P530/1
BIOLOGY
Paper 1
DECEMBER, 2020
$2\frac{1}{2}$ *hours*

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – DECEMEBR, 2020

BIOLOGY

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Answer **all** *questions in both sections* **A** *and* **B**.

SECTION A:
Answers to this section must be written in the boxes provided.

SECTION B:
Answers to this section should be written in the spaces provided and not anywhere else.

No additional sheets of paper should be inserted in this booklet.

For Examiner's Use Only

SECTION		MARKS
Section A:	1 – 40	
Section B:	41	
	42	
	43	
	44	
	45	
	46	
TOTAL		

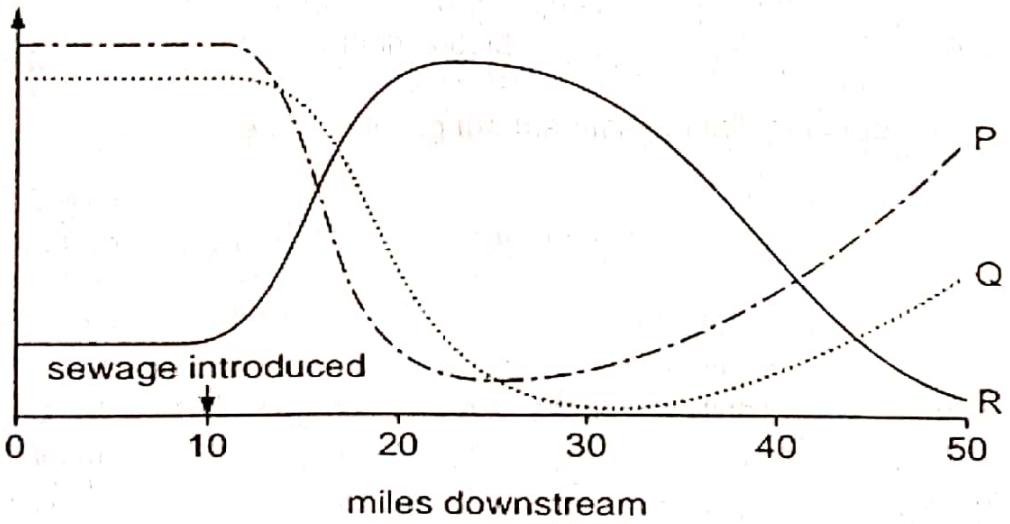
SECTION A (40MARKS)

1. Which one of the following describes the state of the membranes during resting potential?
   A. Depolarized
   B. Neutral
   C. Polarized
   D. Discharged

2. When the dark period of short day plants is interrupted by brief exposure of light, then the plant
   A. Produce more flowers
   B. Will not bear any flowers
   C. Turns into a long day plant
   D. Produce flowers immediately

3. Red blood cells have a diameter of 7000 nm. Pancreatic cells have a diameter of 35 µm. What is correct about the relative sizes of these cells?
   A. The red blood cells are 5 times larger.
   B. The red blood cells are 50 times larger.
   C. The red blood cells are 50 times smaller.
   D. The red blood cells are 5 times smaller

4. The graph shows how the concentration of oxygen and the numbers of fish and bacteria in a river change when sewage flows into it.



What are P, Q and R?

	P	Q	R
A	Bacteria	oxygen	Fish
B	fish	bacteria	oxygen
C	fish	oxygen	bacteria
D	oxygen	fish	bacteria

5. In which one of the following organisms do gill clefts exist?
   A. Hydra
   B. Spiders
   C. Leeches
   D. Amphioxus

6. In some of Mendel's experiments, he observed that pea plants with red flowers had red leaf stalks and always produced grey seeds, while pea plants with white flowers had green leaf stalks and always produced white seeds. He concluded that flower colour gene also controlled leaf stalk colour and seed colour. Such a gene is said to show
   A. Pleitropy
   B. Epistasis
   C. Polygenic inheritance
   D. codominance

7. Which one of the following factors least affects the gliding speed of a bird?
   A. Length of the wings
   B. Weight of the bird
   C. Size of the bird
   D. Shape of the wings

8. The cockroach circulatory system plays a role in all the following body systems except
   A. Respiratory system
   B. Reproductive system
   C. Digestive system
   D. Excretory system

9. A person on a long day hunger strike, surviving only on water will have
   A. Less amino acids in his urine
   B. Less urea in his urine
   C. More sodium in his urine
   D. More glucose in his urine

10. Which of the following is associated with Bilateral symmetry in organisms?
   A. Sessile and limited specialization of body parts
   B. Locomotion and greater specialization of body parts
   C. Stream lined body and sessile
   D. Limited specialization of body parts and locomotion

11. Which sequence shows some of the stages in the production and secretion of an enzyme?
   A. Golgi apparatus ⊠ ribosome ⊠ rough endoplasmic reticulum ⊠ mRNA
   B. mRNA ⊠ smooth endoplasmic reticulum ⊠ Golgi apparatus ⊠ vesicle
   C. ribosome ⊠ rough endoplasmic reticulum ⊠ vesicle ⊠ Golgi apparatus
   D. smooth endoplasmic reticulum ⊠ mRNA ⊠ vesicle ⊠ ribosom e

12. Myelinated axons of a frog conduct impulses three times less fast as those of same diameter in a rat because the
   A. Rat is endothermic
   B. Myelin sheath in axons of frogs is thinner
   C. Neurons of a frog have more synapses
   D. Frog lives in water which is cold

13. The epithelial type found lining the mammalian fallopian tube is
   A. Columnar
   B. Squamous
   C. Cuboid
   D. Stratified

14. Which of the following plant hormones can replace vernalisation
   A. Auxin
   B. Ethylene
   C. Cytokinins
   D. Gibberellins

15. The table 1 below shows results of analysis of DNA bases contained in the cells of a cow's thymus gland

Base composition			
X	Guanine	Y	Z
28.2%	21.5%	21.2%	27.8%

Which of the following is a possible correct identification of the bases?

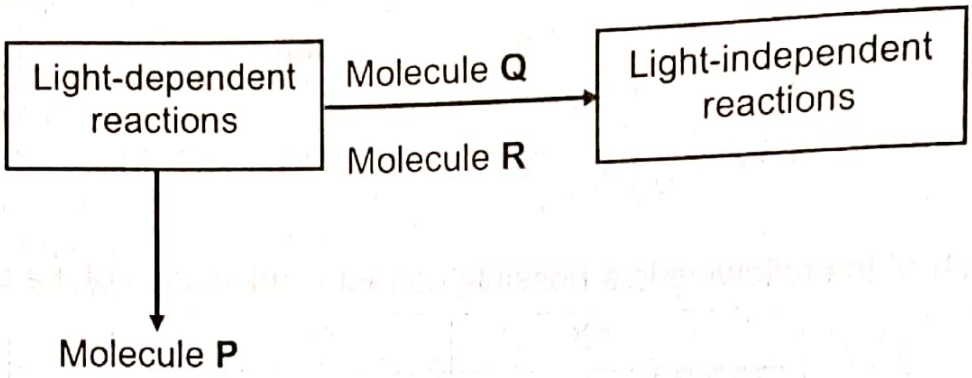
	X	Y	Z
A	Cytosine	Adenine	Thymine
B	Thymine	Adenine	Cytosine
C	Adenine	Cytosine	Thymine
D	Cytosine	Thymine	Adenine

16. A mammal eats more food than a reptile of equivalent body weight because the mammal
A. lives longer
B. controls its body temperature
C. egests more food
D. does not absorb heat from its surroundings

17. Which part of the brain that contains thermoregulatory center?
A. Cerebellum
B. Hypothalamus
C. Medulla
D. Cerebral cortex

18. Which one of the following carbohydrates is the most abundant molecule on earth?
A. α-glucose
B. β-glucose
C. sucrose
D. starch

19. The diagram below shows part of photosynthesis

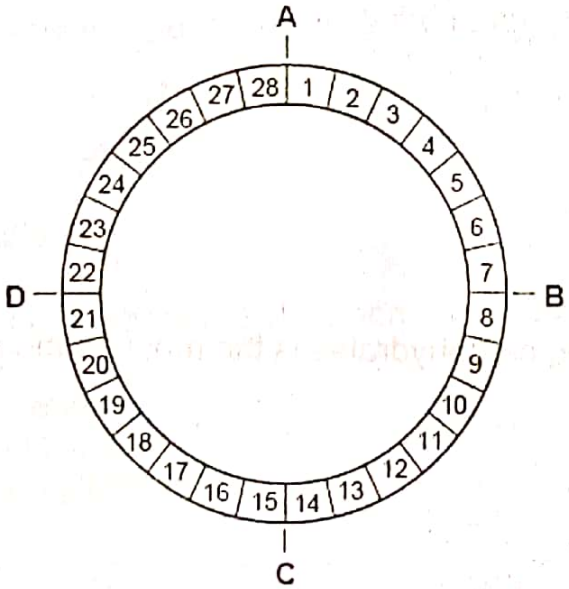


Which of the following is a possible correct identification of the molecules **P**, **Q** and **R**?

	Molecule **P**	Molecule **Q**	Molecule **R**
A	ATP	Oxygen	Reduced NADP
B	Oxidized NADP	ATP	Carbon dioxide
C	Oxygen	Reduced NADP	ATP
D	Carbon dioxide	ATP	Reduced NADP

20. The diagram shows the 28 days of the menstrual cycle.

When does the lining of the uterus break down?



21. What is responsible for the high resolution of the electron microscope?
A. high magnification
B. short wavelength of the electron beam
C. use of heavy metal stains
D. very thin sections

22. The organ of Corti in cochlea of the mammalian ear is composed of
A. Reissner's membrane and tectorial membrane
B. Reissner's membrane and basilar membrane
C. basilar membrane and tectorial membrane
D. tympanic membrane and tectorial membrane

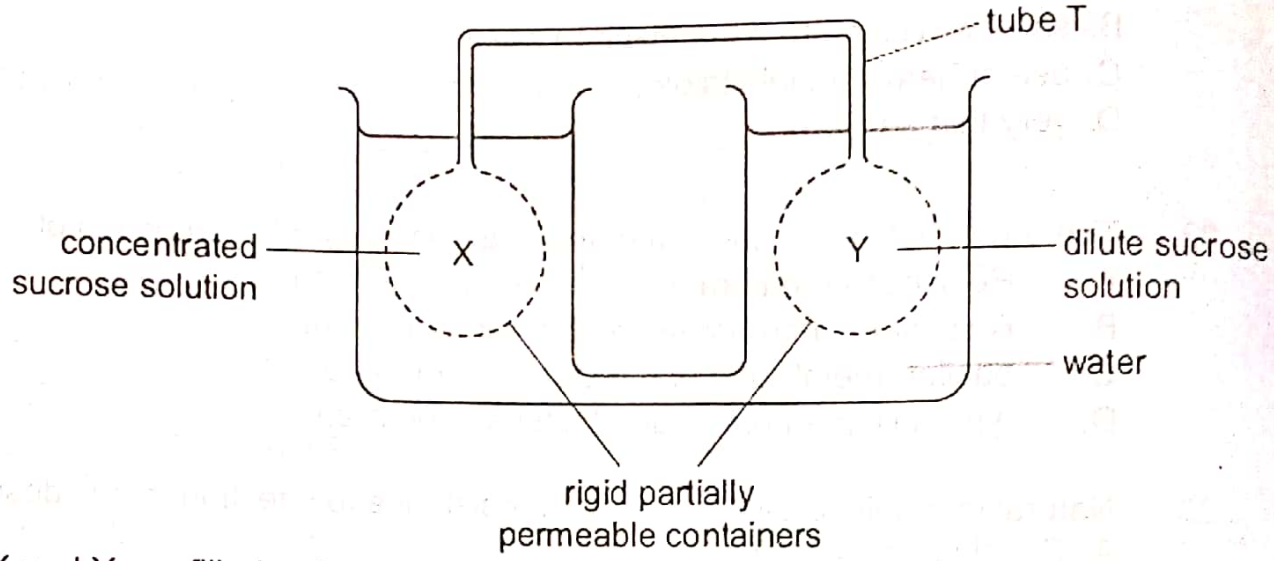
23. Natural immunity provides a form of resistance to infection that is described as
A. Specific and adaptive
B. Specific and with memory cells
C. Adaptive and with memory cells
D. Nonspecific and non-adaptive

24. A human gene is 2700 base pairs long. What is the maximum length of the polypeptide that can be translated from the mRNA transcribed from this gene?
A. 2700 amino acids
B. 1800 amino acids
C. 900 amino acids
D. 1350 amino acids

25. Which one of the following is a simple branched tubular gland?
A. Brunner's gland
B. Salivary gland
C. Sweat gland
D. Mammary gland

26. Which of the following is not stimulated by the parasympathetic nerves?
A. Slowing of the heart beat
B. Constriction of the iris
C. Flow of saliva and other gut secretions
D. Slowing of gut movements

27. The diagram shows a model which can be used to demonstrate mass flow.



X and Y are filled with sucrose solutions of different concentrations, causing water to move in or out of X and Y by osmosis or as a result of hydrostatic pressure. Sucrose solution then moves through tube T joining X and Y.
Which description is correct?

	water potential in X compared with Y	direction of movement of sucrose solution in tube T
A	less negative	from X to Y
B	less negative	from Y to X
C	more negative	from X to Y
D	more negative	from Y to X

28. During a primary immune response, the following events take place

1. Some B – lymphocytes form plasma cells.
2. B – lymphocytes with the specific cell surface receptors divide repeatedly by mitosis.
3. Specific antibody is produced.
4. T – helper cells secrete cytokines.
5. T – helper cells identify a specific antigen.

In which order will the events take place?
A. 5 4 2 1 3
B. 2 1 4 3 5
C. 2 4 3 1 5
D. 5 4 3 1 2

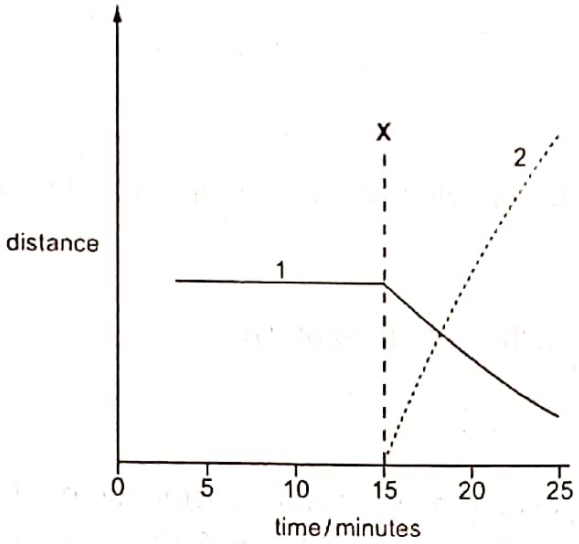
29. A unique characteristic of Bryophytes when compared to other green plants is that they;
A. Lack roots
B. Have the sporophyte attached to gametophyte.
C. Have xylem
D. Produce spores.

30. Genes P, Q, R and S are located on the same chromosome. The cross over values between them are; P-Q 24%, R-P 14%, R-S 8% and S-P 6%. What is the sequence of genes on the genetic map of the chromosome?
A. PRSQ B. RSPQ C. RPQS D. QRSP

31. Which one of the following is a behavioural method of controlling birth?
A. Abortion
B. various intra-uterine devices
C. rhythmic method
D. sterilization of the males or females

32. Protons accumulate in the thylakoid space during electron transport between photosystem I and II. The excess protons in the thylakoid space
A. enter the respiratory pathway.
B. convert NADP to NADPH and generate ATP.
C. raise the pH of the space until the process stops.
D. are small enough to diffuse back into the stroma.

33. The graph shows measurements taken during one mitotic cell cycle.



Which stage of mitosis begins at X and which measurements are shown by curves 1 and 2?

	Stage beginning at X	Distance between centromeres of chromosomes and poles of spindle	Distance between centromeres of sister chromatids
A	Anaphase	1	2
B	Anaphase	2	1
C	Metaphase	1	2
D	metaphase	2	1

34. Preparation of the uterine wall for implantation is coordinated by
A. cerebellum, pituitary and ovaries
B. hypothalamus, pituitary and ovaries
C. uterus, ovaries and amnion
D. pituitary, amnion and ovaries

35. Which one of the following ranges of temperature increase would double the rate of photosynthesis in a green plant with an optimum supply of water, light and carbon dioxide?
A. 40-50^{0}c
B. 25-35^{0}c
C. 30-25^{0}c
D. 20-25^{0}c

36. The base sequence at the free end of RNA, which serves as a binding site of a specific amino acid is composed of
A: UGA B: ACC C: UGC D: CCA

37. What is the total number of ATP molecules that can be produced during the Krebs' cycle of respiration?
A. 38
B. 22
C. 24
D. 30

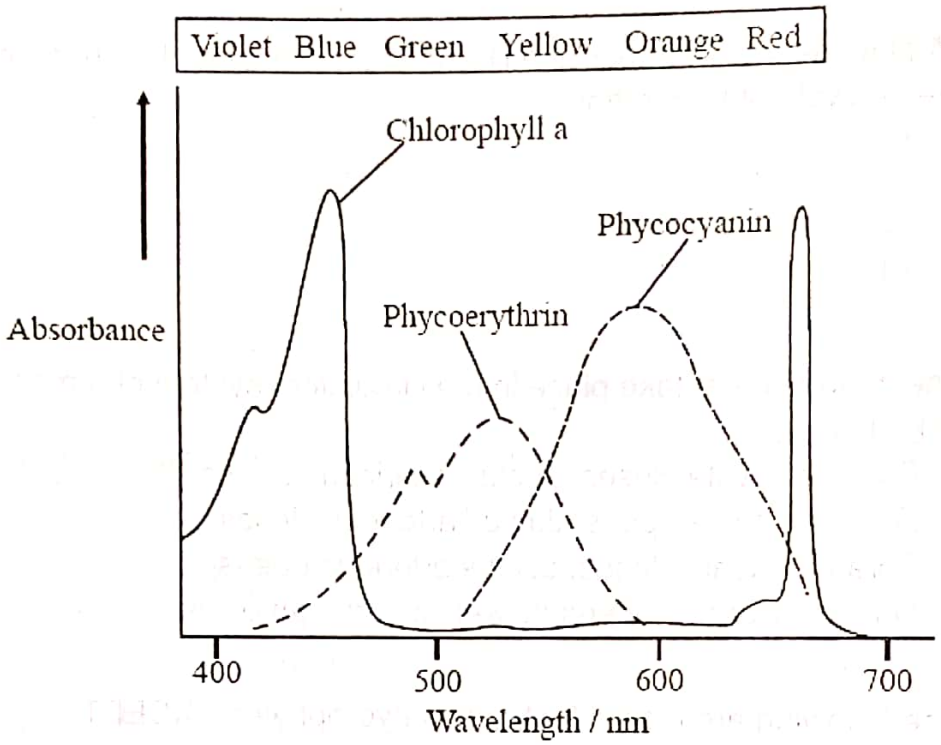
38. The changes that take place in the circulatory system of a mammalian feotus at birth include;
A. Foramen ovale closes, ductus arteriosus closes
B. Foramen ovale opens, ductus arterious closes
C. Foramen ovale closes, ductus arterious opens
D. Ductus arterious opens as well as foramen ovale.

39. The following are typical features of hydrophytes EXCEPT;
A. elongated petioles
B. large floating leaves
C. aerial flowers
D. well-developed xylem

40. Which one of the following is an adaptation of class Aves for terrestrial environment?
A. Lungs and scales
B. Lungs and shelled eggs
C. Regulation of body temperature
D. Wings and parental care

SECTION B (60 MARKS)

41. The graph shows the absorption of different wavelengths of light by three photosynthetic pigments in a red seaweed.



(a) (i) Describe what the graph shows about the properties of chlorophyll a. (02 marks)

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(ii) Describe the part played by chlorophyll in photosynthesis. (03 marks)

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(b) The red seaweed lives under water at a depth of 2 meters. Suggest an advantage to the red seaweed of having other pigments in addition to chlorophyll a. (02 marks)

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(c) Explain how the products of light dependent reactions are used in the light-independent reactions of photosynthesis. (03 marks)

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42. (a) On islands of Lake Victoria, there are almost 150 species of lizards belonging to the genus *Anolis*. Scientists believe that these species evolved from two species found on mainland Uganda. Explain how the species could have evolved. (6 marks)

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(b) Explain why bats and birds, despite not being closely related have evolved wings. (4 marks)

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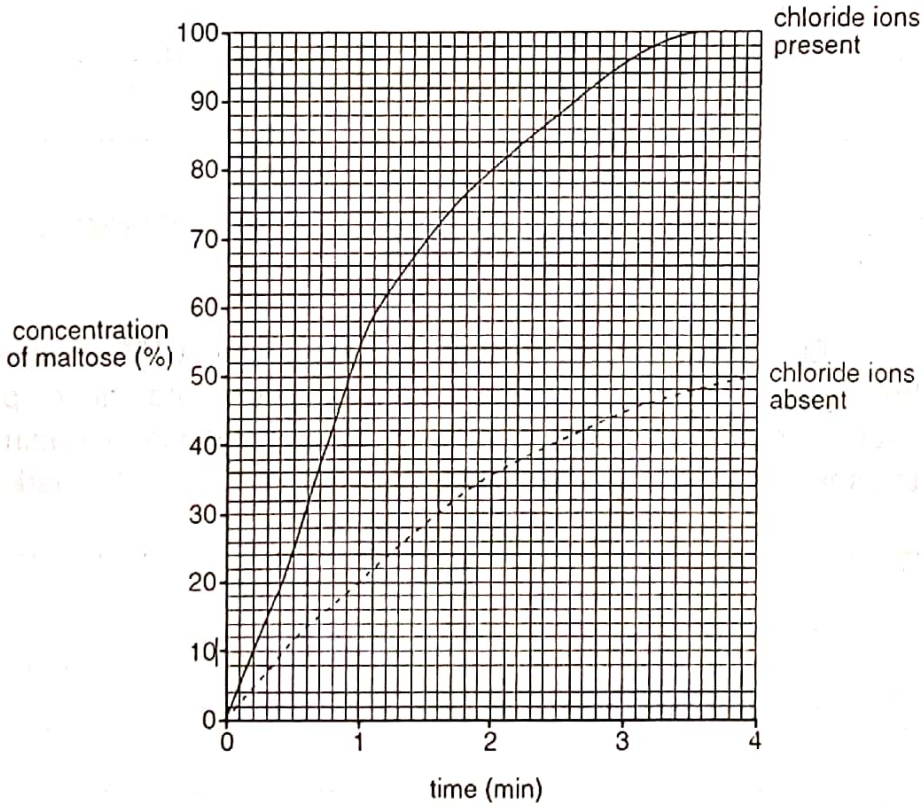
43. Fig below shows results obtained from a practical procedure in which the rate of formation of maltose from hydrolysis of starch was measured in the presence and absence of chloride ions.



(a) Suggest the enzyme that was used in the practical procedure (1 mark)

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(b) Describe the effect of presence and absence of chloride ions on the rate of reaction. (3 mark)

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(c) Suggest ways in which chloride ions have this effect on the rate of reaction. (4 mark)

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(d) State two variables that need to be controlled in this practical procedure in order to produce valid results. (2 mark)

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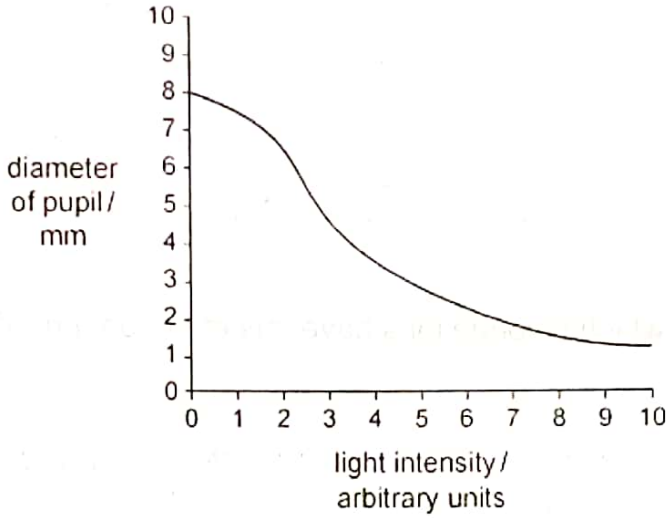
44. In an experiment, a person looked at the same light source from various different distances. The diameter of their pupil was measured at each position. Figure shows how the diameter varied.



(a) Describe the relationship between light intensity and pupil diameter shown in the figure above (2 marks)

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(b) What type of response accounts for this change in pupil diameter? (1 mark)

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(c) Explain how the response is brought about as the light intensity is increased from 2 to 4 arbitrary units (3 marks)

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(d) Albino people lack colouring material (pigment) in their bodies. Suggest why albino people should avoid looking at bright lights. (4 marks)

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45. a) Describe how a marathon runner like Kiprotich is able to release sufficient energy for a 50 km run without having enough oxygen available for his muscles (5 marks)

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b) Explain the fate of lactic acid following a run (3 marks)

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c) Suggest why the build-up of lactic acid in muscles of a marathon runner may prevent any further increase in speed (2 marks)

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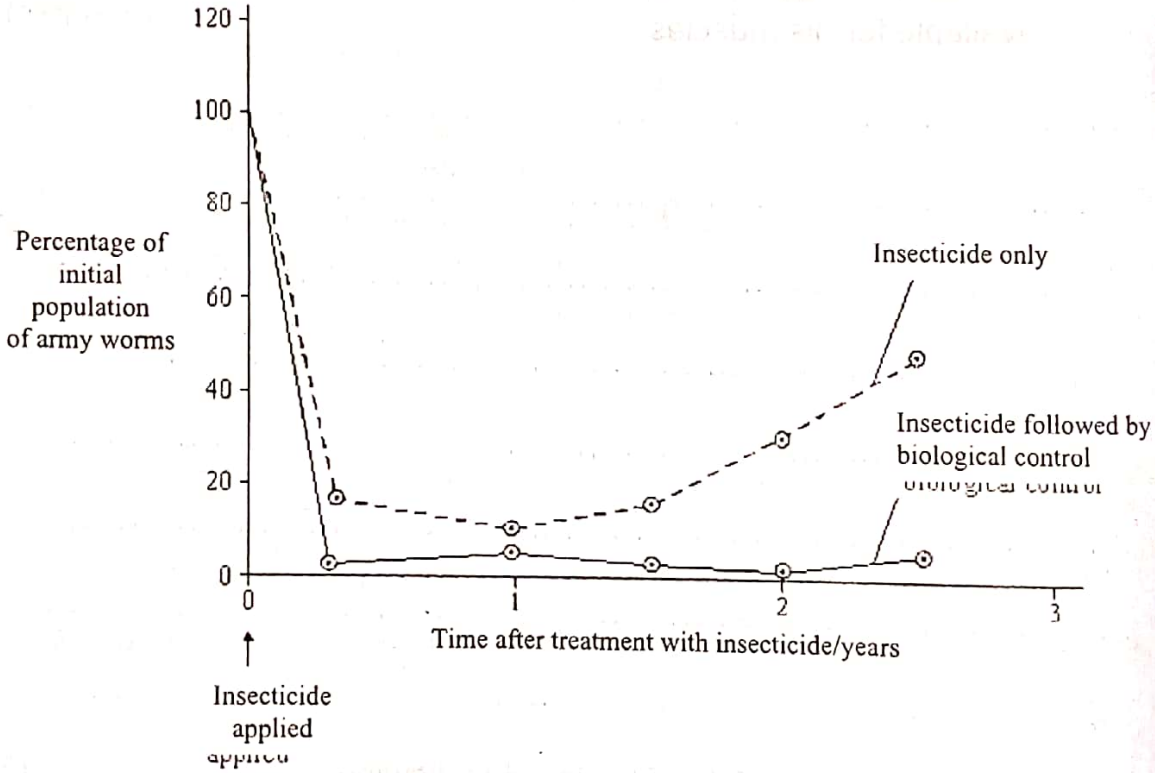
46. Army worms are a serious maize pest in parts of the Uganda. An investigation was carried out to find the best way to control the army worm population. The graph shows the results of this investigation.



a) Describe the effect of using insecticide followed by biological control. (02 marks)

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b) Explain the change in army worm population over the period when they were treated with an insecticide alone. (03 marks)

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c) Give two advantages and three disadvantages of using biological control. (05 marks)

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End