

Canaliculata and Gigarthrig leptorhynchos arises/grows; ✓1
some die and forms humus which supports growth of Coultieri
better competitor outcompetes ✓1 other all species/named species
decreasing their population ✓1 and increasing the population
of Gelidium Coulteri; ✓1 ..... Total Marks 10 mks

42. In a species or snail, shell colour is controlled by a gene with three alleles. The shell may be brown, pink, or yellow. The allele for brown C^B, is dominant to the other two alleles. The allele for pink, C^P, is dominant to the allele for yellow, C^Y.

(a) Explain what is meant by **dominant allele**. (1 mark)

An allele that expresses itself ✓1 in presence of both homozygous state and heterozygous state; ✓1 ..... 07.

(b) State all the genotypes which could result in a brown-shelled snail. (1½ mark)

C^BC^B ✓1 ; C^BC^P ✓1 ; C^BC^Y ; ✓1

(c) A cross between two pink shelled snails produced only pink-shelled and yellow-shelled snails. Use a genetic diagram to explain why. (4 marks)

Parental phenotype : pink shelled X pink shelled snails
parental genotype : C^PC^Y C^PC^Y
Meiosis : ✓
Free and random fertilization ✓
Fi genotype : C^PC^P C^PC^Y C^PC^Y C^YC^Y ✓
Fi phenotype : 3 pink-shelled snails and 1 Yellow shelled snails ✓
Gene for pink shell ✓ was dominant to that for yellow shell ✓
Causing it to fully express itself in both homozygous
and heterozygous state; ✓ 04mks

(d) The shells of this snail may be unbanded or banded. The absence or presence or bands is controlled by a single gene with two alleles. The allele for unbanded, **B**, is dominant to the allele for banded, **b**. A population or snails contained 51 % of unbanded snails. Use the Hardy-

Weinberg equation to calculate the percentage of this population that you would expect to be heterozygous for this gene. Show your working. (4 marks)

Let P represent dominant allele and q recessive allele ✓g
from p+q=1 ✓ where P = 51% = 0.51
p + q = 1 ✓ 0.5 + q = 1 ✓
q = 1 - 0.51 ✓
= 0.49 ✓g
Hence frequency of recessive alleles is 0.49 and that of dominant allele is 0.51 ✓g

Now applying Weinberg principle to get Heterozygous population
$p^2 + 2pq + q^2 = 1$ ✓g
$(0.51)^2 + 2pq + (0.49)^2 = 1$ ✓g
$2pq = 1 - 0.49$
$2pq = 0.50$
50% are heterozygous in the population ✓g

Total Marks = 10Mks

43. (a) Describe the role of each of the following in excretion in mammals.

(i) Skin (2 marks)

Sweat glands ✓releasing excess sweat ✓

(ii) Liver (02 marks)

Deamination ✓ aminogroup removed from amino acids ✓ forming ammonia ✓ shed from the liver cells to the blood stream and transported to the Kidney for elimination ✓

(b) Explain why plants do not need special organs excretion? (06 marks)

Waste products excreted such as Carbondioxide are utilized by plants during photosynthesis.

Extra gaseous wastes are eliminated from plant bodies by simple means of diffusion.

Most of the waste products are non harmful and can be stored within the plant bodies and then removed periodically by plant structures like leaves

Any 3 Ans Pts

Plants synthesis all their organic requirements according to demand no excess of the proteins are produced, therefore no excess of waste products.

Total marks =10

Excess water and dissolved gases are removed by transpiration through stomata.

Some plants remove waste products by exudation for example gums, resins, latex and rubber.

44. (a) Describe the effect of the following on short day plants.

(i) Far red light (02 marks)

Absorbed by photochrome far red during the long night and rapidly converted to phytochrome red stimulating florigen precursor to secrete florigen hormone that causes/induces flowering.

02 Mks

(ii) Gibberellins (01 mark)

Inhibits flowering in short day plants.

Or

(b) Explain the role played by gibberellins in seed germination. (03 marks)

Break seed dormancy causing germination in seeds gibberellins diffuses to the aleuronic layer after imbibition stimulating synthesis of several enzymes like alpha amylase causing breakdown of food substances in the endosperm to release energy for growth of the embryo.

03 Mks

(c) How can plant growth substances be used to improve agriculture? (04 marks)

Indoleacetic acid stimulates fruit growth and ripening. Ethene reduces flowering in pineapples and stimulates ripening of tomatoes and citrus fruits. Any 4

Gibberellic acid formation during cell division, cell elongation, fruiting and parthenocarpy. Cytokinins prolongs the life of fresh leaf crops such as Cabbages. Total marks = 10 mks

45. (a) What is meant by **Bohr effect?** (01 mark)

Is the lowering of the affinity of blood's haemoglobin for oxygen due to increased acidity caused by increase in Carbondioxide Concentration.

(b) Explain the role played by haemoglobin in gaseous exchange. (05 marks)

Haemoglobin has four haem groups with a quaternary structure, readily binds to oxygen at low oxygen partial pressure due to its high affinity for oxygen, to form oxyhaemoglobin a form in which oxygen is transported to the respiring tissues, which dissociates to release oxygen to the respiring tissues, which dissociates to release oxygen to respiring tissues, at low oxygen partial pressure, haemoglobin transports/removes toxic Carbonmonoxide by combining with it to form Carboxyhaemoglobin which is released into the respiring tissues to the outside body. 5 mks

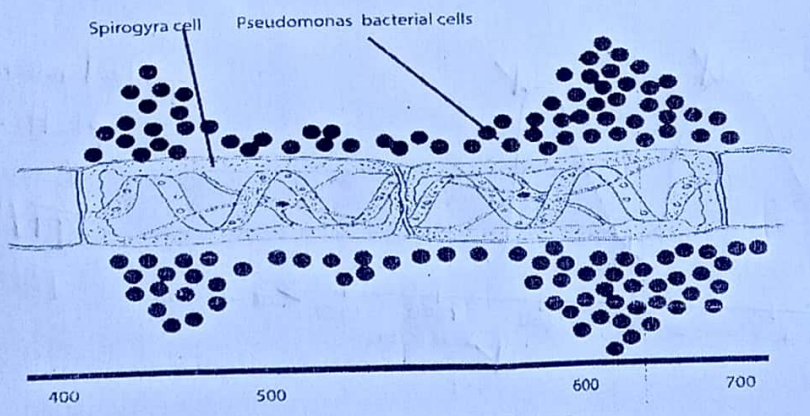
(c) What are the key evolutionary adaptations that diving mammals use to survive at significant ocean depths? (04 marks)

Increased blood volume per body mass and greater number of red blood cells per blood volume to carry more oxygen. Increased affinity for oxygen by haemoglobin to increase the Carrying Capacity of more oxygen by cells for respiration. Increased number of myoglobin concentration in Muscles to provide more energy during metabolism.

Highly/ closely packed haemoglobin to increase the carrying ~~fossil~~ capacity of more oxygen by cells for respiration. 4 ½

Total Marks = 10 Mks

46. The figure below shows results of Engelmann's experiment on the distribution of bacteria of the genus Pseudomonas on a filamentous alga Spirogyra.



Wavelength of light from Prism

(a) Identify the factor in the bacterial environment which determines their distribution. (1 mark)

Oxygen partial pressure/ Oxygen concentration 1

(b) Suggest why the light used was made to pass through the prism. (2 marks)

Prism ensures that various colours that make up light become separated 1 due to difference in their wavelength 1

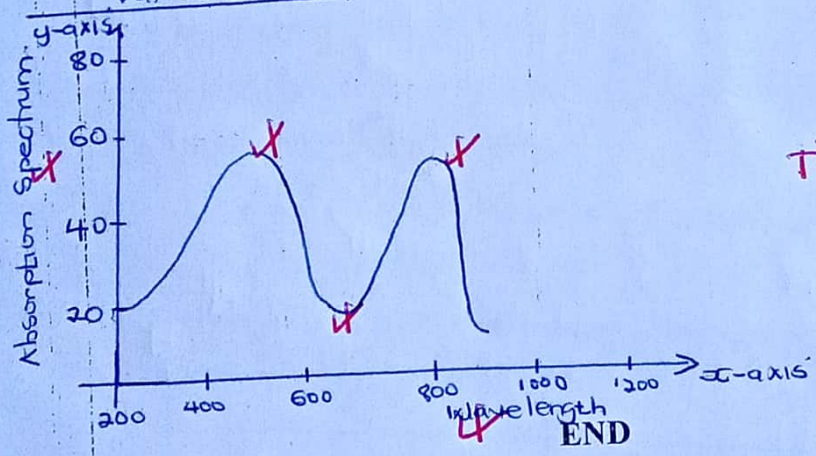
(c) Explain the differences in distribution of Pseudomonas bacteria along the filament of Spirogyra. (4 marks)

~~Distinction~~ Distribution of aerobic bacteria is high at wavelength of between 400nm and 480nm 1 and wavelength 600nm and 680nm 1 and low between 480nm and 600nm 1

Oxygen is more concentrated ~~no~~ near the chloroplasts ✓ and at the two extreme ends due to high light intensity ✓ that causes high rate of photosynthesis ✓ due to darkness ✓ low oxygen release and therefore low concentration of bacteria ✓

(d) From the figure above, sketch a graph to show the absorption spectrum of the photosynthetic pigment found in Spirogyra. (3 marks)

GRAPH SHOWING VARIATION OF THE ABSORPTION SPECTRUM OF THE PHOTOSYNTHETIC PIGMENT ✓ IN SPIROGYRA WITH WAVELENGTH



END

Total marks = 3
plotting = 01
Handle = 01
Title = 01
Total = 03mks

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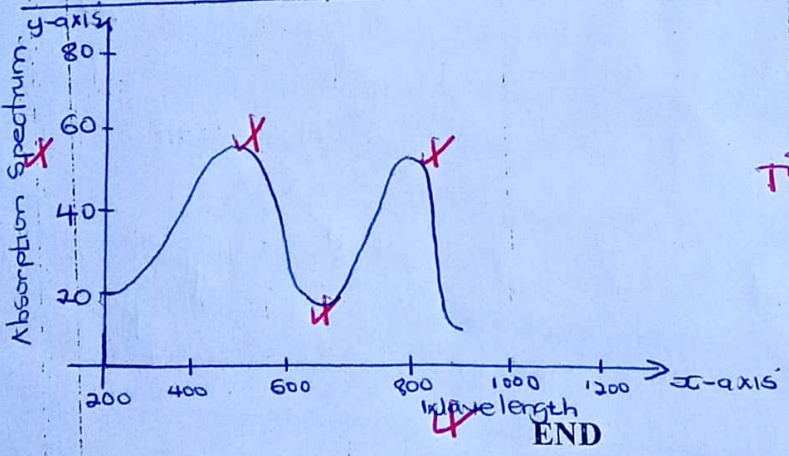

END

Total marks = 3
plotting = 0½
labelling = 0½
Title = 0½
Total = 03mks

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