Name……..Signature……

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P530/1
BIOLOGY
(Theory)
July/Aug. 2023
2 ½ hours

UGANDA TEACHER'S EDUCATION CONSULT (UTEC)
Uganda Advanced Certificate of Education
BIOLOGY
(THEORY)
Paper 1
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

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

*Answer **all** questions in both sections*

*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		**Marks**	**Examiner's Signature &No.**
A	**1-40**		
B	**41**		
	42		
	43		
	44		
	45		
	46		
Total			

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. Which one of the following determines the number of map units between two genes on a chromosome?

A. Frequency of parentals

B. Frequency of recombinants.

C. Number of linkage groups

D. Size of the chromosomes

2. Which one of the following properties of water is important in the dispersal of spores?

A. High tensile strength B. High surface strength

C. High relative density. D. Incompressibility

3. Which one of the following events marks the beginning of the spermatogenesis?

A. Enlargement of the germ cells

B. Differentiation of the spermatozoa

C. Harling of nucleic acid content in each germ cell

D. Division of the germ cells

4. Which one of the following doesn't adapt the stratified tissue for its function?

A. Toughness

B. Impervious

C. Greater thickness

D. Single layer of cells

5. Which one of the following factors will least affects the rate of synthesis of a protein in a plant?

A. Relative humidity

B. Temperature

C. Light intensity

D. Carbon dioxide concentration

6. The surface area and volume of the four mammals A,B,C and D are given in table 1. Which of these mammals would survive better in a cold environment?

Table 1.

Mammal	Surface area (cm^2)	Volume (cm^3)
A	20	5
B	40	80
C	60	60
D	80	100

7. Which one of the following plant tissues lacks fibres?

A. Xylem B. Phloem

C.Sclerenchyma D. Collenchyma

8. Which one of the following structures prevents the mammalian heart from being over stretched?

A. Chordae tendinae

B. Mitral values

C. Pericardium

D. Cardiac muscles.

9. Which one of the following features is not common to both arthropods and annelids?

A. Metameric segmentation

B. Bilateral symmetry

C. Triploblastic coelomate

D. Jointed appendages

10. The most efficient vertebrate respiratory system is found in

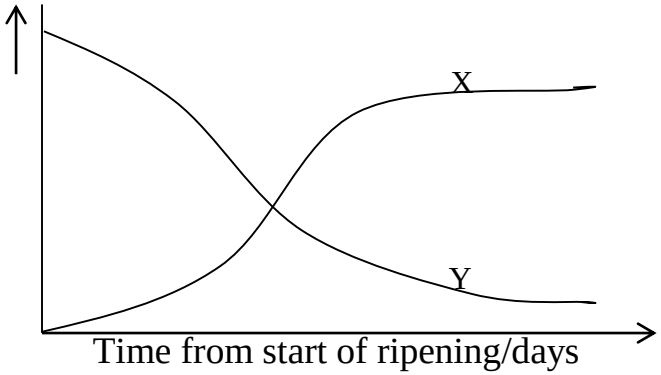
A. Birds

B. Fish

C. Mammals

D. Reptiles

11. Figure 1 shows the changes in levels of hormones X and Y in a ripening seed.



Hormones X and Y respectively are;

A. Ethane and cytokinin

B. Ethane and gibberellins

C. Abscissic acid and auxins

D. Auxins and gibberellins.

12. Which one of the following may limit an organism from colonizing a terrestrial habitat?

A. Development of pollen tube

B. Shelled eggs

C. Internal fertilization

D. Flagellated gametes

13. Which one of the following is the significance of the fluffy nature of down features during flight in birds?

A. Minimize drag

B. Increase strength of each wing

C. Improves on the streamlining of the body

D. Provide high levels of insulation.

14. Which one of the following is correct about the venous end of a capillary bed?

A. Blood pressure is high

B. Water moves out of the capillaries

C. Solute potential of plasma proteins decreases.

D. Solutes are actively transported into the capillaries

15. Which one of the following would occur immediately following entry of sodium ions into the post synaptic neurone?

A. Hyper polarization

B. Depolarization

C. Repolarization

D. Generation of action potential

16. The cause of negative growth at the onset of seed germination is;

A. Imbibition of water

B. Mobilization of foods reserves

C. Rupturing of the seed coat

D. Formation of foliage leaves

17. Which one of the following parts of a nephron contributes most to the survival of the desert rat?

A. Bowman's capsule

B. Proximal convoluted tubule

C. Distal convoluted tubule

D. Loop of Henle

18. Which one of the following structures of a moss contains the same genetic condition as that of a spermatozoan?

A. Spores
C. Spore mother cells
B. Zygote
D. Sporangium

19. Figure 2 shows the effect of temperature on leaf burial by earthworms.

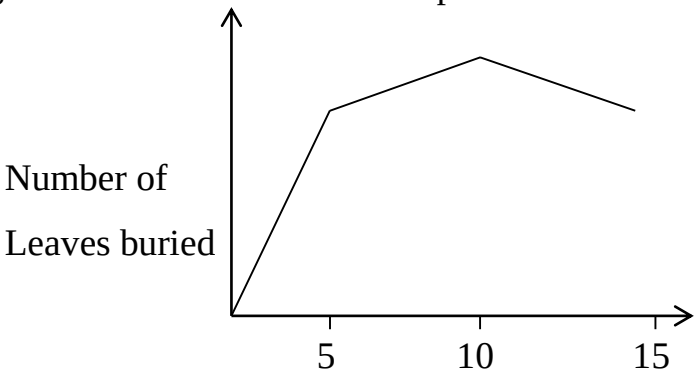


Fig.2: Temperature/^{o}C

Which is the best conclusion from this figure?

A. Activity of earthworms increases with increase in temperature
B. Activity of earthworms decreases with increase in temperature
C. Temperature of earthworm's habitat vary seasonally
D. Low temperatures make earthworms dormant.

20. Which one of the following preserves existing allele frequencies in a population?

A. Stabilizing selection
C. Disruptive selection
B. Directional selection
D. Prevalent selection

21. What type of behaviours enables small mammals to become familiar with their home territories?

A. Latent learning
C. Insight learning
B. Imprinting
D. Habituation

22. Which one of the following is true about meiosis? It involves

A. two diversions and two rounds of DNA replication

B. two divisions and one round of DNA replication

C. one division and two rounds of DNA replication

D. one division and one round of DNA replication

23. Which one of the following is the effect of removing carnivores from an ecosystem?

A. Increase in productivity of pastures

B. Decrease in the number of herbivores

C. Increase in productivity of tertiary consumers

D. Decrease in the amount of vegetation cover

24. Which one of the following physiological processes doesn't require calcium ions?

A. Response to gravity

B. Muscular contraction

C. Transmission of nerve impulse across synapses

D. Transmission of nerve impulse along axons

25. Which one of the following cell structures promotes the growth of bacteria on other surfaces?

A. Cilia

B. Flagella

C. Nucleoid

D. Fimbriae

26. Which one of the following tissues is most likely to be the source of nutrients for insects that parasitise trees?

A. Primary xylem

B. Secondary xylem

C. Vascular cambium

D. Cork

27. Which one of the following is not an advantage of breathing air over breathing water?

A. Air is less dense than water, so it takes less energy during ventilation

B. Oxygen diffuses faster through air than in water

C. Oxygen content of air is greater than that of an equal volume of water

D. Air breathing leads to high evaporation rates from the respiratory surface

28. Which one of the following enzymes is not secreted by the lining of the ileum?

A. Enter kinase

B. Lipase

C. Lactase

D. Sucrose

29. Wearing a hairy shirt causes unpleasant sensation at first but later the discomfort disappears because;

A. the post synaptic membrane cease to release the transmitter substance

B. the sensory system becomes overloaded with sensory impulses

C. there is continuous transmission of nerve impulses across synapses

D. there is a decline in the generator potentials provided by sensory receptors

30. Which one of the following is not correct about tetraploid organisms? They

A. have two complete sets of homologous chromosomes

B. can form homologous pairings during garment formation

C. can be propagated by both sexual and asexual means

D. are usually sterile

31. Figure 3 shows the change in numbers of pathogenic bacteria during an infection of the human body

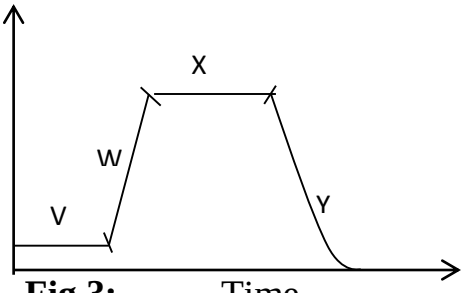


Fig.3:

In which region of the curve is the rate of the immune response of the body equal to the reproductive rate of the bacteria?

A. V C. X

B. W D. Y

32. Which one of the following is absent in the matrix of the mitochondrion?

A. Ribosomes C. Traces of DNA

B. Lipids D. Stalked particles

33. Hydrophytes do not have support tissues because they

A. lack roots where support tissues are found.

B. have parenchyma tissue which makes them buoyant

C. obtain support from the higher density of water

D. have a lignified epidermis that provides additional support

34. Which one of the following methods is suitable for estimating the population size of animals that congregate in open places?

A. Capture – recapture

B. Quadrat

C. Aerial photographs

D. Removal method

35. Table 2 shows the rate of oxygen consumption by different tissues of a dicotyledonous plan.

Tissue		Oxygen consumption (mm^3 O2 $S^{-1}hr^{-1}$)
A	Vascular tissue	800
B	Whole leaves	400
C	Petioles	200
D	Taproots	40

Which of these tissues would be most affected by a metabolic poison?

36. Which one of the following factors limits cartilaginous fishes from having efficient gaseous exchange systems?

A. Possession of small sized gill plates

B. Parallel flow of water and blood across the gill plate

C. Absence of an operculum to enclose the gills

D. Are surrounded with salty water of low oxygen content

37. Mutualistic associations are important in the following process except

A. production of enzymes

B. production of vitamins

C. fixation of nitrogen

D. recycling of carbon

38. Which one of the following events occurs at the beginning of ventricular systole?

A. Ventricular pressure exceeds a trial pressure

B. A trial pressure exceeds ventricular pressure

C. A trio ventricular values are opened

D. Semilunar values are closed

39. One reason why starch lacks structural properties possessed by cellulose is that it

A. lacks cross linkages

B. lacks folded chains

C. has fewer micro fibrils

D. has shorter chains

40. Which one of the following events of photosynthesis is not directly affected by light intensity?

A. Photolysis of water

B. Emission of electrons from chlorophyll

C. Chemiosmotic synthesis of ATP

D. Conversion of PGA to PGAL

SECTION B: (60 MARKS)

Write answers in the spaces provided

41.(a) Explain why symbiotic nitrogen fixation in the soil is affected by changes in temperature. (*03 marks*)

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(b) Explain how soil nitrogen may become part of a protein molecule in a plant. (*04 marks*)

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(c) Explain why eating an excess protein in humans is associated with accumulation of glycogen in the liver. (*03 marks*)

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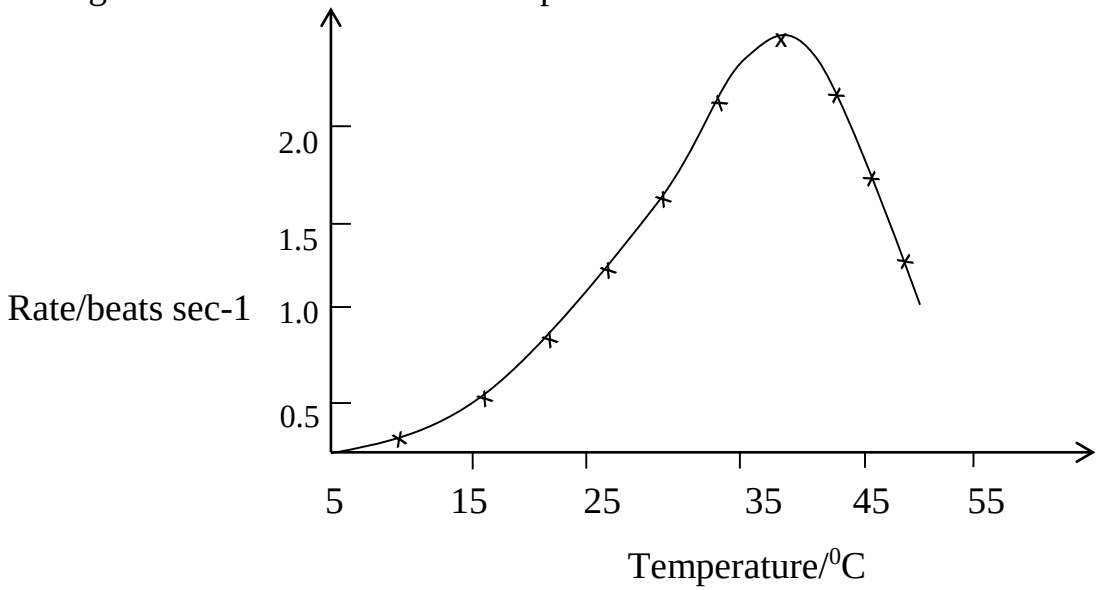
42. Figure **4** shows the effect of temperature on the heart rate of a locust.



(a) Describe the changes in the rate of heart beat (*04 marks*)

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(b) Explain the effect of temperature on the rate of heat beat. (*04 marks*)

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(c) Explain how the rate of heart beat of a rat would differ from that of a locust. *(02 marks)*

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43.(a) Distinguish between primary productivity and secondary productivity (*02 marks*)

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(b) Give five reasons why much of the solar energy doesn't contribute to primary productivity in plants. (*05 marks*)

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(d) Explain why carnivores have a higher secondary productivity than herbivores. (*03 marks*)

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44. An individual was made to undertake a violet exercise and his respiratory quotient (RQ) was measured immediately after the exercise for one hour. **Figure 5** shows the results of the investigation

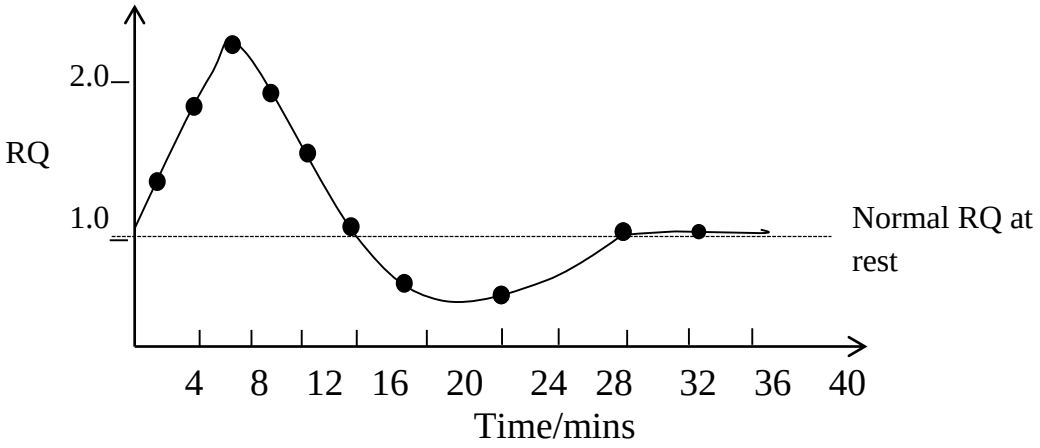

Fig.5

(a) What is meant by respiratory quotient? (*01 mark*)

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(b) Explain the;

(i) rise in RQ up to the 6th minute (*03 marks*)

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(ii) fall in QR from the 6th to 16th minute (*04 marks*)

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(c) Explain why the QR falls below the normal RQ of a resting human (*02 marks*)

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45.(a) State the difference between a **C_3** and a **C_4** plant. (*02 marks*)

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(b) Explain how the structure of **C_4** plants adapts them to avoid photo respiration (*04 marks*)

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(d) Explain the photosynthetic pathway that operate in plants living in the following areas

(i) Hot dry areas (*02 marks*)

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(ii) High altitude areas (*02 marks*)

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46.(a) State two characteristics of each of the following tissues.

(i) Stratified tissue (*01 mark*)

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(ii) Collagen tissue (*01 mark*)

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(b) Explain the importance of the characteristics of stratified tissue in the epidermis of the mammalian skin. (*04 marks*)

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(c) Explain how the structure of proteins enables them to form collagen tissue. (*04 marks*)

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