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P530/1
Biology 1
2½ Hours
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Group
Guide

Uganda Advanced Certificate of Education
Mock examination
S.6 Biology P530/1 (Theory)
Paper 1
Time: 2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all questions in both sections A and B
- Answers to Section A questions must be written in the boxes provided
- Answers to Section B should be written in spaces provided.
- No additional sheets of paper should be inserted in this booklet.

FOR EXAMINERS USE ONLY

Section	Marks
A (1 - 40)	
B 41	
42	
43	
44	
45	
46	
Total	

SECTION A (40 Marks)

Which of the following are not likely to be found in the structure of a virus at the same time?

- A. Proteins and DNA
 - B. RNA and proteins
 - C. Lipids and proteins
 - D. RNA and DNA
2. The primary reason of stratification in epithelial tissue is to increase its function in:
- A. Protection
 - B. Secretion
 - C. Absorption
 - D. Thickening of the basement
- In animal cells, permeability of the plasma membrane to most biological molecules is reduced by:
- A. Proteins
 - B. Glycolipids
 - C. Phospholipids
 - D. Cholesterol
4. Which one of the following does not involve a positive feedback mechanism?
- A. Birth
 - B. Propagation of a nerve impulse
 - C. Blood clotting
 - D. Ovulation
5. Which one of the following does not take part in physical methods of body temperature regulation in mammals?
- A. Sweat glands
 - B. Brown fat
 - C. White fat
 - D. Arterioles
6. During depolarization of the membrane of an axon,
- A. Sodium ions diffuse out of the neuron
 - B. Potassium ions diffuse out of the neuron
 - C. Sodium ions diffuse into the neuron
 - D. Organic ions diffuse into the neuron
7. In short day plants, flowering can be
- A. stimulated by Pfr
 - B. stimulated by Pr
 - C. suppressed by Pfr
 - D. suppressed by Pr

8. During germination of a broad bean, the plumule thrusts upward, leaving cotyledons below the ground. This is due to:
- A. elongation of the hypocotyl
 - B. Elongation of epicotyl
 - C. Rupturing of the seed coat
 - D. Small cotyledons of the broad bean

The total number of chromosomes in a diploid plant species is 12. What would be the number of chromosomes in its endosperm after fertilisation?

- A. 6
- B. 18
- C. 12
- D. 24

9. A forest was cut down and was replaced by a sugar cane plantation. Which one of the following is the most likely negative consequence of this practice?
- A. Increase in carbon dioxide level in the atmosphere
 - B. Increase in soil erosion
 - C. Decrease in biodiversity
 - D. Loss of nutrients by leaching

10. A man with an allele for normal colour vision marries a woman whose father was colour-blind. What proportion of offspring produced by the couple will be normal boys?

- A. 25%
- B. 33%
- C. 50%
- D. 75%

11. In teleosts, gaseous exchange is very efficient because
- A. Blood meets water with a higher concentration of oxygen
 - B. Blood and water flow in the same direction
 - C. Blood and water move at the same speed
 - D. Blood and water move at different speed

12. Which one of the following is not formed during anaerobic break down of glucose by yeast?

- A. ATP C.
- B. Carbon dioxide
- C. Water
- D. Ethanol

13. Which one of the following is done by marine bony fish during osmoregulation to survive in the sea?

- OL
chool
- A. Loose water by osmosis
 - B. Swallow water and absorb the salts
 - C. Swallow water and extrude salts
 - D. Gain water by osmosis and extrude salts

15. In which of the following does salutatory conduction occur?

- A. Thin nerve fibres
- B. Thick nerve fibres
- C. Myelinated fibres
- D. Non myelinated fibres

C

16. Hypothalamus secretions are conveyed to the posterior lobe of pituitary gland via one of the following.

- A. Portal blood vessel
- B. Capillary network
- C. Nerve fibre
- D. Pituitary stalk

C

17. Which one of the following is the best way of increasing chances of preserving species diversity?

- A. Increasing the size of conservation area
- B. Introducing new species in the conservation area
- C. Reducing human interference in the conservation area.
- D. Removing patches from the conservation area.

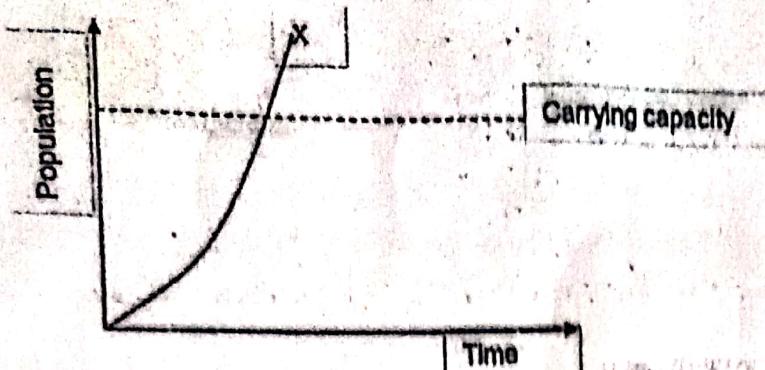
A

18. The pentadactyl limb of mammals modified to become adapted to different modes of life is an illustration of

- A. Homologous structures
- B. Analogous structures
- C. Convergent evolution
- D. Comparative anatomy

A

19. The figure below shows changes in population of animal species.



Which one of the following is most likely to occur after point X? The population

- A. Increases exponentially
- B. Drops to carrying capacity
- C. Becomes constant
- D. Decreases below carrying capacity

D

20. Which one of the following groups of plants does not contain phloem tissues?

- A. Tracheophytes
- B. Angiosperms
- C. Bryophytes
- D. Pteridophytes

C

21. Which one of the following processes in plants would be most affected if it takes up a metabolic poison?

- A. Movement of water through the xylem
- B. Evaporation of water from the leaf
- C. Movement of water within the leaf
- D. Movement of food from leaves to roots

D

22. The chemical reaction that converts carbon dioxide to bicarbonate ions takes place in the:

- A. Blood plasma
- B. Alveoli
- C. Red blood cells
- D. Hemoglobin molecule

A

23. The common method of reproduction in organisms which have a large number of undifferentiated cells is:

- A. Conjugation
- B. Sporulation
- C. Fragmentation
- D. Fission

C

24. Miscarriage due to premature birth can be caused by insufficient levels of

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- ANSWER
- A. Progesterone
 - B. Oxytocin
 - C. Oestrogen
 - D. Prolactin

25. Which one of the following statements is true only for the sympathetic nervous system?

- A. Nerve endings produce noradrenalin
- B. Preganglionic fibres are short
- C. Nerve endings produce acetylcholine
- D. Preganglionic fibres are long

26. Stomatal closure occurs in plant leaves when

- A. Turgor in guard cells rises
- B. PH in guard cells rises
- C. Water potential in guard cells is more than surrounding cells
- D. Starch in guard cells is converted to sugar

27. Which one of the following conditions is most likely to increase the risk of the fetus being harmed by the mother's immune system?

	Pregnancy	Blood type of mother	Blood type of fetus
A.	First	Rhesus negative	Rhesus positive
B.	Second	Rhesus positive	Rhesus negative
C.	First	Rhesus positive	Rhesus negative
D.	Second	Rhesus negative	Rhesus positive

28. Members of a plant species suddenly begin to flower earlier than the average and fail to attract pollinating insects leaving fewer of their offspring in the next generation. This is an example of,

- A. Stabilizing selection
- B. Disruptive selection
- C. Directional selection
- D. Polymorphism

29. Which one of the following is most likely to occur when a plant is allowed to photosynthesize under very low carbon dioxide levels?

- A. glycerate-3-phosphate accumulates

A

B

C

D

C

- B. Ribulose biphosphate accumulates
C. Both ribulose biphosphate and glyceral-3-phosphate accumulate
D. Both ribulose bi-phosphate and glyceral-3-phosphate reduce

B

30. By which one of the following processes are hormones and enzymes released from glands which produce them?

- A. Exocytosis
B. Osmosis

- C. Endocytosis
D. Phagocytosis

A

31. Which one of the following characteristics is not suitable for use in classification of insects?

- A. Number of segments
B. Number of hairs
C. Length of wings
D. Body colour

D

32. Worker bee and queen bee are polymorphic forms of bees in a bee colony. The difference in their fertility is due to:

- A. Mutation
B. Fertilization
C. Environment
D. Meiosis

C

33. The purpose of intercalated discs in cardiac muscles is to:

- A. Separate individual muscle cells
B. Stop diffusion of ions from one cell to another
C. Facilitate rapid spread of action potential
D. Prevent the muscle from fatigue

C

34. The oxygen dissociation curve of the fetus lies to left of that of its mother because:

- A. The fetus is less active
B. The fetus uses less oxygen
C. Fetal hemoglobin has higher affinity for oxygen
D. Mothers hemoglobin has higher affinity for oxygen

C

35. Which one of the following forms of non disjunction occurs in non sex chromosomes?

- A. Klinefelters syndrome
B. Down's syndrome

B

A

A-T

10 - 10

G-C

10

40 - 40

40

$\frac{10}{40} = 1:4$

C. Turner's syndrome

D. Jacob's syndrome

- * 36. Three counts of 103, 46, 20 of a plant species were made using quadrant of 25cm^2 . The density of plants per m^2 is.

A. 169

B. 2253

C. 56.3

D. 676

37. If 10% of bases in DNA are adenine. What is the ratio of adenine to guanine in the same molecule?

A. 1:1

B. 1:3

C. 1:2

D. 1:4

38. Which one of the following is not true during hormonal control of breathing?

- A. Cerebral cortex allows voluntary control over breathing
 B. Impulses move from the respiratory centre to stretch receptors via Vagus nerve
 C. Stretch receptors in bronchioles and bronchi monitor the amount of inflation.
 D. Impulses from aortic and carotid bodies stimulate increased inspiration rate

39. A non-competitive inhibitor affects the rate of enzyme action by

- A. Binding to the active site
 B. Altering the substrate
 C. Altering the active site
 D. Acting as coenzymes

40. The starch component that forms the blue-black colour with iodine solution is?

- A. Amylose
 B. Amylopectin
 C. Amylase
 D. Pectin

SECTION B (60MARKS)

41. The levels of ant diuretic hormone in the blood rise during strenuous exercise

(a) Explain:

(i) The cause of this increase

(03 marks)

During strenuous Exercise, there is excessive loss of water through sweating in order to decrease the body temperature. This leads to increase of Osmotic pressure of blood. An impulse reaches the hypothalamus, the osmoreceptors here stimulated and therefore impulse is sent to the posterior pituitary gland which leads to release of Antidiuretic hormone.

(ii) The effect it has on kidney function

(04 marks)

The Antidiuretic hormone will stimulate the receptors on the walls of the distal convoluted tubule and collecting duct which causes them to become more permeable to water. ADH causes the walls of collecting duct to be more permeable to urea which increases the concentration of urea in the lumen, therefore causing osmotic outflux of water from distal convoluted tubule resulting in longer loop of Henle.

(b) Suggest how mammals adapted to life in dry deserts benefit from a longer loop of Henle

(04 marks)

Longer descending loop of Henle means larger surface area for absorption of large amounts of water preventing it from being lost. A longer ascending loop of Henle means a large surface area for absorption of salt which will provide greater osmotic gradient at the medulla leading to absorption of water. Longer descending loop of Henle means 2. a) Duration of time for maximum absorption of water.

i) Far red light - It causes flowering

(02 marks)

When exposed to far red light, the phytochrome far red will absorb the far red light and is rapidly converted to phytochrome red. The action of phytochrome red causes the flower buds to be converted to flower where it is converted to the buds and simulate the buds to develop into flowers.

ii) Gibberellins

(01 mark)

Gibberellins stimulates the release of pollen. Stimulates the buds to develop into flowers.

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

Upon Imbibition, There is Secretion of Gibberellins which stimulates Secretion of Amylase Enzyme. Eg. Proteases, alpha amylase, lipases where in the amylase will break down starch to glucose. Lipase break down lipids to fatty acid and glycerol. And protease will breakdown proteins to amino-acids.

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

- Plant Substances like Auxin are used to Induce fruit formation.
- Plant Substances like Ethene Induce fruit ripening.
- Plant Substances like Auxin can be used as growth regulators
- Gibberellins is used to break seed dormancy therefore promoting Germination

43. a) Give the meaning of the following terms

i) Epistasis

(01mark)

This is a condition where the presence of One gene suppresses the effect of another gene at another locus.

ii) Dihybrid inheritance

This is the simultaneous inheritance of two contrasting characters.

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(b) In oats, the grain is enclosed by a hull (remains of the flower). The colour of the hull is controlled by two pairs of alleles which interact. In a cross between two pure breeding varieties of oats, one with black hulled grains the other with white hulled grains, the offspring (F₁) all had black hulled grains. Allowing F₁ to self-fertilize gave F₂ with the phenotypes below

10

Black hulled grain	418
Grey hulled grains	106
White hulled grains	36

i) What genetic ratio is suggested from the figures given (01 marks)

..... 11 : 3 : 1 (01)

ii) Use suitable genetic symbols to work out the genotypes and phenotypes of each generation. (07 marks)

Let the alleles for Black be B

1st Generation for white be b

Phenotype

Parents

Genotype BBWW

Mos 13

Gametes (n) all
Random fertilization

Offspring Genotype all BbWw

Offspring Phenotype all Black hull grain

F₂ generation

parents

Phenotype Black x Black

Genotype BbWw

Mos 13

Gametes (n)

BW

Bw

W

bw

bbww

all bw

BW

Bw

W

bw

BW	BW	BW	bW	bW
BW	BBWW	BBWw	BbWW	BbWw
BW	BBWw	BBww	BbWw	Bbw
BW	BbWW	BbWw	bbWW	bbWw
bW	BbWw	Bbw	bbbWW	bbbw

Phenotype Ratio

Black : Grey : White

11 : 3 : 1

(07)

Random fertilization shown by a parent square

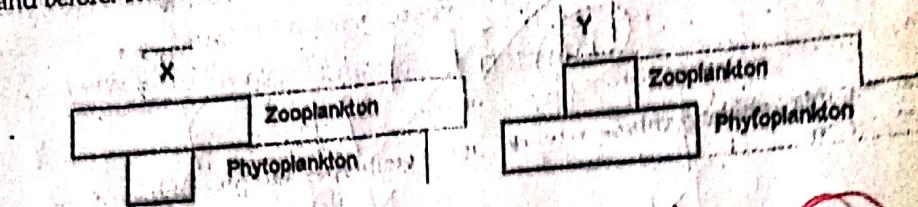
44. a) State any two human activities which cause eutrophication.

..... Direct discharge of untreated industrial wastes into water bodies
..... Excessive use of fertilizers

(2marks)

(07)

b) The figure below shows plankton biomass of a lake measured during onset of eutrophication and before. The results are represented in pyramid of biomass X and Y.



i) Identify which of the pyramid represents the lake:
During onset of eutrophication

X (1/2 mark)

Before eutrophication

X (1/2 mark)

ii) Suggest the explanation for the difference in the pyramids X and Y. (3 marks)

During the Onset of Eutrophication, the biomass of zooplankton is lesser than those before eutrophication. This is because of increased respiration of oxygen demand which decreases oxygen which is used by aerobes. During the Onset of eutrophication, the biomass of phytoplankton is higher than those before eutrophication this is because of increase of carbon dioxide in nutrients which is used by plants and also abundant carbon dioxide which is used for photosynthesis by phytoplankton.

iii) Explain how the phytoplankton in X are able to support the zooplankton. (2marks)

(2 marks)

→ The phytoplankton in X is able to photosynthesise

which provides food in form of starch for zooplankton and also the oxygen produced during photosynthesis of phytoplankton can be used by zooplankton.

1) State two ways of reducing water pollution.

— By treatment of sewage therefore discharging treated

— By recycling & some of waste instead of disposing them in water

5. a) Distinguish between genetic drift and genetic load. (2marks)

Genetic drift: This is change in allele frequencies within a population which occurs by chance rather than by natural selection due to loss of certain alleles or arrest of death.

Genetic load: This is the existence of disadvantageous alleles in heterozygous genotype.

b) Explain how natural selection maintains recessive alleles in a population. (04marks)

Disadvantageous Recessive allele ~~is always~~ not expressed therefore ~~they~~ those ~~for~~ for Selection pressure will not act up on them. They will not be selected ~~repeatedly~~ ~~continuously~~ therefore Organism posses ~~survive~~ ~~will~~ always ~~survive~~ and pass on these ~~genes~~ to next generation therefore these alleles are maintained from generation.

c) How does geographical isolation lead to changes in the gene pool? (04marks)

Geographical isolation prevent gene flow between 2 sub populations by preventing interbreeding. Meaning that the introduction of new mutant genes end avoided therefore the gene pool in each sub population decreases.

46. According to the fluid-mosaic model of cell membrane structure, the unit membrane is a dynamic structure composed of several components:

(a) Name the component of the membrane

(I) Which is fluid in consistency.

(01 mark)

Cholesterol

(II) That forms a mosaic

(01 mark)

Membrane proteins

(III) That accounts for its specificity

(01mark)

Glycoproteins

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(b) State two major functions of the cell membrane to the cell.
(02 marks)

- Controls entry and Exit of material in and out of cell
- They are involved in Cell Recognition during Cell formation

c) List three ways in which active transport is different from the process of diffusion across a cell membrane.

- Materials are transported against concentration gradient
- Materials are transported with use of Energy
- Materials are transported mainly via protein on the cell membrane

(b) State two ways in which facilitated transport differ from active transport across a cell membrane.

(02 marks)

- Facilitated transport occurs in absence of energy while Active transport requires Energy
- In facilitated transport materials are transported down concentration gradient while in Active transport materials are transported against a concentration gradient