NAME .....

RANDOM/PERSONAL No. ...../..... SIGNATURE .....

P530/1
BIOLOGY THEORY
Paper 1
Monday 14th August 2023 (Morning)
2 hours 30 minutes

# ACHOLI SECONDARY SCHOOLS EXAMINATIONS COMMITTEE

*Uganda Advanced Certificate of Education*

Joint Mock Examinations, 2023

BIOLOGY THEORY

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- ✓ Answer ALL the questions in both Sections A and B.
- ✓ SECTION A – Answers to this section should be indicated by circling the correct alternative.
- ✓ SECTION B – Answers to this section should be written in the spaces provided.

| For Examiner's Use Only | | |
|---|---|---|
| Questions | | Marks |
| Section A: 1 – 40 | | |
| Section B | 41 | |
| | 42 | |
| | 43 | |
| | 44 | |
| | 45 | |
| | 46 | |
| **TOTAL** | | |

## SECTION A

1. The production of red blood cells in the mammalian foetus is carried out by the:
   A. bone marrow B. liver C. spleen D. lymph nodes

2. The diameter of glomerular capillaries is much less than that of arterioles in order to:
   A. eliminate glucose from the filtrate
   B. raise the filtration pressure
   C. eliminate globular proteins from urine
   D. regulate the process of filtration

3. During carbon dioxide transport, the movement of chloride ions from the plasma into red blood cells is aimed to:
   A. restore its water potential
   B. restore the electronegativity of the cell
   C. maintain a larger diffusion gradient for ions
   D. maintain the blood pH

4. Which one of the following pairs of hormones would be most active during periods of physiological stress in plants?
   A. Ethene and abscissic acid
   B. Cytokinins and ethene
   C. Abscissic acid and gibberrelins
   D. Ethene and auxins

5. Which of the following epithelial tissues lines the oviduct and kidney tubules respectively?
   A. Stratified and cuboidal
   B. Ciliated and cuboidal
   C. Squamous and ciliated
   D. Ciliated and squamous

6. The following are the effects of territorial behaviour except:
   A. increased in-breeding
   B. reduced competition
   C. increased variation
   D. reduced reproductive fitness

7. Which of the following groups of bacteria uses nitrate ions as their electron acceptor in the respiratory pathway?
   A. Denitrifying bacteria
   B. Pathogenic bacteria
   C. Photosynthetic bacteria
   D. Nitrifying bacteria

8. The following functions are performed by roots of plants except:
   A. absorption of oxygen
   B. production of new cells
   C. provision of support
   D. storage of waste products

9. What is the significance of the three semi-circular canals being in different planes?
   A. Allows rapid transmission of sound vibrations
   B. Allows detection of changes of movements in various directions

C. Allows transmission of information to several parts of the nervous system
D. Brings about summation of information from various directions

**10.** Which type of population growth curve arises in a population that is characterised by explosion followed by rapid decline?
A. Boom and burst curve
B. Logarithmic
C. Cyclic population curve
D. Logishal

**11.** The fact that all native mammals of Australia are marsupials and they are not represented elsewhere in the world is evidence for evolution that is basically:
A. developmental
B. biogeographic
C. genetically isolated
D. discontinuous distribution

**12.** The part of the brain that controls language, memory, sensation and decision making is the:
A. cerebrum
B. thalamus
C. hypothalamus
D. cerebellum

**13.** Which of the following cell types divide to produce cells that make antibodies?
A. B – cells
B. Cytotoxic
C. Neutrophils
D. Helper T – cells

**14.** Earthworms have a large number of looped blood capillaries in their epidermis in order to:
A. reduce the diffusion distance between the body surface and blood vessels
B. provide large surface area for diffusion
C. increase the pumping action if pseudo hearts
D. maintain a steep concentration gradient for gaseous exchange

**15.** In each of the following cases an RH– mother is not likely to develop antibodies against RH+ foetus except when she is of blood group O and the foetus is of blood group:
A. AB
B. O
C. A
D. B

**16.** In the course of pregnancy, the placenta takes over the role of producing oestrogen and progesterone because:
A. menstruation is terminated
B. menstruation has commenced
C. corpus luteum has degenerated
D. corpus luteum has persisted

**17.** Which of the following pairs of structures are NOT homologous?
A. Arms of humans and wings of birds
B. Legs off insects and those of mammals
C. Pods of beans and pericarps of maize grains
D. Pectoral fins of fish and arms of humans

**18.** Excessive variation in the calcium ion content of blood may result into:

A. dehydration of the body
B. mental retardation
C. neuromuscular disturbances
D. hardening of bones

**19.** Which of the following is NOT found in the body cells of obligates anaerobes?

A. Sugars B. ATB C. Glycolytic enzymes D. Mitochondria

**20.** Which one of the following is the primary function of lymphatic tissue?

A. Filtration of foreign particles out of blood
B. Production and storage of white blood cells
C. Transport of excess tissue fluid back into blood
D. Transport of cholesterol molecules into the blood

**21.** Which one of the following is a form of vegetative propagation?

A. Spore formation B. Conjugation C. Budding D. Parthenogenesis

**22.** In which of the following parts of mammalian testis does meiosis occur?

A. Primodial germ cells
B. Seminiferous tubules
C. Leydig cells
D. Sertoli cells

**23.** Which of the following hormones is secreted by an organ that is also its target?

A. Secretin B. Cholecystokinin C. Gastrin D. Prolactin

**24.** Telophase I of meiosis results in production of:

A. four cells containing one homologous of each homologous pair
B. four cells containing both homologous of each homologous pair
C. two cells containing one homologous of each homologous pair
D. two cells containing both homologous of each homologous pair

**25.** Both ATP and NADPH are produced:

A. in the Calvin cycle
B. within the leaf
C. in the light dependent reactions
D. within the stroma of chloroplast

**26.** During water stress, photosynthesis reduces in plants mainly due to shortage of:

A. carbon dioxide B. mineral salts C. sunlight D. water

**27.** Messenger RNA is important in protein synthesis because it:

A. contains the code for protein synthesis
B. carries the code from DNA to the nucleus
C. carries the code from DNA to polyribosomes
D. has sites for attachment of amino acids

**28.** Where is pyruvate produced and used in cell respiration aerobically?

A. Cytoplasm, cytoplasm
B. Cytoplasm, mitochondria
C. Mitochondria, cytoplasm
D. Mitochondria, mitochondria

**29.** The main function of the acrosome reaction is to:

A. activate the eggs
B. improve sperm penetration of the eggs
C. prevent double fertilisation of the eggs
D. improve sperm motility

**30.** Consider four human populations that differ demographically only in their age structure. The population that will grow most in the next 30 years is the one with:

A. 10 – 20 years
B. 20 – 30 years
C. 40 – 50 years
D. 50 – 60 years

**31.** For which one of the following diseases is mosquito the vector?

A. Trypanosomiasis
B. Yellow fever
C. Cholera
D. Typhoid

**32.** Which f the following is the best method to use for measuring the growth rate of sorghum seedlings from 3 to 6 weeks?

A. Fresh weight
B. Height
C. Dry weight
D. Number of leaves

**33.** Which of the following mammalian organs has both exocrine and endocrine functions?

A. Pituitary gland and stomach
B. Stomach and salivary gland
C. Stomach and pancreas
D. Pancreas and pituitary gland

**34.** The main value of conservation of living organisms is to:

A. promote evolutionary changes
B. allow the population to increase
C. maintain genetic diversity
D. keep ecological balance

**35.** Which of the following combinations would result in more energy being fixed by chloroplasts for photosynthesis?

A. High light intensity of long wavelength
B. Low light intensity of long wavelength
C. High light intensity of short wavelength
D. Low light intensity of short wavelength

**36.** Albinism is recessive to normal skin pigment in humans. In a population where the frequency of the albino allele is 10% of the total alleles, the percentage of normal but carrier people are expected to be:

A. 81%
B. 1%
C. 18%
D. 91%

**37.** Below is the list of some amino acids:

(i) alanine (iv) histidine
(ii) arginine (v) leucine
(iii) glycine (vi) lysine

Which of the following consists of essential amino acids?

A. (i), (ii), (iii) B. (ii), (iv), (v) C. (i), (iii), (iv) D. (ii), (v), (vi)

**38.** The following are trisonic conditions except:

A. Klinefelter's syndrome B. Down's syndrome C. Turner's syndrome
D. XXX female

**39.** Among the allopatric species of anopheles mosquitoes, some live in brackish water, some in running water and others in stagnant water. What type of reproductive barrier is most obviously separating these different species?

A. Mechanical barrier B. Post zygotic barrier
C. Ecological isolation D. Behavioural isolation

**40.** Given that two genes are linked and no crossing-over occurs between them. What would be the proportions of the F1 generation if a double recessive parent is crossed with a double heterozygous one?

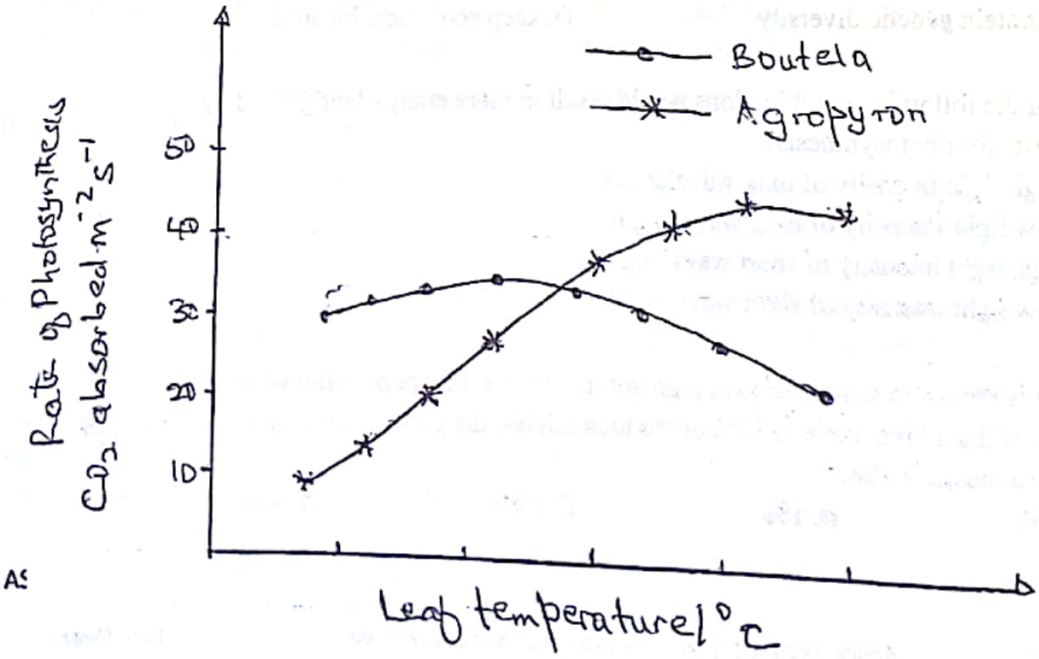
A. 3 : 1 B. 9 : 3 : 3 : 1 C. 1 : 1 D. 1 : 1 : 1 : 1

## SECTION B

*Answers to this section should be written in the spaces provided and NOT anywhere else.*

**Question 41:**

The figure below shows the effect of temperature on the rate of photosynthesis of two grasses in Agropyron and Boutela.



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(a) State how different the effect of leaf temperature on the rate of photosynthesis in both grasses. (03 marks)

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(b) Giving a reason in each case, suggest which of the two grasses is likely to grow faster in (a):

(i) Temperate climate (02 marks)

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(ii) Tropical climate (02 marks)

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(c) Explain the effect of temperature on the rate of photosynthesis in Agrophyron. (03 marks)

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**Qtestion 42:**

In sweet potato flower, colour is determined by two alleles of R for red and W for white which are itcompletely dominant. A population has the following individuals distributed as follows:

| Flower colour | Number of individuals |
|---|---|
| Red | 450 |
| Pink | 500 |
| White | 50 |

(a) Using the information provided, determine the:

(i) total number of R and W alleles in the population. Show your working. (03 marks)

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(ii) genotype frequency of each genotype (03 marks)

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(iii) allele frequencies of each allele. (02 marks)

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(b) State four causes of change in the allele frequencies and genotype frequencies in a population. (02 marks)

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**Question 43:**

(a) Explain the changes in the metabolic rate of a mammal when the environmental temperature :

(i) lowers below the lower critical temperature. (02 marks)

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(ii) rises above the upper critical temperature (02 marks)

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(b) Explain the role of the following in temperature regulation:

(i) Hypothalamus (03 marks)

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(ii) Circulatory system (03 marks)

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**Question 44:**

The table below shows control of digestion along the alimentary canal of a human being.

| Parts of Canal | Mechanism controlling digestive juice secretion |
|---|---|
| Mouth | Pure nervous control |
| Stomach | Both nervous and hormonal |
| Duodenum | Purely hormonal |

(a) State the significance of the observed trend of control of secretion of digestive juice along the alimentary canal. (06 marks)

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(b) Give the roles of two named hormones in stimulating the secretion of digestive juices in the duodenum. (04 marks)

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**Question 45:**

(a) State four ideas put forward in Mendeleev's work on genetics. (03 marks)

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(b) Examine the data for crosses in cats as shown in the table below;

| Parents | Off-springs |
|---|---|
| Black male x yellow female | ½ yellow males<br>½ tortoise shell females |
| Yellow male x black female | ½ black males<br>½ tortoise shell females |
| Yellow male x tortoise shell female | ¼ black males<br>¼ yellow males<br>¼ yellow females<br>¼ tortoise females |

From the data given, suggest the type of inheritance exhibited. (01 mark)

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(c) Using a Punnet Square, predict the results of a cross involving a black male and a tortoise shell female. (04 marks)

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(d) Explain why tortoise shell cats are normally females. (02 marks)

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**Question 46:**

(a) Distinguish between magnification and resolving power of a microscope. (02 marks)

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(b) In an investigation under medium power of a microscope, the number of epidermal cells of an onion leaf observed across a diameter of field of view was 100. The diameter of the field of view as 3mm:

(i) Work out the average length of each cell in micrometres. (03 marks)

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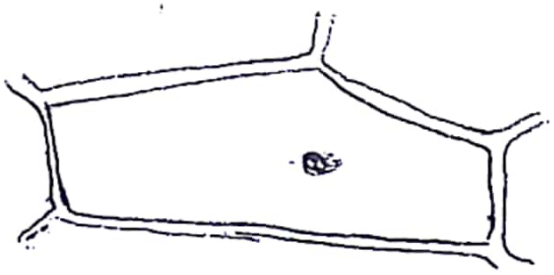
(ii) The figure below shows a candidate's drawing of one of the cell observed under this microscope.



Work out the magnification of the drawing. (02 marks)

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(c) What are the advantages of a light microscope over an electron microscope? (03 marks)

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END