

# **BIOLOGY REVISION**

## **ORDINARY LEVEL**

### **TOPICAL QUESTIONS**

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**Diversity**  
**SECTION A**

1. Which one of the following is the correct order in the level of organization of an organism?
  - A. Cells → organs → tissues → systems
  - B. Tissue → organs → systems → cells
  - C. Cells → tissues → organs → systems
  - D. Organs → tissues → systems → cells
2. Which one of the following cell structures is possessed by both animal and plant cells?
  - A. Chloroplast                    C. Cell wall
  - B. Flagellum                    D. Cell membrane
3. Which one of the following characteristics of an organism is important in constructing a dichotomous key?
  - A. Body structure                    C. Body colour
  - B. Body size                    D. Age of an organism
4. The following are characteristics of animals
  - (i) Jointed appendages
  - (ii) Possession of exoskeleton
  - (iii) Three body parts
  - (iv) Three pairs of limbsWhich set of characteristics is possessed by all arthropods?
  - A. (i) and (ii)                    C. (iii) and (iv)
  - B. (ii) and (iii)                    D. (ii) and (iv)
5. Which of the following parts of a microscope are adjusted in order to bring the specimen into focus?
  - A. Eye piece and coarse adjustment
  - B. Coarse and fine adjustment
  - C. Eye piece and fine adjustment
  - D. Mirror and fine adjustment.

6. Which of the following groups contains the largest number of organisms?
- A. Order      C. Class  
B. Species      D. Phylum
7. Which of the following levels of classification can organisms interbreed and produce fertile offspring?
- A. Class      C. Phylum  
B. Species      D. Kingdom
8. Which of the following parts of a microscope magnify the object?
- A. Eye piece and mirror  
B. Objective lens and mirror  
C. Eye piece and objective lens  
D. Eye piece and fine adjustment.
9. The following are structures of a cell.
- (i) Cell wall  
(ii) Cell membrane  
(iii) Nucleus  
(iv) Chloroplast

Which of them are found in both plant and animal cells?

- A. (i), (ii) and (iv)      C. (ii) and (iii)  
B. (i), (iii) and (iv)      D. (ii) and (iv)
10. Which of the following features of an amphibian are suited for aquatic life?
- A. Possession of wings  
B. Muscular hind limbs  
C. Moist skin without scales  
D. Webbed toes.

11. Which of the following parts of a plant cell provides shape and rigidity?

- A. Protoplasm
- C. Nucleus
- B. Cell wall
- D. Cell membrane.

12. Which one of the following sets of organisms belong to the same group?

- A. Butterfly, beetle and star fish.
- B. Crab, Tapeworm, and liverfluke
- C. Scorpion, mite and spider
- D. Jelly fish and sea urchin.

13. The following are some features of lower plants.

- i) Reproduce by spores
- ii) Lack vascular tissues
- iii) Grow in damp places
- iv) Have simple stems and leaves

Which of the features belong to both mosses and ferns?

- A. (i) and (iv)
- C. (i) and (iii)
- B. (ii) and (iii)
- D. (iii) and (iv)

14. Which one of the following combination of words about amoeba are related?

- A. Pseudopodia, reproduction
- C. Contractile vacuole , water
- B. Nucleus, movement
- D. Ectoplasm, Digestion.

15. Why is it necessary to keep both eyes open when you are using a monocular microscope?

- A. Straining one eye is avoided
- B. One eye is set on the drawing paper
- C. It enables one to see the object clearly
- D. It eases the control of the adjustment knobs.

16. Which one of the following is a characteristic of insects only?

- A. Exoskeleton
- C. Jointed legs
- B. Two pairs of wings
- D. Three body divisions

17. Which of the following pairs of cells does not have nuclei when mature?

- A. Sieve tube cells and companion cells
- B. Erythrocytes and leucocytes
- C. Sieve tube cells and erythrocytes
- D. Companion cells and leucocytes.

18. A bat is classified as a mammal because

- A. It does not possess feathers
- B. It has specialized teeth
- C. It has four limbs
- D. Its digits have claws

19. Which one of the following types of cells is unspecialized?

- A. Companion cell in plants
- B. Red blood cell
- C. Meristemic cell
- D. Nerve cell

20. Which one of the following is characteristic of animal cells?

- A. Presence of cell walls
- B. Cells consist entirely of cytoplasm
- C. Have regular shape
- D. Have large centrally placed vacuoles.

21. Which one of the following characteristics is common to birds, fish and reptiles?

- A. Regulation of body temperature
- B. Bodies are covered with scales

- C. Use of nostrils for breathing  
D. Internal fertilization.
22. Which one of the following can not be used in the classification of plants?  
A. Structure of the flowers      C. Type of seeds  
B. Leaf structure                  D. leaf color
23. Which one of these is not a means of movement in protozoa?  
A. Coelom      C. Flagella  
B. Cilia              D. Pseudopodia.
24. Which one of the following protozoa has cilia?  
A. Amoeba      C. Euglena  
B. Paramecium    D. Plasmodium
25. Functionally, the most diversified organ in the human body is the  
A. Brain      C. Stomach  
B. Liver              D. Kidney
26. The following belong to the same group of organisms except  
A. Trypanosome      C. Penicillium  
B. Plasmodium              D. Entamoeba histolytica
27. Which one of the following expressions can be used to determine the magnification power of a microscope? The magnification of the eye piece.  
A. X the magnification of the objective lens  
B. + the magnification of the objective lens  
C. / the magnification of the objective lens  
D. - the magnification of the objective lens

28. Simple aquatic plants containing chlorophyll and usually with bodies not differentiated into root, stem and leaves are
- A. Fungi                      C. Mosses  
B. Liverworts                D. Algae
29. Which of the following pairs represents true worms (phylum annelida)
- A. Earth worm, leeches    C. Liver flukes, leeches  
B. Earth worm, squids     D. Oysters, ascaris.
30. Which one of the following is well developed in a tape worm?
- A. Digestive system        C. Reproductive system  
B. Nervous system          D. Respiratory system
31. If a microscope eye piece has a number X10 written on it and the objective lens has a number X45 written on it, the magnification will be.
- A. 45                        B. 10                        C. 45                        D. 450.
32. Which one of the following structures separates the nucleoplasm from cytoplasm?
- A. Plasma                      C. The cell wall  
B. Plasma membrane        D. The nuclear membrane
33. Which of the following is not a difference between a typical plant cell and animal cell?
- A. Animal cells contain small vacuoles whereas plant cells usually have one or two large vacuoles.  
B. Animal cells have cell membranes only whereas plant cells have cell walls only.  
C. Animal cells are usually flaccid whereas plant cells are usually turgid  
D. Animal cell never contain chlorophyll whereas plant cells do.

34. Which of the following characteristics are true of all arachnids?

- (i) Breathe by lung hooks or gill hooks
  - (ii) Body divided into head, thorax, and abdomen.
  - (iii) Mainly terrestrial
  - (iv) Body divided into opisthosoma and prosoma.
- A. (i), (ii) and (iii)      C. (i), (ii) and (iv)  
B. (i), (iii) and (iv)      D. (ii), (iii) and (iv)

35. Which one of the following phyla consists of human parasites?

- A. Nematoda      C. Mollusca  
B. Coelentrata      D. Echinodermata

36. What is the magnification of an object which has a linear dimension of 36mm and an image of linear dimension of 18cm?

- A. 0.5      B. 2      C. 12      D. 24

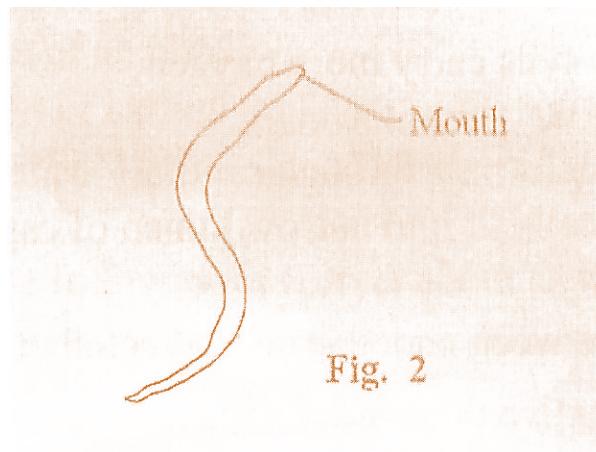
37. Below are some characteristic features of non flowering plants.

- i) Lack vascular tissues
- ii) Have roots, stems and leaves
- iii) Have rhizoids
- iv) Reproduce by spores
- v) Have thallus

Which of the following characteristics are common to the division of ferns?

- A. (i) and (V)      C. (iii) and (v)  
B. (ii) and (iv)      D. (i) and (iii)

38. To which one of the following phyla does the organism in the figure below belong?



- A. Annelida
- B. Nematoda
- C. Coelentrata
- D. Platyhelminthes

39. Which one of the following is a characteristic of arachnids?

- A. lack antennae
- B. have compound eyes
- C. have many appendages
- D. Have 3 body parts.

40. Which one of the following is a photosynthetic protozoa?

- A. Plasmodium
- B. Euglena
- C. Trypanosome
- D. paramecium

41. While carrying out field work, students collected animals with the following characteristics.

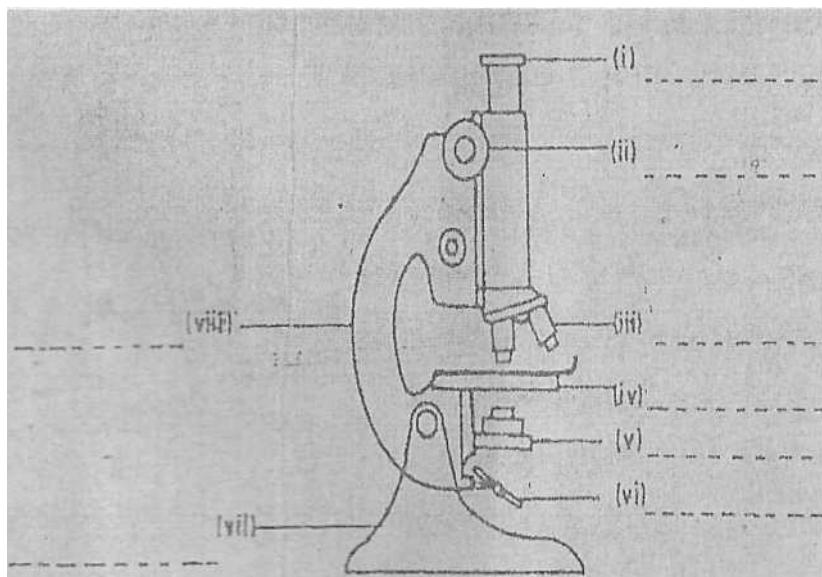
Animal A	Animal B
4 pairs of walking legs	A pair of compound eyes
Simple legs	3 pairs of walking legs
2 body parts	1 pair of antennae
	3 body parts

Animal A and B belong to the same;

- A. Class
- B. Phylum
- C. Species
- D. Genus

## SECTION B

42. Figure ii is a drawing of an instrument used in a laboratory



- Identify the instrument.
- Name the parts labeled (i) - (viii) in the spaces provided on the diagram.
- What are the functions of (i), (ii), (iv) and (vi)?
- Naomi observed an object using a microscope with an eye piece lens of magnification X5 and an objective lens of magnification X20. What was the magnification of the object?
- Mwaniki observed eight leaf epidermal cells across the field of view of a light microscope. If the observed field of view was 4mm in diameter, estimate the average size of the cells in micrometers. ( $1\text{mm} = 1000\text{m}$ ).

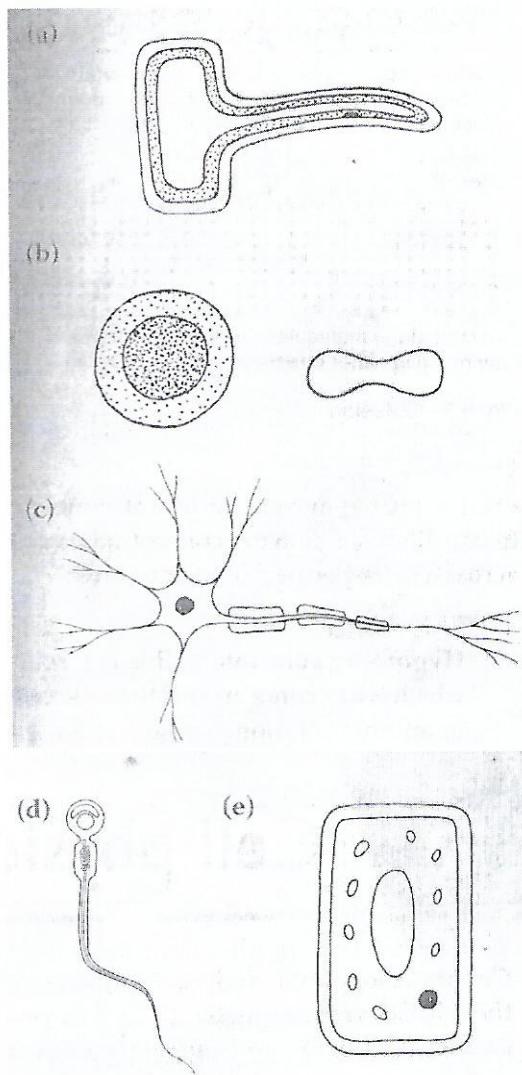
43. a) Complete the table below to summarize the characteristics of each class of Arthropoda

Characteristic	Insect	Arachnida	Crustacean	Diplopoda	Chilopoda
Number of body parts					
Number of limbs					
Gaseous exchange structure					
Number of antennae					
Number of wings					

- a) State 3 characteristics that are used to divide the phylum Arthropoda into classes
  - b) Give a classification of each of the following under the following taxa: kingdom, phylum and class
    - i) Honey bee
    - ii) Spider
    - iii) Salamander.
  - c) Make a three point dichotomous key to identify the organisms named below:
    - i) Millipede
    - ii) Grasshopper
    - iii) Snake
    - iv) Rat

44. a) Define each of the following terms:

(e) The diagrams below show different types of cells. Identify each cell and state its function



45. a) Blackjack (*Bidens pilosa*) belongs to the family Compositae. What is the plant's

- (i) Genus?
- (ii) Species?

b) Name the structures used for locomotion in each of the following organisms.

- i) Euglena
- ii) Paramecium
- c) Give two classes of the phylum Chordata where all members are poikilothermic
- d) State two characteristics of living organisms

- e) The scientific name of the wolf is *Canis lupus*.
- i) What is the significance of each part of the name?
- ii) Name this method of identifying organisms.

46. a) Define the following terms:

- i) Virus
- ii) Bacteriophage
- b) What features make a virus a
- i) Living?
- ii) Non living?
- c) i) Name three effects of viruses on the hosts
- ii) Name five common viral diseases.
- iii) Viruses, protozoans and bacteria are parasitic organisms and pathogens. Briefly explain the ways of preventing parasitic diseases.

47. a) Differentiate between a vertebrate and an invertebrate

- b) Name the five classes to which vertebrates belong.
- c) Outline the general characteristics of vertebrates.
- d) i) state the differences between bony fish and cartilaginous fish,  
ii) Give five characteristics that are common to all birds.
- e) Complete the table below which summarizes the characteristics of individual classes.

Class	Reptilian	Aves	Pisces	Amphibian	Mammalian
Skin					
Nature of teeth					
Limbs					
Mode of breathing					
Appearance of young					
Mode of temperature regulation					
Type of fertilization					

g) Define the following terms as applied to the study of vertebrates.

Metamorphosis

External fertilization

Internal fertilization

Poikilothermic

Homoeothermic

Oviparous

Viviparous

Homodont

Heterodont

Pentadactyl limb

48. Define the term fungi.

a) Name five examples of fungi

b) State five general characteristics of fungi

c) Briefly explain how the yeast cell reproduces

d) Describe with well labeled diagrams how a bread mould reproduces

Asexually

Sexually

e) Briefly explain the economic importance of fungi

**Insects of main economic importance**  
**Section A**

1. Which one of the following pairs of insects undergoes incomplete metamorphosis?
  - A. Housefly and cockroach
  - B. Butterfly and cockroach
  - C. Honey bee and moth
  - D. Cockroach and grasshopper
  
2. Which of the following are not social insects?
  - A. Ants
  - B. Bees
  - C. Termites
  - D. Butterflies
  
3. Which one of the following does not contribute to the efficiency of a housefly as a vector?
  - A. Ability to fly
  - B. Feeding on liquid food
  - C. Feeding in dirty places
  - D. Possession of hairs on the body
  
4. Which of the following diseases are all transmitted by mosquitoes?
  - A. Elephantiasis, river blindness and yellow fever
  - B. Malaria, river blindness and malaria
  - C. Yellow fever, malaria and elephantiasis
  - D. Yellow fever, river blindness and malaria
  
5. Which one of the following is a characteristic of the class insect?
  - A. Cutaneous outer skeleton
  - B. Jointed limbs
  - C. Two pairs of wings

- D. Three body parts
6. Which one of the following characteristics of insects enables them to live in dry habitats?
- A. Spiracles
  - B. Hairy bodies
  - C. Waxy cuticle
  - D. Wings
7. P, Q, R and S are characteristics of insects
- P- Undergoes complete metamorphosis
  - Q- Possesses wings
  - R- Have 3 pairs of wings
  - S- Divided into 3 body parts.
- Which of them are common to all insects?
- A. P and Q
  - B. R and S
  - C. Q and S
  - D. P and R
8. A cuticle may be regarded as a disadvantage to insects mainly because
- A. It does not allow rapid locomotion.
  - B. It limits the size of the insects.
  - C. Does not prevent water loss.
  - D. Does not allow gaseous exchange.
9. Which one of the following may not be used for classifying insects?
- A. Mouth parts
  - B. Feeding habits
  - C. Structure of legs
  - D. Type of eyes.

10. Which one of the following parasites is transmitted by anopheles mosquito?

- A. Filarial worm
- B. Trypanosome
- C. Plasmodium
- D. Schistosome.

11. Which one of the following is a characteristic of insects only?

- A. Exoskeleton
- B. Jointed limbs
- C. Two pairs of wings
- D. Three body divisions

12. The following are characteristics of insects

- i) They undergo complete metamorphosis
- ii) They have 1 or 2 pairs of wings
- iii) They have 3 pairs of jointed legs
- iv) Their bodies are divided into 3 main parts
- v) They possess exoskeletons

Which of these are common to all insects?

- A. (iii), (IV) and (v)
- B. (i), (ii) and (iii)
- C. (i), (iii) and (v)
- D. (iii), (ii) and (v)

13. The last segment of a caterpillar bears a pair of structures called

Prolegs

- A. Ovipositors
- B. Claspers
- C. True legs

14. Which one of the following features is typical of the class insects?
- A. Jointed legs
  - B. Three body parts
  - C. Complete metamorphosis
  - D. Exoskeleton
15. Which one of the following activities takes place during the pupal stage in the life cycle of an insect?
- A. Hibernation
  - B. Organ formation
  - C. Feeding
  - D. Resting
16. A male cockroach is different from the female cockroach by having
- A. Styles
  - B. Cercus
  - C. Longer antennae
  - D. Larger abdomen
17. Biological control as a method of prevention of malaria would include
- A. Spraying oil on the surface of stagnant water
  - B. Spraying insecticides on the mosquitoes
  - C. Introducing fish in water bodies
  - D. Draining stagnant water
18. Which of the following groups of insects all have similar feeding habits?
- A. Bee, mosquito, caterpillar
  - B. Housefly, cockroach, preying mantis
  - C. Tsetsefly, housefly, caterpillar
  - D. Bee, butterfly, bedbug

19. Which of these insects does not lay eggs in its life cycle?

- A. Bee
- B. Grasshopper
- C. Tsetsefly
- D. Housefly

20. Which one of the following would help in reducing the number of mosquito larvae?

- A. Increase in the number of microscopic algae
- B. Increase in the number of larger fish
- C. Increase in the number of crocodiles
- D. Decrease in the number of small fish

21. A mosquito larva breathes by means of

- A. Spiracles
- B. Gills
- C. Segments
- D. Nostrils

22. The female mosquito sucks blood because

- A. It requires iron to make haemoglobin
- B. It needs to feed on liquid food at around 37°C
- C. It obtains materials essentials for egg production
- D. Its mouth

23. Which one of the following is not a characteristic of insects?

- A. Two pairs of antennae
- B. Jointed legs
- C. External skeleton
- D. Body divided into head, thorax and abdomen

24. Which of the following insects live in colonies?
- A. Butterflies
  - B. Houseflies
  - C. Mosquitoes
  - D. Wasps
25. The larva of a housefly moults a number of times before it pupates in order to
- A. Breathe more easily
  - B. Pass out waste products
  - C. Increase in size
  - D. Move faster
26. Which one of the following does not live in colonies?
- A. Wasp
  - B. Termites
  - C. Red ants
  - D. Butterfly
27. Bees belong to order
- A. Isoptera
  - B. Diptera
  - C. Hymenoptera
  - D. Lepidoptera
28. In which of the following habitats are housefly larvae likely to be found? In
- A. Stagnant ponds
  - B. The of a sheep
  - C. The dry places of a house
  - D. Decaying organic matter.

29. Which one of the following pairs of insects undergoes complete metamorphosis?

- A. Butterfly and housefly
- B. Housefly and grasshopper
- C. Cockroach and moth
- D. Butterfly and grasshopper

30. Which of the following methods of controlling malaria does not harm the environment?

- A. Draining ponds
- B. Use of insecticide such as DDT
- C. Spraying oil on top of water ponds
- D. Introducing of fish into ponds.

31. The following is a dichotomous key of invertebrates;

- |                       |   |
|-----------------------|---|
| a. Has 8 legs         | W |
| b. Has 6 legs         | 2 |
| a. Has long antennae  | X |
| b. Has short antennae | 3 |
| a. Has proboscis      | Y |
| b. Has mandible       | Z |

Which one of the organisms is a fly?

- A. W
- B. X
- C. Y
- D. Z

32. Which one of the following may be used as the best distinguishing feature between a male and female cockroach?

- A. Presence of cerci on male
- B. Presence of styles on male
- C. Large abdomen on male
- D. Presence of ovipositor.

33. Which one of the following may not be used for classifying insects?

- A. Mouth parts
- B. Feeding habits
- C. Structure of legs
- D. Type of eyes

34. Which one of the following is the most destructive stage in the life cycle of a butterfly?

- A. Pupa
- B. Adult
- C. Larva
- D. egg

35. When a taxonomist uses the term Lepidoptera to refer to a butterfly, which category of classification is he using?

- A. Class
- B. order
- C. Genus
- D. Family

36. Insects in the dry areas conserve water by passing waste in form of

- A. Urea
- B. Uricacid
- C. Ammonia
- D. Urine

37. A mosquito larva breathes by means of

- A. Spiracles
- B. Gills
- C. Segments
- D. Breathing trumpet.

38. Which of the following features belong to both an arachnid and an insect?

- A. Cuticle and two pairs of wings
- B. Six legs and two pairs of wings
- C. Six legs and antennae
- D. Jointed legs and cuticle.

39. Which of the following mosquitoes spreads elephantiasis?

- A. Female anopheles mosquito
- B. Male anopheles mosquito
- C. Aedes mosquito
- D. Culex mosquito

40. What is the function of the prong found on the middle leg of the honey bee?

- A. Carrying pollen collected from flowers
- B. Scooping pollen out of the pollen basket on the hind leg
- C. Cleaning pollen off the body into the pollen basket
- D. Hopping.

## SECTION B

41. a) In what ways does the life cycle of a housefly differ from that of a cockroach?

- b) State four adaptations of insects that enable them to transmit diseases.
- c) Giving examples, explain how insects can be harmful and useful to people.

42. a) Name five orders which are found in class Insecta.

- b) State four characteristics that are common to all insects.

43. a) Distinguish between complete and incomplete metamorphosis.

- b) State two insects which undergo complete metamorphosis.
- c) Complete the table below.

Mosquito	Disease spread	Causative agent
	Malaria	
Culex		
Aedes		

- d) State five ways how the spread of malaria can be controlled.

44. a) Classify a butterfly

- b) State four features which are found on the thorax of a butterfly.
- c) Give four differences between butterflies and moths.

45. a) Name the 3 major parts that make up the mouth parts of a cockroach.

- b) State the 3 segments that make up the thorax of a cockroach.
- c) Give 3 differences between male and female cockroaches.

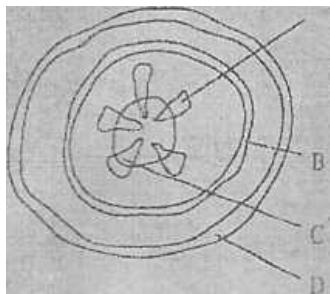
d) State 7 adaptations of cockroaches to their habitat.

## **SECTION C**

46. a) Describe the life cycle of a housefly.  
b) What is the economic importance of a housefly?  
c) How would you minimize the spread of houseflies in a home?
47. a) Outline the features on a grasshopper that qualifies it to be an insect.  
b) With the aid of labeled diagrams, describe the life cycle of a grasshopper.  
c) Explain why grasshoppers swarm in rainy season.
48. a) What is meant by the term metamorphosis?  
b) Describe the life cycle of a cockroach.  
c) What is the economic importance of cockroaches?
49. a) Insects are diverse organisms and very successful. State 15 reasons for the success of insects,  
b) List with examples where necessary the economic importance of insects.

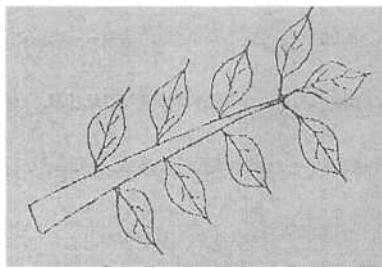
**Plant structures**  
**Section A**

1. The figure below is a transverse section through a dicotyledonous stem.



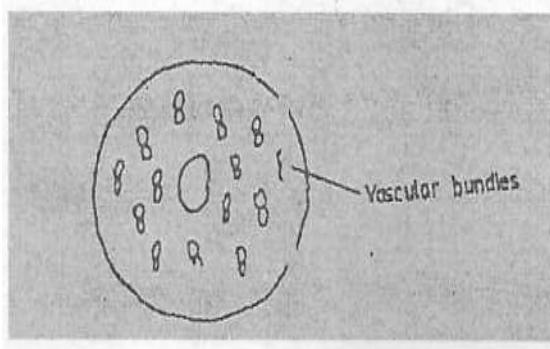
Which one of the parts labeled is used to transport food substances?

2. The best description of the leaf in the figure below is.



- A. Pinnate and parallel veined
  - B. Palmate and net veined.
  - C. Pinnate and net veined
  - D. Bi pinnate and parallel veined
3. Which one of the following is true about insect pollinated flowers?
- A. Produce small and smooth pollen
  - B. Have small greenish bracts.
  - C. Stigma and pollen grains are often sticky
  - D. Filaments are flexible and anthers loosely attached.

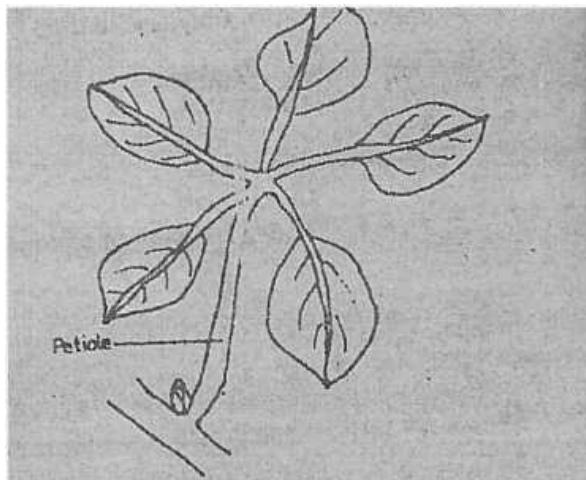
4. The figure below is a cross section of part of a plant.



From which one of the following was the section obtained?

- A. Root of dicotyledonous plant
- B. Stem of monocotyledonous plant
- C. Root of monocotyledonous plant
- D. Stem of dicotyledonous plant.

5. The figure below is a leaf type.



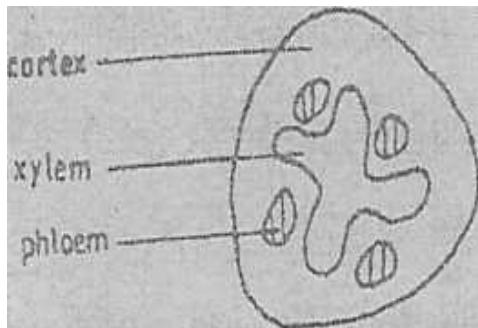
Which type of leaf is shown in the figure above?

- A. Compound bipinnate
- B. Compound trifoliate
- C. Compound pinnate
- D. Compound palmate.

6. Which of the following is a modified root?

- A. Irish potato tuber
- B. Cassava tuber
- C. Rhizome
- D. Corm

7. Which part of a flowering plant is represented in the figure below?

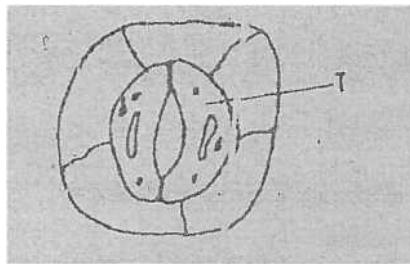


- A. Monocotyledonous stem
- B. Dicotyledonous stem
- C. Monocotyledonous stem
- D. Dicotyledonous stem

8. Which one of the following fruits is an example of a drupe?

- A. Avocado
- B. Tomato
- C. Passion
- D. Orange

9. The figure below shows the structure of a part of the lower epidermis of a leaf



What is the structure labeled T?

- A. Stoma
- C. Chloroplast
- B. Vacuole
- D. Guard cell

10. Which of the following is an example of a berry?

- A. Avocado
- C. passion
- B. Ground nut
- D. Cotton

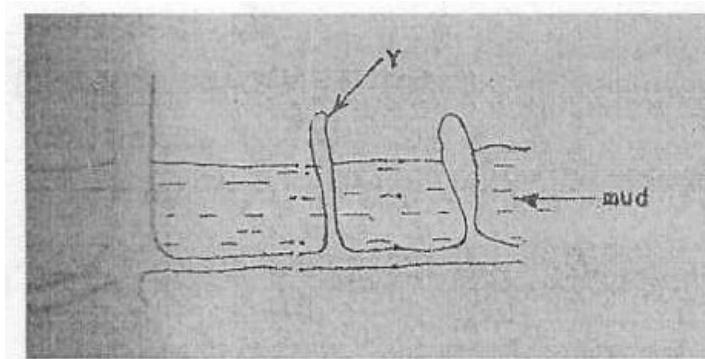
11. A maize grain is both a seed and a fruit because it

- A. Shows hypogeal germination
- B. Has fused pericarp and testa
- C. Shows two attachments or scars
- D. Has both endosperm and cotyledon.

12. Which one of the following is not a primary function of roots?

- A. Conduct water and mineral salts
- B. Anchor the plant into the soil
- C. Store food and water
- D. Absorb water and mineral salts.

13.



The root modification shown by Y is for

- A. Storage
- C. Excretion
- B. Breathing
- D. Extra support.

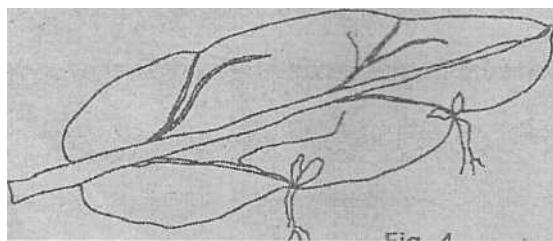
14. Which one of the following is characteristic of monocotyledons?

- A. Leaf sheath
- C. Net venation
- B. Prominent tap root
- D. Cork layer.

15. Which one of the following flower parts is most important in promoting insect pollination?

- A. Calyx
- C. Stamens
- B. Corolla
- D. Pistil.

16. The leaf in the figure below is modified for



- A. Absorption of nutrients
- C. Photosynthesis
- B. Reproduction
- D. Water storage

17. The root which grows from near the base of the trunk of some woody plants is called.

- A. Lateral root
- C. Prop root
- B. Aerial root
- D. Adventitious root.

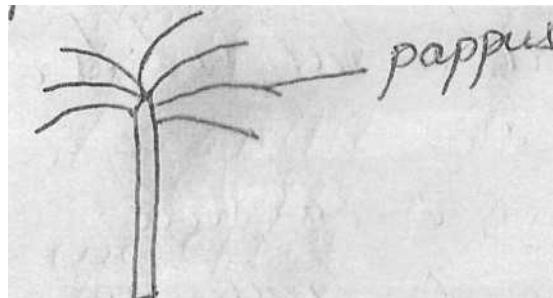
18. Which of the following sets of flower parts do not match?

- A. Sepals and petals together form the perianth
- B. Sepals form the calyx
- C. Petals form the corolla
- D. Carpels form the androecium.

19. Secondary thickening in flowering plants is brought about by division of the

- A. Phloem cells
- C. Cambium cells
- B. Xylem cells
- D. Cortex cells.

20. The increase in girth of woody stems is due to the formation of
- A. Sclerenchyma cells      C. Secondary phloem
  - B. Secondary xylem      D. Secondary cortex
21. Which one of the following plant food storage organs contains most food substances?
- A. Stem tubers      C. Root tubers
  - B. Fruits      D. Seeds
22. Which one of the following is a modified tap root?
- A. Carrot tuber      C. Onion bulb
  - B. Cassava tuber      D. Sweet potato tuber
23. Which one of the following is the least important benefit of seed and fruit dispersal to plants?
- A. Increasing chances of finding better habitat for multiplication
  - B. Avoiding being eaten by animals in its original habitat.
  - C. Reducing competition for food.
  - D. Ensuring colonization of different habitats.
24. The pappus on the fruit in the figure are remains of the



- A. Petals      C. Pericarp
- B. Stamen      D. Calyx

25. Which of the following floral modifications is a means of promoting self pollination?

- A. Protandry
- C. Small closed flowers
- B. Protogyny
- D. Bright colored petals

26. Which one of the following fruits is an example of a drupe?

- A. Avocado
- C. Passion
- B. Tomato
- D. Orange.

27. Which of the following is an example of a modified swollen soft underground stem?

- A. Carrot
- C. Ginger
- B. Sweet potato
- D. Straw berry

28. Which of the following cells in the leaf contain the least number of chloroplasts?

- A. Palisade cells
- C. Guard cells
- B. Epidermal cells
- D. Spongy mesophyll cells

29. The dry fruit which splits open along both sutures is

- A. Follicle
- C. Capsule
- B. Achene
- D. legume.

30. A runner is a

- A. Stem which bends over and roots in the soil
- B. Horizontal stem above the ground which gives roots and aerial shoots at the nodes
- C. Horizontal stem beneath the ground which gives rise to roots and aerial shoots at the nodes
- D. Short vertical stem which buds beneath the soil.

31. Which one of the following is characteristic of monocotyledons?

- A. Leaf sheath
- C. Net venation
- B. Prominent tap root
- D. Cork layer.

32. The following are some characteristics of flowers.

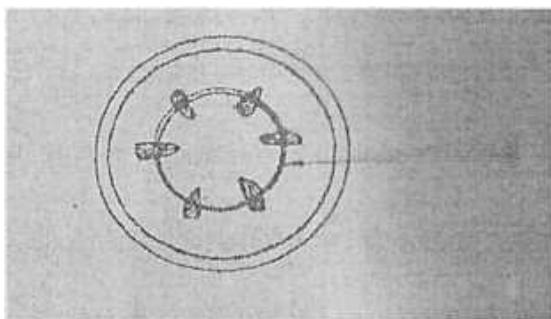
- i) Large feathery stigma
  - ii) Large brightly coloured petals
  - iii) Produce large quantities of pollen grains
  - iv) Flowers are often scented.
- A. (i) and (ii)      C. (i) and (iii)  
B. (iii) and (iv)      D. (ii) and (iv).

33. Which one of the following plants would depend most on wind for its reproduction?

- A plant with.....
- A. Small inconspicuous flowers and light seeds
  - B. Sticky pollen grains and explosive fruits
  - C. Numerous pollen grains and enclosed stigma
  - D. Coloured petals and small hairy fruits.

34. The part marked X in the figure below is

- A. Xylem      C. Phloem
- B. Vascular bundle      D. Cambium



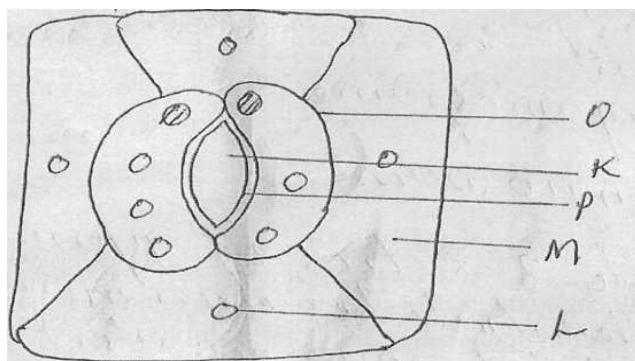
35. Which one of the following is the least important benefit of seed and fruit dispersal?

- A. Increasing chances of finding better habitat for multiplication
- B. Avoiding being eaten by animals in its original habitat
- C. Reducing competition for food resulting from over crowding.
- D. Ensuring colonization of different habitats.

36. Production of many pollen grains is an adaptation for
- A. Cross pollination      C. Insect pollination
  - B. Wind pollination      D. Self pollination
37. Seeds from bean pods are able to be dispersed through explosive mechanism because the pods
- A. Split open when they are dry
  - B. Contain lines of weakness
  - C. Are forced to open due to enlargement of the seeds
  - D. Contain edible seeds
38. Below are mechanisms by plants to promote cross pollination except
- A. Homogamy      C. Protandry
  - B. Protogyny      D. Self sterility.

### Section B

39. a) i) State the differences between cross pollination and self pollination  
ii) Give 3 structural features of flowers that ensure cross pollination  
b) Give five adaptations of flowers for insect pollination.
40. The structures below are seen when examining a strip of lower epidermis of a leaf.



a) Name the parts labeled in the diagram above.

b) State one function of structure

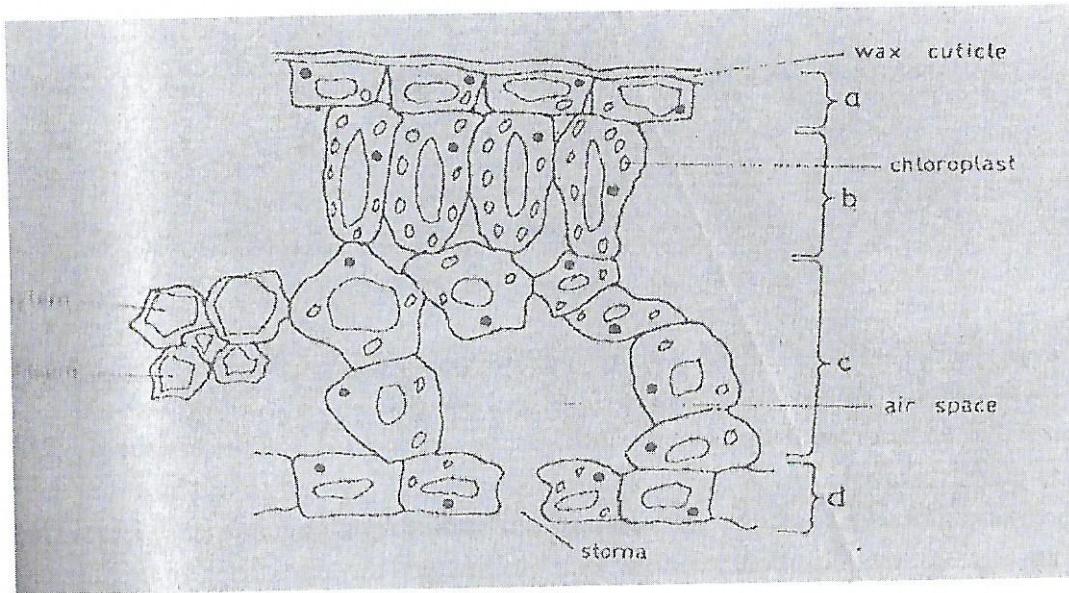
K .....

O .....

L.....

c) Comment on the distribution of structure K on the upper surface of a leaf.

41. Figure below shows an internal structure of a leaf.



a) Label the layers marked a, b, c and d on the diagram

b) Give three differences between layers b and c

c) Using evidence from the diagram, describe how the structure of a leaf is suited for photosynthesis.

d) What is the importance of wax on layer (a)?

42. a) What is seed dispersal?

b) State four importance of seed dispersal.

c) Give four adaptations of seeds and fruits dispersed by animals.

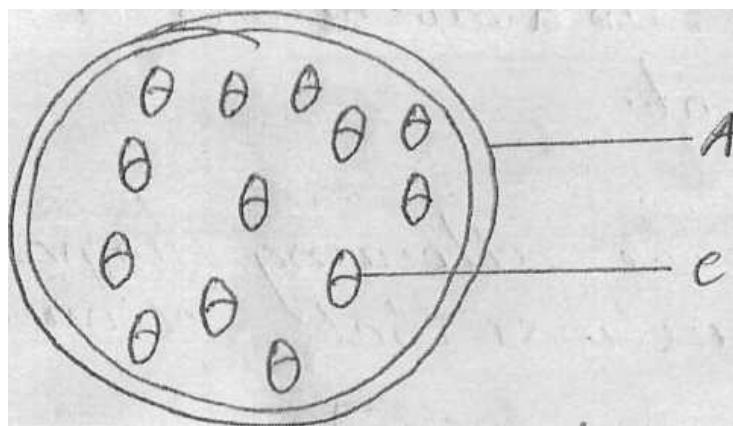
43. a) Giving examples, define the following terms

- i) Gymnosperms
  - ii) Angiosperms
- b) State 3 characteristics of gymnosperms.
- c) i) Differentiate between monocotyledonous and dicotyledonous plants,  
ii) State four characteristics that are common to monocotyledonous plants

44. a) Give the differences between wind pollinated flowers and insect pollinated flowers in each of the following structures.

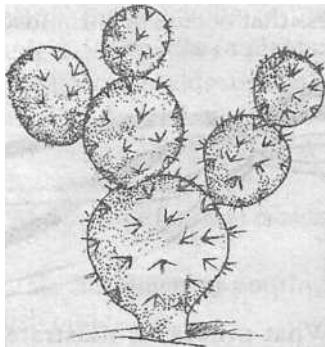
- i) Anthers
  - ii) Pollen grains
  - iii) Stigma
- b) What is the importance of cross pollination?
- c) Explain how a seed is formed after an ovule is fertilized.

45. The diagram below represents a cross section of a part of a certain plant.



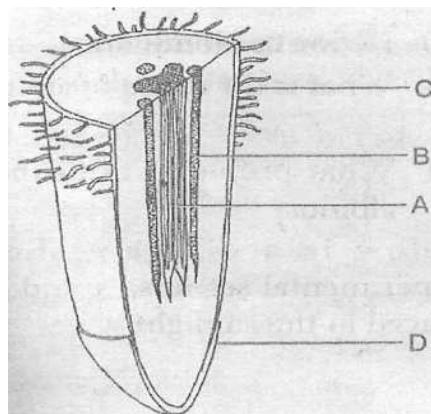
- (a) State the class of the plant from which the section was taken?
- (b) Give a reason for your answer in (a)
- (c) What is the function of the pith in a plant?
- (d) Name the parts labeled A and C.

46. a) state the adaptations of pollen grains in wind pollinated flowers  
b) Observe the diagram below and answer the questions that follow.

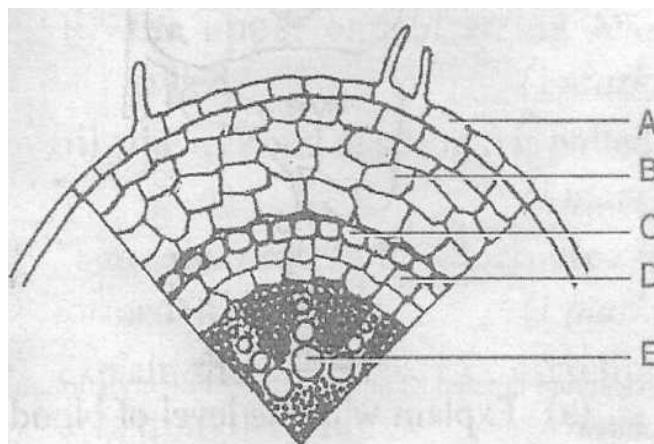


- i) Name the habitat of the plant.
- ii) State two adaptations of the plant to its habitat.

47. Study the following diagram and answer the questions that follow.

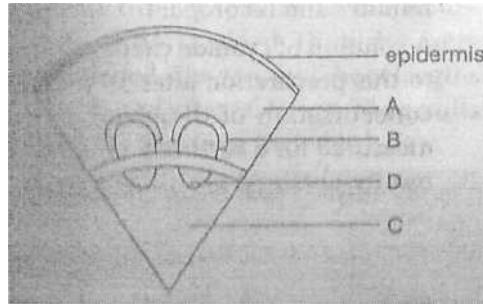


- a) Name the parts labeled A, B and C.
- b) State the function of the part labeled D.
- c) Below is a diagram showing a portion of a transverse section of a root drawn by a form two student as seen under a light microscope.

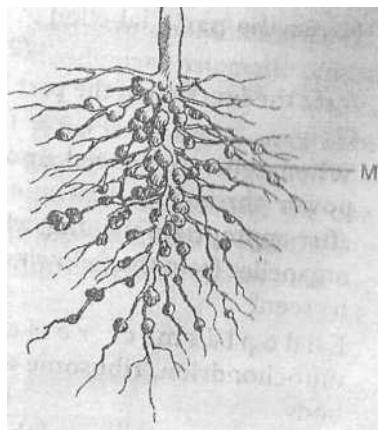


- (i) Giving a reason, name the class of the plant from which the root was obtained.
- (ii) Name the parts labeled A, B and D.
- (iii) State the functions of parts B, C and E

48. a) The diagram below shows a section of a dicotyledonous stem.



- i) Name the tissues marked A, B, C and D
  - ii) State the function of each.
- b) The diagram below represents the roots of a dicotyledonous plant.



- i) Name the structure labeled M and the type of dicotyledonous plants that develop these structures.
- ii) Identify an organism that is found in the structure M.
- iii) Explain the importance of the organism identified in (i) to the plant.
- iv) How does the organism in (ii) above benefit the relationship?
- v) Give an example of another symbiotic relationship.

49. a) with respect to flowers, define the following terms.

- i) Complete flower
- ii) Incomplete flower
- iii) Unisexual flower
- iv) Hermaphroditic flower

b) State the adaptations of flowers to promote

- i) Cross pollination
- ii) Self pollination

(c) Complete the table below by giving an example of a fruit in each case.

Class	Example
Nut	
Legume	
Schizocarp	
Drupe	
Achene	
Follicle	

### Section C

50. a) Draw and label a transverse section of a stem of herbaceous dicotyledonous plant.

b) State the functions of five parts that can be identified in the section.

c) Describe how stems are modified to perform other functions than conducting materials within the plant.

51. Using named examples, describe the methods of fruit and seed dispersal.

52. a) What is meant by the term placentation?

b) With the aid of diagrams, describe the following types of placentation in fruits

- i) Marginal placentation
- ii) Axile placentation
- iii) Free central placentation
- iv) Pariental placentation.

53. a) what is seed and fruit dispersal?
- b) Describe how seeds and fruits are adapted to their different methods of dispersal.
54. a) list any 3 structural differences between a stem and a root.
- b) What are the main functions of a stem?
- c) What adaptations of stems enable them to serve additional functions?

**Soil**  
**SECTION A**

1. Which one of the following farming practices does not promote soil fertility?  
A. Strip cropping                  B. Monoculture  
C. Crop rotation                  D. Mulching
  
2. Which one of the following stores CO<sub>2</sub> for a long term, in the carbon cycle?  
A. Living animals                  B. Fossils  
C. Dead plants                  D. Living plants
  
3. When 80cm<sup>3</sup> of water was added to 100cm<sup>3</sup> of soil, the volume of the mixture was 140cm<sup>3</sup>. What was the percentage of air in the soil?  
A. 20%                  B. 40%  
C. 60%                  D. 80%
  
4. Beans are usually included in crop rotation cycle because they.  
A. Act as cover crops.  
B. Improve water retention of the soil.  
C. Increase humus content in the soil.  
D. Restore nitrogen in the soil.
  
5. Which one of the following organisms improves aeration and damage of soil?  
A. Fungi                  B. Snails  
C. Bacteria                  D. Termites
  
6. Which one of the following is least important function of humus in the soil?  
A. Improving soil aeration.  
B. Prevention of soil aeration.  
C. Water retention.  
D. Increasing soil fertility.

7. Addition of humus to sandy soil would
- A. Decrease the capillarity of the soil.
  - B. Increase the aeration of the soil.
  - C. Decrease the mineral content of the soil.
  - D. Improve the water retention capacity of the soil.
8. Which of the following farming practices would control soil erosion?
- A. Application of artificial fertilizers.
  - B. Addition of compost manure.
  - C. Terracing.
  - D. Mixed farming.
9. Which one of the following increases the amount of nitrogen in the atmosphere?
- A. Excretion.
  - B. Action of fungi on dead organic matter.
  - C. Action of nitrifying bacteria.
  - D. Action of denitrifying bacteria.
10. While analyzing a soil sample, the following results were obtained
- |                               |   |                     |
|-------------------------------|---|---------------------|
| Sand                          | = | 200 cm <sup>3</sup> |
| Water                         | = | 300 cm <sup>3</sup> |
| Water and sand after stirring | = | 450 cm <sup>3</sup> |
- What was the percentage of air in the sand?
- A. 10%
  - B. 20%
  - C. 25%
  - D. 30%
11. The following are sizes of different soil particles in millimeters.
- |   |   |            |
|---|---|------------|
| P | = | 2.0-0.02   |
| Q | = | 0.2 - 0.02 |

$$R = 0.02 - 0.002$$

$$S = \text{less than } 0.002$$

In which of the following soil particles would you expect the rise of water by capillarity to the highest?

- A. P              B. Q              C. R              D. S

12. Which of the following are characteristics of sandy soil?

- A. Poor aeration and poor drainage.
- B. Good water retention and poor drainage.
- C. Sticky when wet and poor drainage.
- D. Good aeration and good drainage.

13. The results of an experiment to determine the percentage of water in a sample of soil are shown below.

$$\text{Mass of crucible} = 15\text{g}$$

$$\text{Mass of crucible plus soil} = 30\text{g}$$

$$\text{Mass of crucible plus after drying} = 25\text{g}$$

What is the percentage of water?

- A. 33.3%
- B. 18.7%
- C. 66.7%
- D. 20.0%

14. Which one of these methods is not important in the maintenance of soil fertility on a given piece of land?

- A. Practicing crop rotation.
- B. Addition of organic manure.
- C. Maintaining of vegetation cover.
- D. Burning of the grass in the plot regularly.

15. Which one of the following soil types has the highest capillarity?

- A. Silt
- B. Loam
- C. Clay
- D. Sand

16. Which type of soil has the following properties?

- i) Heavy to cultivate
  - ii) High water retention.
  - iii) High capillarity
- 
- A. Sandy loam
  - B. Loam
  - C. Sand
  - D. Clay

17. The best method that prevents the start of gully erosion on a cultivated hill is

- A. Contour cultivation
- B. Strip cropping
- C. Tree belts
- D. Mulching

18. The type of soil with minute air spaces and high water retention capacity is

- A. Sand
- B. Clay
- C. Silt
- D. Loam

19. Which one of the following farming methods would cause pollution in an aquatic habitat?

- A. Mulching.
- B. Use of fertilizers.
- C. Crop rotation.
- D. Application of farm yard manure.

20. Which of the following represents the diameter of a silt particle?

- A. 2-0.2mm.
- B. 0.2-0.02mm
- C. 0.02-0.002mm
- D. Less than 0.002mm

21. A student heated strongly a dry sample of soil to a constant mass. The loss of mass in the soil is due to;
- A. Loss of mineral salts.
  - B. Loss of water.
  - C. Escape of air.
  - D. Destruction of humus.
22. The addition of humus to sandy soil will;
- A. Decrease the capillarity of the soil.
  - B. Improve the water retention of the soil.
  - C. Increase the aeration of the soil.
  - D. Decrease its mineral content.
23. Which of the following will prevent soil erosion?
- A. Regular hoeing.
  - B. Growth of grass plants.
  - C. Addition of fertilizer.
  - D. Ploughing down the slope.
24. Which one of the following types of bacterial causes the conversion of ammonia into nitrites?
- A. Nitrifying bacteria.
  - B. Denitrifying bacteria.
  - C. Putrefying bacteria.
  - D. Nitrogen Fixing Bacteria.
25. Which one of the following best describes the practice of green manuring?
- A. Spreading of rotten, kitchen refuse, weeds, grass cuttings and dead leaves over a garden.
  - B. Use of animal droppings to fertilize gardens.
  - C. Digging live green plants back into the soil.

D. Addition of artificial fertilizers to the soil.

26. The following shows hypothetical results from an experiment to determine the water and humus content of a garden soil.

- Weight of a crucible = Pg
- Weight of crucible + soil = Qg
- Weight of crucible + soil after drying to constant weight = Rg
- Weight of crucible + soil after heating to red hot = Sg

Which one of the following expressions gives the percentage of the humus content of the soil?

- A.  $\frac{R-P}{S-P} \times 100\%$       B.  $\frac{R-P}{Q-P} \times 100\%$   
C.  $\frac{R-S}{Q-P} \times 100\%$       D.  $\frac{R-S}{Q-S} \times 100\%$

27. A soil sample with marked colloidal properties swells in water and shrinks when dry, and has a high content of moisture is likely to be

- A. Silt      B. Sandy soil  
C. Clay soil      D. Loamy soil

28. A sample of soil poured into a measuring cylinder containing water and the mixture stirred. The readings taken were as follows:

- Volume of water in the measuring cylinder =  $215 \text{ cm}^3$   
Volume of water + soil =  $260 \text{ cm}^3$   
Volume of water + soil after stirring =  $250 \text{ cm}^3$

What was the percentage of air in the soil?

- A. 10      B. 22      C. 35      D. 45

29. Beans are usually included in crop rotation cycle because they

- A. Act as cover crops.  
B. Only one member benefits.

- C. Both members suffer harm.
- D. Neither member is harmed.

30. How does temperature cause physical weathering?
- A. By destroying rocks.
  - B. By decomposing rocks.
  - C. By burning rocks.
  - D. By exposing the rocks during the day, the rock break as they suddenly cool during the night.
31. Which of the following bacteria is responsible for the break down of the proteins of dead organisms and their excretory matter into ammonium compounds?
- A. Putrefying bacteria
  - B. Denitrifying bacteria
  - C. Nitrifying bacteria
  - D. Nitrobacter
32. Which of the following is the best advantage of crop rotation?
- A. Reduces soil erosion.
  - B. The growth of weeds is brought under control.
  - C. It prevents exhaustion of particular mineral salts from the soil.
  - D. It improves soil conditions.
33. Which one of the following can be applied so as to reduce the acidity of a soil?
- |                      |            |
|----------------------|------------|
| A. Ammonium compound | B. Nitrate |
| C. Phosphate         | D. Lime    |
34. A student heated strongly a dry sample of soil to a constant mass. The loss of mass in the soil is due to;
- A. Loss of mineral salts.
  - B. Loss of water.

- C. Escape of air.  
D. Destruction of humus.
35. The least effective environmental factor in soil formation is  
A. wind                    B. heat  
C. water                   D. light
36. Clay soil is usually water logged due to;  
A. Too much water.  
B. Poor drainage.  
C. Small pores.  
D. A higher force of capillarity.
37. 300cm<sup>3</sup> of water was added to 260 cm of soil and stirred. The resultant mixture was 840cm<sup>3</sup>. The percentage of air in the soil was.....%.  
A. 16.7                    B. 26.7  
C. 30.8                   D. 54.2
38. To which one of the following does humus contribute least in the soil?  
A. Improving aeration.  
B. Reducing soil erosion.  
C. Improving water retention.  
D. Increasing soil fertility.
39. A sample of soil previously dried in an oven was heated to red hot until smoke stopped loaming out. What was the percentage of humus in the soil sample; if the weight of the dry soil was =  $\alpha$  and the weight of strongly heated was =  $b$ ?  
A.  $\frac{b}{\alpha+b} \times 100$                     B.  $\frac{\alpha}{b+\alpha} \times 100$   
B.  $\frac{\alpha-b}{\alpha} \times 100$                     D.  $\frac{b-\alpha}{\alpha} \times 100$

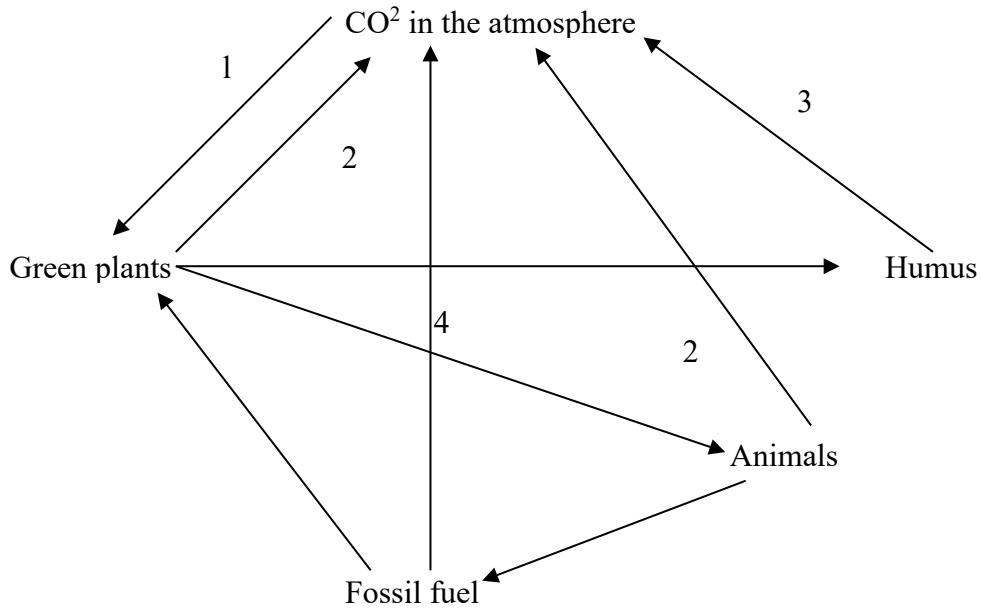
40. Extended fallow system practiced by farmers is to ensure that;

- A. More nitrogen is fixed in the soil.
- B. Soil erosion is controlled.
- C. Land is available for the next planting season.
- D. Better yields are realized in the piece of land.

## SECTION B

41. a) What is soil erosion?  
b) Name four types of soil erosion.  
c) State the causes of soil erosion.  
d) How does mulching help the farmer in  
i) Water conservation?  
ii) Soil conservation?

42. a) The diagram represents the carbon cycle.



- i) Name the processes labeled 1, 2, 3 and 4.  
ii) Explain concisely how CO<sub>2</sub> entering a palisade cell in the leaf of a green plant becomes part of a glucose molecule.  
iii) Name two groups of organism that play a major role in process 3.  
iv) Where does the process in (iii) above normally occur?  
v) Name one fossil fuel.

43. a) What is meant by the nitrogen cycle?

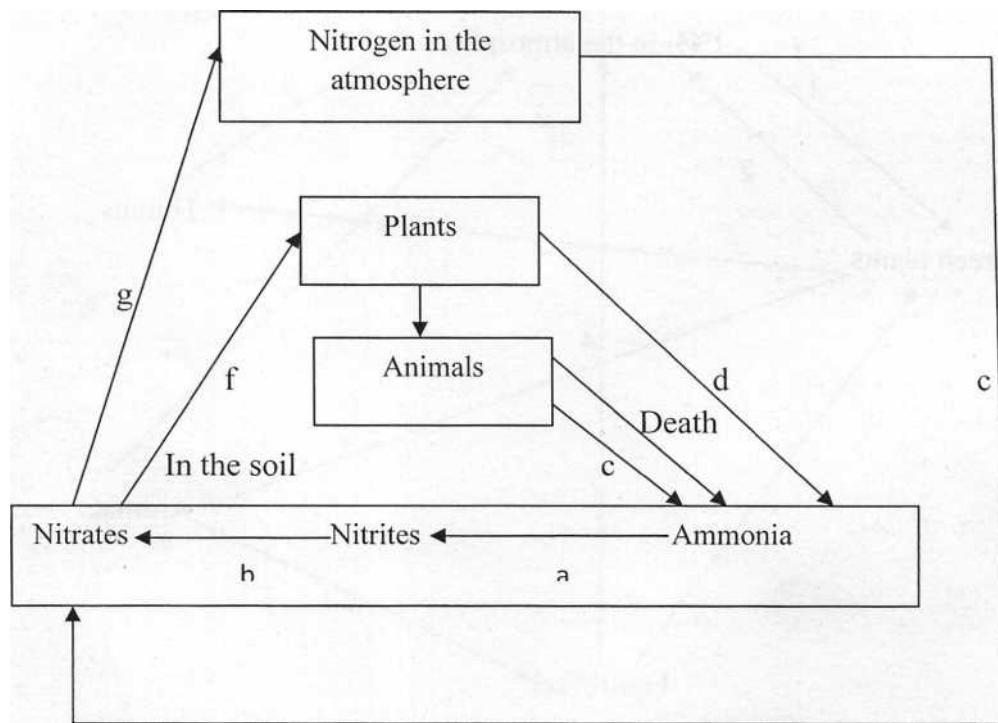
b) Name two processes by which nitrogen is

- i) Added to the atmosphere.
- ii) removed from the atmosphere

c) Write short notes on the following:

- i) Leaching.
- ii) Soil exhaustion.
- iii) Crop rotation.

44. The diagram below shows the nitrogen cycle. Use it to answer the questions that follow.



a) Name the processes labeled

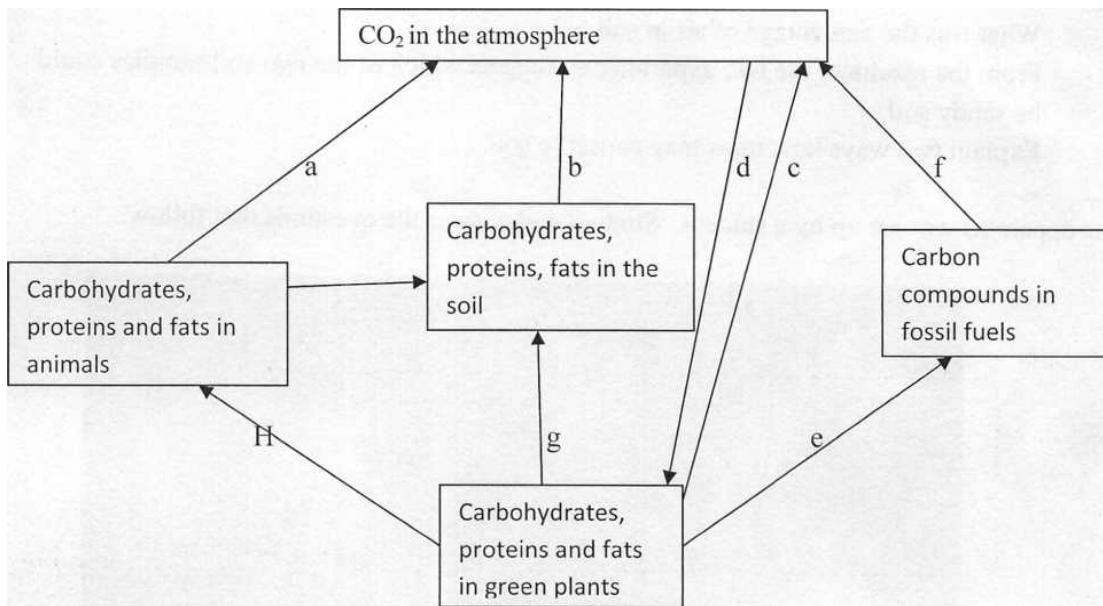
- i) a and b
- ii) c.
- iii) d.
- iv) e.

b) Suggest the names of the organisms which bring about the processes below.

- i) a
- ii) b
- iii) c
- iv) e
- v) g

- c) In what form is nitrogen in animals?
- d) How does the nitrogen in plants move to animals?

45. Figure below represents the carbon cycle.



- a) Name the processes labeled a, c, f and g.

a) ..... f) .....

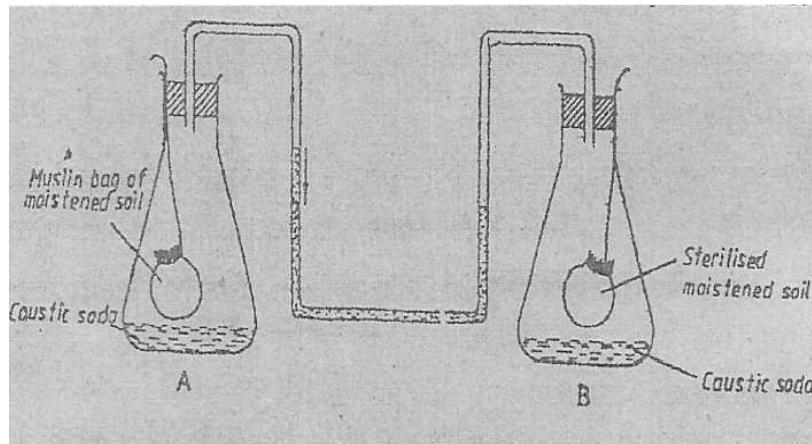
c) ..... g) .....

State one physical factor that promotes process b.

- b) Give two uses of process d to animals.
- c) Describe one way in which process e may be harmful.
- d) i) Suggest one human activity that tends to lower the level of CO<sub>2</sub> in the atmosphere.  
ii) Explain how the activity suggested in (e)i) lowers the level of CO<sub>2</sub> in the atmosphere.

- e) i) Name two groups of organisms that play a major role in process b.  
ii) Where does the process in f(i) above normally occur?  
iii) Name one fossil fuel.
46. A tin of volume 100 cm was completely filled with a certain kind of soil, X. the soil was emptied (while stirring) into a measuring cylinder of water raising the level of water from  $400\text{cm}^3$  mark to the  $480\text{cm}^3$  mark.
- a) i) Why did the level not rise to the 500 cm mark?  
ii) What was the percentage of air in soil X?
- b) The above experiment was repeated with a difference of soil Y. This time the water level after stirring was  $460\text{cm}^3$ .
- i) What was the percentage of air in soil Y?  
ii) From the results of the two experiments, suggest which of the two soil samples could be sandy soil.  
iii) Explain two ways how trees may conserve soil.

47. The apparatus was set up by a student. Study it and answer the questions that follow.



- a) i) What was the student investigating in this experiment?  
ii) Which of the flasks acted as a control?
- b) What is the use of caustic soda solution in flasks A and B?
- c) What would you observe if the experiment is left to continue for a few days? Explain your observation.

## **SECTION B**

48. a) What are the constituents of fertile soil?

- b) In what ways may human activities
  - i) Improve soil?
  - ii) degrade soil?

49. a) Explain the value of earthworms in maintaining the soil in a condition suitable for crop growth?

b) How does clay affect the fertility of soil?

50. a) Distinguish between the characteristics of loam and clay soil.

b) What are the roles of invertebrates in soil improvement?

51. a) Outline the importance of humus in the soil.

b) Describe an experiment you would perform to determine the amount of humus in a soil sample.

52. Describe an experiment to determine the percentage of air in a soil sample.

53. a) State four ways through which soil organisms contribute to soil fertility.

b) Describe the nitrogen cycle in nature. Your answer should include:

- i) Reduction of complex compounds in the soil to nitrates.
- ii) Fixation of atmospheric nitrogen from air.
- iii) Removal of nitrogen from the soil.

**END**

**Nutrition**  
**SECTION A**

1. Which one of the following secretions does not play a digestive role in the alimentary canal?  
A. Pepsin                    B. Trypsin  
C. Rennin                    D. Lipase
  
2. Which one of the following blood vessels has the highest level of nutrients  
A. Mesenteric artery  
B. Hepatic portal vein  
C. Renal artery  
D. Hepatic vein
  
3. Which one of the following enzymes acts in the duodenum and ileum?  
A. Lipase  
B. Peptidase  
C. Maltase  
D. Sucrose
  
4. Which one of the following is not an adaptation of a leaf for absorption of carbon dioxide?  
A. Its exposure in air.  
B. Presence of air spaces in the mesophyll layer.  
C. Its being thin.  
D. Presence of chloroplasts.
  
5. When testing for starch in a leaf, it is boiled in alcohol in order to;  
A. Kill the protoplasm.  
B. Make it permeable to iodine.  
C. Remove the chlorophyll.

- D. Make it soft.
6. Which one of the following are end products of cane sugar?
- A. Sucrose and maltose.
  - B. Glucose and fructose.
  - C. Maltose and galactose.
  - D. Fructose and galactose.
7. Which one of the following sets of characteristics of leaves enables them to absorb maximum sunlight?
- A. Broad lamina, tightly packed palisade cells.
  - B. Being thin, possession of numerous stomata.
  - C. Possession of numerous stomata, waxy cuticle.
  - D. Being thin, large intercellular spaces.
8. Which one of the following is correct about nutrition in Rhizopus?
- A. Digestion of food occurs outside the organism.
  - B. It makes its own food.
  - C. Digestion of food is intracellular.
  - D. It does not produce enzymes.
9. Controlled feeding on food rich in vitamin A may improve
- A. calcium deposition                    B. number of red blood cells
  - C. night vision                            D. healing of wounds
10. Which one of the following monosaccharides make up sucrose?
- A. Galactose and fructose              B. Galactose and glucose
  - C. Fructose and glucose                D. Two glucose molecules

11. Green plants give out less carbon dioxide during day than at night because during the day;
- The rate of photosynthesis is low.
  - Transpiration interferes with escape of carbon dioxide.
  - Most stomata close.
  - Some of the carbon dioxide produced is used for photosynthesis.
12. When milk is the main food in the diet of a child, it should be supplemented with food rich in
- Iron
  - Calcium
  - Sugar
  - Vitamin D
13. Which one of the following pairs of organs is important in the digestion of fats?
- Stomach and liver
  - Pancreas and stomach
  - Liver and pancreas
  - Stomach and mouth
14. A farmer grew beans and noticed that the leaves turned yellow but the veins remained green. The minerals likely to be deficient in the soil are:
- Magnesium and iron
  - Potassium and manganese
  - Calcium and potassium
  - Zinc and calcium
15. In which two parts of the alimentary canal is starch digested?
- Small intestines and mouth.
  - Mouth and duodenum.
  - Duodenum and starch.
  - Mouth and stomach.
16. Lack of iodine in the human diet causes
- Anaemia
  - Scurvy
  - Goitre
  - Rickets

17. Which one of the following parts of a tooth contains living tissue?
- A. Cement
  - B. Enamel
  - C. Pulp cavity
  - D. Dentine
18. The role of rennin in children during digestion is;
- A. Breaking down milk into peptides.
  - B. Mixing the milk protein with digestive enzyme.
  - C. Activating pepsin to digest the milk protein
  - D. Coagulating milk protein.
19. Which one of the following is not a function of the liver?
- A. Regulation of blood sugar.
  - B. Production of insulin.
  - C. Formation of bile.
  - D. Storage of iron.
20. When preparing to test for starch in a leaf, the leaf is boiled in alcohol in order to;
- A. Bust chloroplasts.
  - B. Remove coloured materials in the leaf.
  - C. Quicken the reaction of starch with iodine.
  - D. Soften the leaf.
21. Enzymes differ from catalysts because enzymes;
- A. Are required in small amounts.
  - B. Respond to temperature changes.
  - C. Are protein in nature.
  - D. Speed up reactions.

22. Which one of the following dental formulae is that of a sheep?

- A.  $1\frac{0}{2}$        $C\frac{0}{0}$        $Pm\frac{3}{3}$        $M\frac{3}{3}$
- B.  $1\frac{0}{2}$        $Pm\frac{2}{2}$        $M\frac{3}{3}$
- C.  $1\frac{3}{3}$        $C\frac{0}{0}$        $Pm\frac{3}{3}$        $M\frac{2}{2}$
- D.  $1\frac{2}{2}$        $C\frac{1}{1}$        $Pm\frac{2}{2}$        $M\frac{3}{3}$

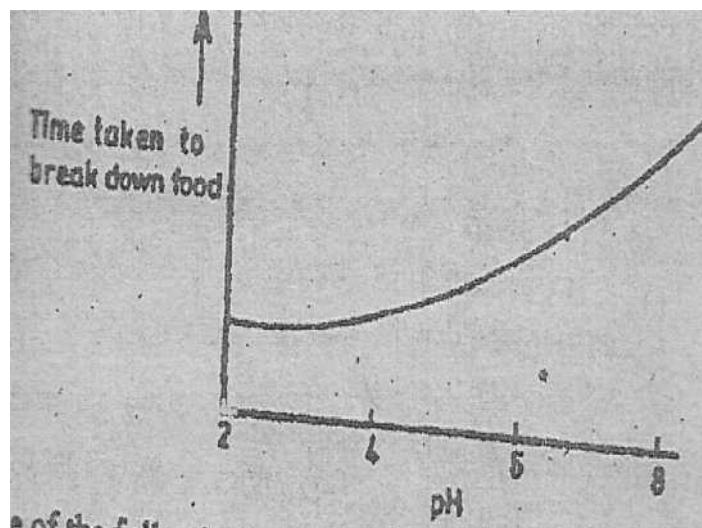
23. Student plant growth, cream yellow leaves and poor fruit development is caused by;

- A. Nitrogen and potassium.
- B. Nitrogen and phosphorous.
- C. Potassium and iron.
- D. Nitrogen and iron.

24. Which of the following are the end products of lactose?

- A. Glucose and sucrose
- B. Glucose and galactose
- C. Glucose and fructose
- D. Fructose and galactose

25. The graph below shows the effect of varying PH on the time taken for an enzyme to break down food.



Which one of the following enzymes below could have given that response?

- A. Pepsin
- B. Lipase
- C. Salivary amylase
- D. Trypsin

26. To identify a substance Y, a student performed the following experiment.

Test	Observation
i) Heated Y with Benedict's solution.	Solution remained blue.
ii) Heated Y with hydrochloric acid, cooled, added sodium hydrogen carbonate, Benedict's solution, then heated again.	Solution turned from blue to orange.

From the observations, the most likely food substance in Y is

- A. starch
- B. sucrose
- C. maltose
- D. glucose

27. Which one of the following would be observed in a plant growing in a soil lacking magnesium?

- A. Poorly developed shoot system.
- B. Yellowing of leaves.
- C. Poorly developed root system.
- D. Yellowing of buds.

28. Which one of the following sets consists of substances that are stored in the liver?

- A. Glucose, iron and vitamin D.
- B. Iron, glycogen and vitamin D.
- C. Glucose, glycogen and vitamin D.
- D. Iron, glycogen and amino acids.

29. The following are body secretions.

- i) Amylase
- ii) Trypsin
- iii) Hydrochloric acid
- iv) Pepsin
- v) Rennin

Which of them are contained in gastric juice?

- A. i) and iii)
- B. ii) and iv)
- C. iii) and v)
- D. i) and ii)

30. The mode of feeding displayed by mucor is describe as

- A. holozoic
- B. parasitic
- C. filter feeding
- D. saprophytic

31. Which one of the following organisms carries out intracellular digestion?

- A. Fungi
- B. Algae
- C. Amoeba
- D. Hook worm

32. A plant with poorly developed roots is likely to be growing in a soil that is deficient in

- A. sulphur
- B. phosphorous
- C. magnesium
- D. iron

33. What would happen to an enzyme if the temperature of the medium was increased to above 50°C? The enzyme would be

- A. killed
- B. activated
- C. denatured
- D. inactivated

34. Yellowing of leaves in growing maize plants indicates a deficiency of

- A. calcium
- B. sulphur
- C. nitrogen
- D. magnesium

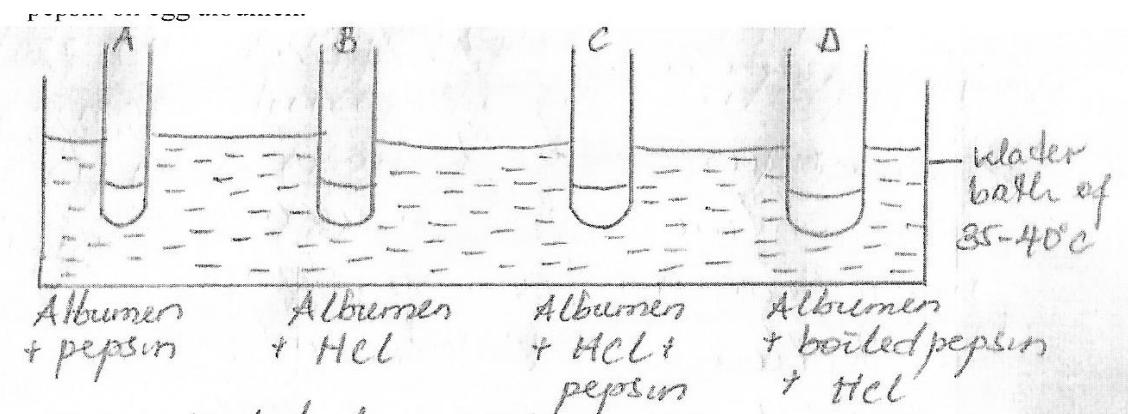
35. A rabbit is able to utilize cellulose because it;

- A. Has symbiotic bacteria in the stomach.
- B. Has symbiotic bacteria in caecum.
- C. Has a very long alimentary canal.
- D. Secretes the enzyme cellulase.

36. Which one of the following factors is not important as far as nutrition of the common bread mould is concerned?

- A. It produces large quantities of spores.
- B. It can respire aerobically.
- C. It has a highly branched mycelium.
- D. It secretes enzymes.

37. The figure below shows an experimental set up used to investigate the action of enzyme pepsin on egg albumen.



In which test tube will the contents clear off after some time?

- A.A
- B.B
- C.C
- D.D

38. The milk teeth in humans consist of;

- A. Incisors only.
- B. Incisors and canines
- C. Incisors, canines and premolars.
- D. Incisors and premolars.

39. Which one of the following food substances are not changed by the gut enzymes?

- A. Lipids and vitamins.
- B. Minerals and disaccharides.
- C. Minerals and vitamins.
- D. Lipids and lactose.

40. Which one of the following organisms is not a heterotroph?

- A. Mushroom      B. Alga  
C. Tick            D. Grass hopper

41. What would result if secretion of gastric juice were inhibited in an individual?

- A. The person would suffer from heart burn.  
B. The person would suffer from constipation.  
C. Digestion would not take place.  
D. Digestion of certain food types would be delayed.

## SECTION B

42. a) What is an enzyme?

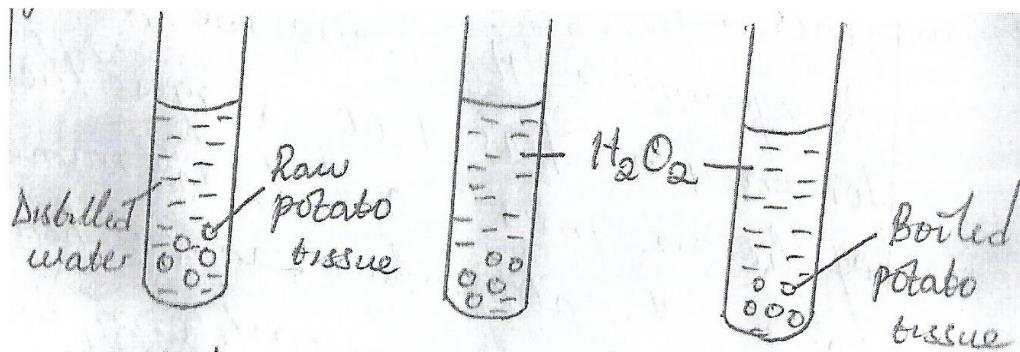
- b) State three factors which affect enzyme action.  
c) The optimum PH for enzyme X is 2.00 and enzyme Y is 9.00. Suggest the names of the enzymes X and Y, and name the parts of the alimentary canal where you would expect to find each enzyme.

	Name of enzyme	Part of alimentary canal the enzyme is found
X		
Y		

d) State two enzymes contained in the pancreatic juice, the food substances acted on by each enzyme and the product formed in each case.

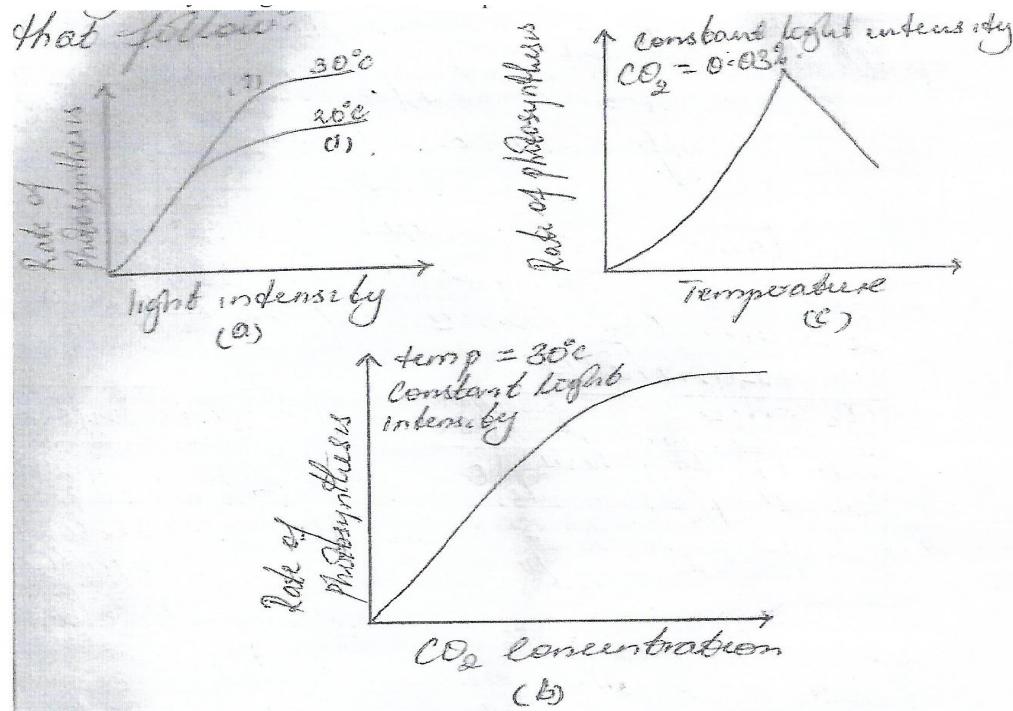
Enzyme	Food substance acted upon	Product formed
(i).....		
(ii).....		

43. Study the experimental set up in figure below and answer the questions that follow.



- i) What is being investigated?
- ii) Suggest what was observed in each of the test tubes?
- iii) Explain the observations suggested in b(ii) above.

44. Figure (a), (b) and (c) show the variation of rate of photosynthesis under different conditions. Study the figure and answer the questions that follow



- a) i) Describe the shape of curve 1 in figure (a).
- ii) Giving a reason, state why the rate of photosynthesis in curve 1 of figure (a) remains constant at some stage.
- b) Giving a reason state two factors which might be the cause of a constant rate of photosynthesis in figure (b).
- c) Describe the shape of the curve in figure (c).
- d) i) From figures (a), (b) and (c), state factors that affect the rate of photosynthesis,
- ii) Explain how each of the factors states in d(i) affect the rate of photosynthesis.

45. The table below shows some data from an experiment to investigate the relationship between CO<sub>2</sub>? concentration and the rate of photosynthesis.

CO <sub>2</sub> concentration % by volume in air	0.0	0.02	0.04	0.06	0.08	0.010	0.12	0.14	0.16	0.018	0.19	0.20
Rate of photosynthesis (Bubbles of O <sub>2</sub> per minute)	0	10	14	18	20	21	23	24	24	24	24	24

- a) i) Draw a graph to show the relationship between carbon dioxide concentration and the rate of photosynthesis.
- ii) State the carbon dioxide concentration at which oxygen does not affect the rate of photosynthesis.
- iii) What was the optimum carbon dioxide found in the experiment?
- b) State three factors other than carbon dioxide which can limit the rate of photosynthesis.

c) Describe how the following processes are achieved during the testing of a leaf for starch.

- i) Decolourising the leaf.
- ii) Killing the protoplasm.

46. An experiment was carried out to investigate the effect of temperature on the activity of enzyme catalase. The results are shown in the table below.

Temperature °C	0	15	25	35	45	55	65	75
Time taken to evolve 10cm <sup>3</sup> of O <sub>2</sub> (S)	0	40	20	05	20	40	125	0
Rate of oxygen cm <sup>3</sup> S <sup>-1</sup>	0							

- a) i) Complete the table by calculating the rate of oxygen released.  
ii) Using the information in the table, plot a graph to show the relationship between temperature and rate of reaction of catalase enzyme.
  
- b) i) Describe the shape of the graph.  
ii) Explain the shape of the graph.  
iii) State other factors that may affect the activity of catalase apart from that investigated.
- c) Suggest the:
  - i) Role of catalase in the body.
  - ii) Importance of oxygen in living tissues.

47. The table below shows the effect of temperature on the rate of carbon dioxide absorption and carbon dioxide release during the day by a green plant. Study the information given and answer the questions that follow.

Temperature (°C)	7	10	20	30	38	44	50
Rate of CO <sub>2</sub> absorption	1.2	1.3	1.7	2.9	3.9	2.6	1.6
Rate of CO <sub>2</sub> release	0.3	0.7	1.3	2.2	2.8	2.5	2.1

- a) Plot a graph of rate of CO<sub>2</sub> absorption and release against temperature.
- b) Describe the effect of temperature on the rate of CO<sub>2</sub> absorption.

- c) Explain the reduction in the rate of CO<sub>2</sub> absorption between 38°C and 50°C.
- d) i) At what temperature is the compensation point?
- ii) Describe what happens at that point.
- iii) Name the process and structure in the plant in which each of the above occurs.
48. An experiment was set up to investigate the effect of light on the rate of photosynthesis in the shoot of a water weed. The shoot was immersed in a 2% sodium hydrogen carbonate solution. The gas given off by the shoot was collected for 5 minutes at different light intensities and the volume measured. The results obtained are shown in the table below.

<b>Light intensity (arbitrary units)</b>	<b>Gas collected (cm<sup>3</sup> / 5 minutes)</b>
1	0.35
2	0.60
3	0.85
5	1.20
10	1.55
20	1.70
30	1.80
40	1.79
50	1.79

- a) Using the data given in the table, plot a graph of the volume of the gas collected against light intensity.
- b) Account for the rate of gas production in the following intervals of light intensity.
- i) 1 - 50.
- ii) 30 - 50.
- c) What is the use of sodium hydrogen carbonate in this experiment?
- d) Write a word equation for the process of photosynthesis?
- e) State the products of the light stage of photosynthesis.
- f) Other than light intensity, name two other factors that affect the rate of photosynthesis.

49. a) In an experiment to investigate the rate of enzyme activity, three extracts of fresh plant materials were mixed with a fixed concentration of hydrogen peroxide solution in 10ml measuring cylinders, labeled 1, 2 and 3. The volume of the mixtures including froth (foam) were read and recorded every 20 seconds for 60 seconds.

The results obtained are as shown in the table below.

The potato cylinders were allowed to stand in the sucrose solutions for half an hour (30 minutes); after which they were removed and re-measured.

The results obtained are shown in the table 1 below.

Time (s)	Volume of mixture with extract 1 (cm <sup>3</sup> )	Volume of mixture with extract 2(cm <sup>3</sup> )	Volume of mixture with extract 3 (cm <sup>3</sup> )
0	5.0	5.0	5.0
20	5.2	5.3	5.4
40	5.4	5.6	6.0
60	5.6	6.0	9.2

On the same axes, plot graphs on the graph paper provided for the volume of mixtures 1, 2, 3 (on the y axis) with time (on the x-axis).

b) Using your graph calculate the rate of reaction  $\left[ \frac{\text{Change in volume}}{\text{Change in time}} \right]$  in cm<sup>3</sup> per second between 20 and 40 seconds for the reaction with each extract.

- i) Rate with extract 1.
  - ii) Rate with extract 2.
  - iii) Rate with extract 3.
- 
- c) Explain the results for the rate of reaction in (b) above.
  - d) Besides the factor being investigated in the experiment state any three other factors that may affect an enzyme activity.
  - e) Suggest the identity of the enzyme whose action has been investigated in the above experiment.

## SECTION C

50. a) What is the importance of bile in digestion?  
b) How does the body  
i) regulate the level of glucose in the blood?  
ii) deal with amino acids?
51. a) Give three characteristics of enzymes.  
b) Describe an experiment to show that enzyme activity is affected by temperature.
52. Describe an experiment that you would carry out in the laboratory to test for the presence of a non - reducing (complex) sugar in a solution of a food sample. In your description, state the use of each reagent used.
53. a) Describe the digestion of proteins in a mammal.  
b) Explain how the ileum is suited for its functions.
54. Describe an experiment to show that carbon dioxide is necessary for photosynthesis.
55. a) Describe an experiment to show that oxygen is produced during photosynthesis,  
b) What are the adaptations of a foliage leaf to its function?
56. a) Describe what happens to a piece of cooked cassava from the time it is eaten up to when it is absorbed into the blood stream of a human being.  
b) Draw a well labeled longitudinal section through a villus.  
c) How is the ileum adapted to its functions?
57. a) Define digestion.  
b) Describe the digestion of starch in man.
58. a) Describe the digestion of the main nutrients in milk.  
b) How may the products of digestion in (a) above be utilized in the body?

- c) Suggest what digestive problems a person with a damaged pancreas would have.
59. The small intestine performs two functions; completing digestion and absorption of digested food. Explain how the two functions are achieved by the small intestine.
60. a) Describe an experiment to show that a leaf exposed to light manufactures starch for the plant.
- c) State the modifications of leaves for any other functions.

**END**

**Transport**  
**SECTION A**

1. Which one of the following organisms has the largest surface area to volume ratio?
  - A. Dog
  - B. Frog
  - C. Cockroach
  - D. Amoeba
  
2. In comparison with the blood flowing through the vena cava, the blood flowing through the aorta has:
  - A. Less carbon dioxide, more oxygen and higher pressure.
  - B. More oxygen, more carbon dioxide and lower pressure.
  - C. More carbon dioxide, less oxygen and higher pressure.
  - D. Less carbon dioxide, less oxygen and lower pressure.
  
3. People living at high altitudes have more red blood cells than those at lower altitudes in order to:
  - A. Breath more quickly.
  - B. Keep the body warm.
  - C. Pump more blood.
  - D. Absorb enough oxygen.
  
4. Which one of the following would happen to plasmolysed cells of a plant tissue that has been placed in water for some time?
  - A. Their cell vacuoles would shrink.
  - B. They would not experience any change in size.
  - C. They would increase in volume.
  - D. They would become shorter.

5. By which one of the following processes does carbon dioxide leave the blood capillaries into the alveoli?
- A. Osmosis              B. Active transport  
C. Diffusion              D. Capillarity
6. Which of the following conditions increase the rate of transpiration?
- A. High temperature, windy conditions and high humidity.  
B. Low temperature, windy conditions and high humidity.  
C. High temperature, low humidity and windy conditions.  
D. Low temperature, low humidity and still air.
7. Which one of the following maintains a transpiration stream in flowering plants?
- A. Capillary              B. Osmosis  
C. Diffusion              D. Active transport
8. What would happen to a plant tissue placed in a strong sugar solution? It;
- A. Becomes longer and soft.  
B. Maintains the original length and texture.  
C. Becomes shorter and soft.  
D. Becomes shorter and hard.
9. In a plant tissue, water moved from cell A to cell B. This indicates that;
- A. Cell A and Cell B had the same osmotic potential.  
B. Cell A had a higher osmotic potential than Cell B.  
C. Cell A had a lower osmotic potential than Cell B.  
D. Cell A was older than Cell B.
10. Which one of the following is not a function of blood?
- A. Regulation of sugar level in the body.  
B. Healing of damaged parts of the body.  
C. Regulation of body temperature.

D. Transportation of wastes.

11. Which one of the following would occur if a potato strip was placed in distilled water?  
A. Increase in length      B. Strip would soften  
C. Decrease in length      D. Remain unchanged
  
12. Which one of the following reactions is likely to occur when a donor of blood group A gives blood to a recipient of blood group B?  
A. Antibodies a react with antigens B.  
B. Antigens B react with antibodies b.  
C. Antibodies b react with antigens A.  
D. Antigens A react with antigens B.
  
13. Which one of the following blood vessels contains the lowest concentration of urea?  
A. Hepatic portal vein  
B. Hepatic vein  
C. Renal artery  
D. Renal vein
  
14. Which one of the following is the correct response to increased carbon dioxide in human blood? The rate of;  
A. Breathing is slowed.  
B. Heart beat is slowed down.  
C. Heart beat is increased.  
D. The pulse is slowed down.
  
15. Which one of the following is the correct reason for the thickness of the walls of atria and ventricles?  
A. Atria are thicker because they have to generate higher pressure.  
B. Atria are thicker because they have to resist higher pressure.  
C. Ventricles are thicker because they have to generate higher pressure.

D. Ventricles are thicker because they have to resist higher pressure.

16. Which one of the following events occurs during osmosis?

- A. Solute molecules move from more to less concentrated solution.
- B. Solvent molecules move from more to less concentrated solution.
- C. Solvent molecules move from less to more concentrated solution.
- D. Solute molecules move from less to more concentrated solution.

17. The blood constituents that help in the formation of blood clot at the site of an injury are;

- A. Platelets and erythrocytes.
- B. Hormones and plasma.
- C. Platelets and leucocytes.
- D. Platelets and fibrinogen.

18. The following are characteristics of blood vessels:

- i) Presence of valves.
- ii) Thick walls.
- iii) Wide lumen.
- iv) Elastic walls.

Which of the characteristics belong to vein?

- A. i) and ii)
- B. i) and iii)
- C. ii) and iii)
- D. iii) and iv)

19. The forces which mostly help water to move up a tall plant are;

- A. Osmosis and diffusion.
- B. Capillarity and transpiration.
- C. Osmosis only.
- D. Capillarity and osmosis

20. Blood flows in the pulmonary artery at a lower pressure than in aorta because in the pulmonary circulation;
- Blood travels a shorter distance.
  - The right ventricle has thinner walls.
  - The vessel carrying blood is smaller.
  - Fewer organs are supplied.
21. What is the main function of the phloem in green plants?
- Transporting water.
  - Supporting the plant.
  - Transporting mineral salts.
  - Transporting manufactured food.
22. Which of the following blood vessels transports blood most rich in nutrients?
- |                      |                        |
|----------------------|------------------------|
| A. Pulmonary artery  | B. Hepatic portal vein |
| C. Mesenteric artery | D. Renal vein          |
23. The blood serum of a universal donor contains;
- Antigens A.
  - Antigens B.
  - Neither antigen A nor B.
  - Both antigens A and B.
24. An unknown sample of blood was found to agglutinate with blood of group AB but not with blood of O. What was the blood group of the unknown sample?
- |      |       |
|------|-------|
| A. O | B. AB |
| C. A | D. B  |
25. In the human heart, the mixing of oxygenated and deoxygenated blood is prevented by the
- |           |                    |
|-----------|--------------------|
| A. Septum | B. tricuspid value |
|-----------|--------------------|

C. bicuspid                    D. semi lunar valve

26. Which of the following processes need energy?

- A. Osmosis
- B. Diffusion
- C. Plasmolysis
- D. Active transport

27. Which one of the following events does not occur following the concentration of the ventricle in mammalian heart?

- A. Blood flows from ventricles into arteries.
- B. The blood pressure increases in aorta.
- C. Atrio-ventricular valves open.
- D. Arterial valves open.

28. Which of the following is true about arteries? They;

- A. Carry blood away from the heart.
- B. Carry deoxygenated blood.
- C. Carry oxygenated blood.
- D. Possess valves along the length.

29. Individuals with blood AB are said to be universal recipients because they have;

- A. No antigens.
- B. No antibodies.
- C. Both antigens and antibodies.
- D. Antibodies a and b.

30. Which one of the following processes needs energy?

- A. Absorption of water by root hairs.
- B. Gaseous exchange in the alveoli.
- C. Loss of turgidity by a plant cell.
- D. Absorption of mineral salts by root hairs.

31. When blood passes from the lungs to the kidney, it has gone through the;

- A. Pulmonary artery, tricuspid valve and aorta.
- B. Pulmonary vein, bicuspid valve and aorta.
- C. Anterior vena cava, tricuspid valve and aorta.
- D. Posterior vena cava, bicuspid valve and aorta.

32. Which of the following is the best description of the term double circulation in a mammal?

- A. Blood flows into the two lungs and then into the body.
- B. Body passes through two chambers of the heart.
- C. Blood passes through the heart twice in one circulation.
- D. Blood flows through arteries and then through veins.

33. In the flowering plants translocation of photosynthetic products is by the

- A. Xylem vessels
- B. sclerenchyma
- C. sieve tubes
- D. companion cells

34. A sample of blood from the hepatic portal vein contains;

- A. Fats.
- B. Proteins.
- C. High concentration of urea.
- D. High concentration of products of digestion.

35. Which of the following does not affect the rate of diffusion?

- A. Density of the diffusion medium.
- B. Size of the molecules
- C. Temperature of the medium
- D. Distance moved by the diffusing molecules

36. Artificial immunity to a disease is developed by;
- A. Catching the disease and recovering from it.
  - B. Inoculation with a mild strain of the pathogen.
  - C. Receiving antibiotic injections against the disease.
  - D. Taking the drugs that prevent the disease.
37. Which one of the following is not transported in blood?
- A. Amylase
  - B. Urea
  - C. Insulin
  - D. Sodium chloride
38. Decrease in the number of mammalian red blood cells could reduce the ability of the blood to
- A. clot
  - B. transport oxygen
  - C. destroy harmful bacteria
  - D. distribute heat
39. Which one of the following takes place by the process of active transport in plants?
- A. Uptake of water.
  - B. Intake of carbon dioxide.
  - C. Transpiration.
  - D. Uptake of mineral salts.
40. Which one of the following is not a property of a fully turgid plant cell?
- A. The vacuole has maximum volume.
  - B. There is no more absorption of water by the cell.
  - C. The cell wall resists further expansion of the vacuole.
  - D. The cytoplasm is only slightly separated from the cell wall.

## SECTION B

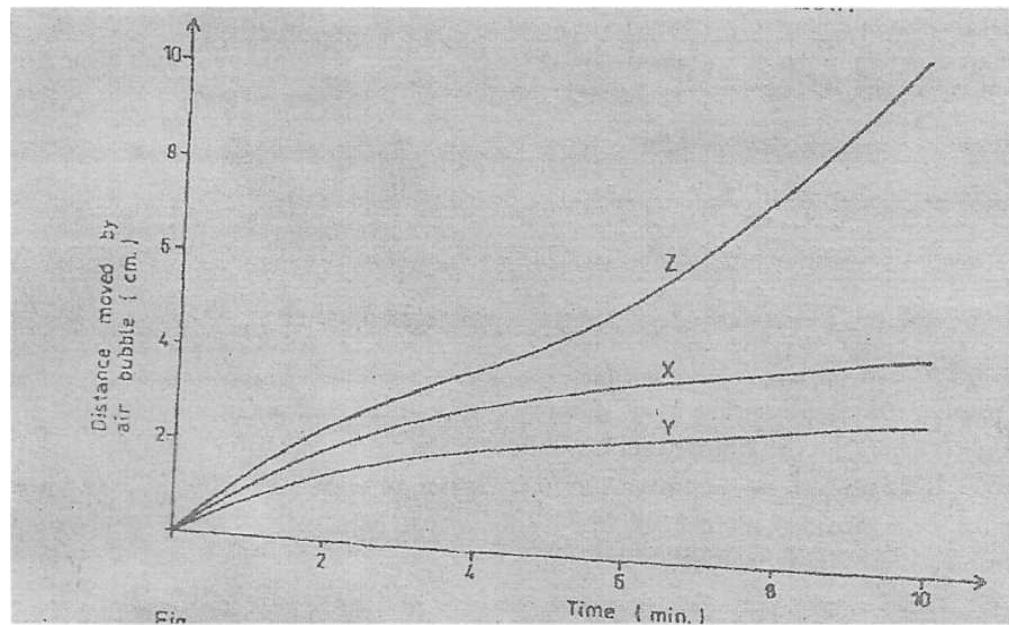
41. Three equal sized shoots X, Y and Z bearing the same number of leaves from similar herbaceous plants were treated as follows:

X - Had the upper epidermis of all its leaves covered with petroleum jelly.

Y - Had the lower epidermis of all its leaves covered with petroleum jelly.

Z - All its leaves were left uncovered.

The three shoots were cut under water and each placed in one of the three identical potometers. All the photometers were then left under a shade. After 5 minutes, the potometer bearing shoot Z was transferred to a sunny place. The movement of the air bubble in each potometer was recorded every minute for 10 minutes. The results are shown in the figure. Use the information to answer questions that follow.



- a) Describe the pattern of movement of the air bubble in each of the photometers during the time of the experiment.
- X.
  - Y
  - Z.
- b) Explain the pattern of movement of the air bubble in each potometer.
- X.
  - Y.

- iii) Z.
- c) Why were similar shoots and photometers used and all the three potometers placed under a shade?
- d) The movement of the air bubble in the potometer is an increase of water uptake rather than water loss. Why is this so?
42. Six identical potato cylinders measuring 2.0 cm in length were each placed in a different concentration of sugar solution. After two hours, the potato cylinders were removed from the solutions and measured. The table below shows the results.

<b>Concentration of sugar solutions mol 1<sup>-1</sup></b>	<b>Length of potato cylinders after 2 hours (cm)</b>	<b>Difference in length of potato cylinders after 2 hours (cm)</b>
0.1	2.40	
0.2	2.25	
0.3	2.15	
0.4	2.05	
0.5	1.98	
0.6	1.02	

- a) Complete the table by filling in the difference in length of each potato cylinder after 2 hours (i.e. length after 2 hours subtract initial length).
- b) In the space provided, plot a graph of the difference in length after 2 hours against concentration of sugar solutions.
- c)
  - i) What was the effect of the concentration of the sugar solutions on the length of the potato cylinders?
  - ii) Explain why the concentration of the sugar solutions affected the length of the potato cylinders as stated in (c)i).
- d)
  - i) From your graph, determine the concentration of the sugar solution that would give o difference in length of a potato cylinder.
  - ii) Explain what happens in a potato cylinder when no change in length occurs.

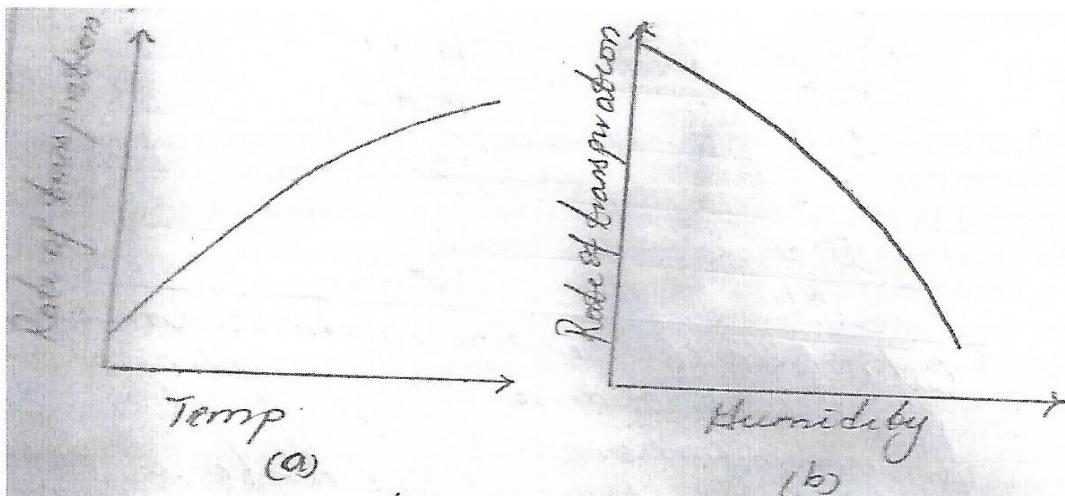
- e) Suggest one other observation other than change in size that would be made on the potato cylinders.
43. Fresh green pepper strips were placed in sucrose solutions of varying concentrations to investigate the changes in mass. The strips each measuring 4 cm x 0.5 cm were cut from the wall of the fruit. A total of 18 strips were cut and the mass of each determined. Three strips were then placed in each of the following sucrose solutions. 0.2, 0.4, 0.6, 0.8 and 1.0 mol dm<sup>-3</sup> respectively. The remaining three were placed in distilled water. All were left for 30 minutes and then removed and reweighed. The mean mass of each group of three strips was calculated. The results were recorded on a table as shown below.

Mean mass (g)	Mean mass (g)	
Molarity of sucrose (mol/m <sup>3</sup> )	At the beginning	After 30 minutes
0.0	1.74	1.83
0.2	1.47	1.46
0.4	1.45	1.35
0.6	1.52	1.34
0.8	1.80	1.53
1.0	1.38	1.15

- a) Calculate the change in mass and the percentage change for each strip. Record the information on a table.
- b) Plot a graph of the percentage change in mass against the molarity of the sucrose solution.
- c) From your graph, determine the molarity of sucrose solution that is isotonic to the pepper tissue.
- d) Account for the change in mass when the molarity of sucrose solution was
- 0.0.
  - 1.0.
- e) Name one hormone that regulates the osmotic pressure of blood in human beings.

44. a) Define the term transpiration.

b) Figure 1(a) and (b) show how temperature and humidity affect the rate of transpiration.



i) From figure (a), describe how the rate of transpiration changes with temperature.

ii) From figure (b), describe how the rate of transpiration changes with humidity.

c) Explain why;

i) Temperature affects the rate of transpiration as shown in figure (a)/

ii) Humidity affects the rate of transpiration as shown in figure (b).

d) Study the importance of transpiration in plants.

45. The concentration of the cell sap of most plant tissues is usually 0.3M. When such a tissue is placed in solutions of different concentrations, its physical conditions may either change from hard to soft or rigid to flexible.

a) Explain what would be the physical condition of a plant tissue which had been placed for a period of two hours in a solution of:

i) 0.2 M concentration.

ii) 0.4 M concentration.

b) In the spaces below, draw diagrams to show the appearance of a cell from a plant tissue placed in each of the following solutions.

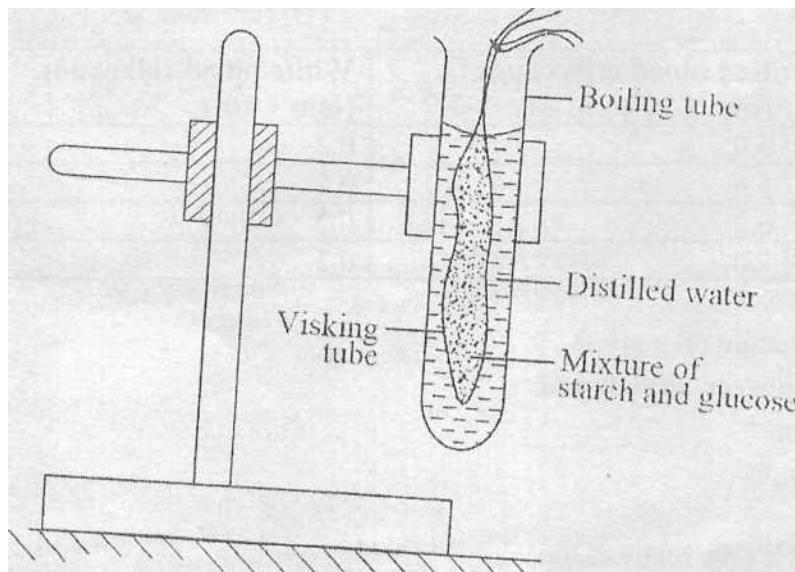
- i) 0.2 M concentration.
  - ii) 0.4 M concentration.
- b) State two importances of osmosis in plants.

46. The table below shows the results of blood cell counts (red and white blood cells) taken on people living at different altitudes.

<b>Altitude (m)</b>	<b>Red blood cells count (mm x 10<sup>6</sup>)</b>	<b>White blood cell count (mm x 10<sup>6</sup>)</b>
1000	5.0	0.2
2000	5.6	0.2
3000	6.2	0.2
4000	7.0	0.2

- a) Represent the above information on a graph.
- b) Describe the relationship between altitude and
  - i) Red blood cell count.
  - ii) White blood cell count.
- c) Give an explanation for the above relationship.
  - i) Red blood cell count.
  - ii) White blood cell count.
- d) Determine the red blood cell count at
  - i) 500 M.
  - ii) 6000 M.
- e) i) How are red blood cells adapted to carry out their functions?  
 iii) What happens to old blood cells in the body?

47. A solution containing starch and glucose was put in a visking tube in the set up shown in the figure and left to stand for 30 minutes.



After 30 minutes, samples were drawn from the contents of the visking tube and boiling tube, then iodine and Benedict's tests carried out on each of them.

- a) Describe what was observed with iodine test on
  - i) visking tube content.
  - ii) boiling tube content.
- b) Explain your observation in (a).
- c) Describe what was observed with Benedict's test on
  - i) visking tube content.
  - ii) boiling tube content.
- d) Explain your results in (c).
- e) Giving reasons, state the nature of the visking tube.

48. The table below shows the amount of water in mg /hr lost by a terrestrial plant at different times of the day. Study the table and use it to answer the questions which follow.

Time of day	2 am	6am	8am	10am	12pm	1pm	2pm	3 pm	4pm	6pm	8pm	12am
Water lost mg/hr	114	14	35	135	275	315	285	245	175	75	16	16

- a) Represent the above information graphically.
- b) Describe the changes in the amount of water lost during the study period.
- c) Explain the water loss between
  - i) 2 am and 6 am.
  - ii) 6 am and 1pm.
  - iii) 1 am and 6pm.
- d) Explain what would happen to the amount of water lost if it suddenly rained between 12 noon and 1 pm.
- e) What would be the effect of putting an electric fan near the experimental plant at 6pm? Explain your answer.

49. The blood pressure in the flow of blood in a mammal was determined at two different vessels in the body and the following results were obtained.

Time / seconds	Blood pressure in blood vessel	
	A (mm/Hg)	B (mm/Hg)
0	160	320
10	164	360
20	165	320
30	178	400
40	172	360
50	160	320
60	160	360

- a) Plot a graph of variation of blood pressure with time for both blood vessels on the same axes.
- b) Describe how the blood pressure varies with time for
- i) Blood vessel A.
  - ii) Blood vessel B.
- c) Of the two blood vessels, which one is an artery and vein?
- i) Artery.
  - ii) Vein.
- d) Give reasons to support your answer in (c) above.
- e) State three structural differences between blood vessels A and B.
- f) State two factors that would result into an increase in blood pressure in blood vessels A and B.
50. The table below shows the composition of blood of 3 adult individuals. One lives at high altitude, another is anaemic and the other has an infection. It also shows the average number of each blood component in an adult woman. Study the information in the table and answer the questions that follow.

<b>Components of blood</b>	<b>Person A</b>	<b>Person B</b>	<b>Person C</b>
Red blood cell per mm <sup>3</sup>	7,500,000	5,000,000	2,000,000
White blood cell per mm <sup>3</sup>	6,000	8000	12,000
Blood platelets per mm <sup>3</sup>	250,000	255,000	100,000

Average number in adult human

5,000,000

5,000- 10,000

250,000

a) Giving a reason, suggest the person

i) Who lives at high altitudes.

ii) Who is anaemic.

iii) Who has an infection.

b) Suggest a likely effect of the observed number of blood platelets in person C.

51. Leaves were collected from a plant of a certain species growing in a shaded side and a plant from the same species growing in an open site. The surface area of each leaf was worked out. The results obtained are shown in the table below.

Surface area of leaves ( $\text{cm}^2$ )	
Shaded site	Open site
21	15
14	17
16	18
18	17
19	17
21	19
19	13
22	14
18	21
16	13
13	16
22	13
21	16
23	16
19	12
18	14
15	12
	20
<b>Mean surface area = <math>X_1</math></b>	<b>Mean surface area = <math>X_2</math></b>

- Calculate the mean surface areas  $X_1$  and  $X_2$ .
- Suggest one reason for the differences in the mean surface areas between the leaves from the two sites. Explain your answer.
- Briefly state the adaptations of plant leaves to desert habitat.
- Leaves of a plant exposed directly to sunlight are often thicker than leaves found in the shade. Suggest two reasons for this observation.
- How does the observation in (d) improve the efficiency of leaves exposed to direct sunlight?
- Apart from photosynthesis, state two other functions of a leaf.

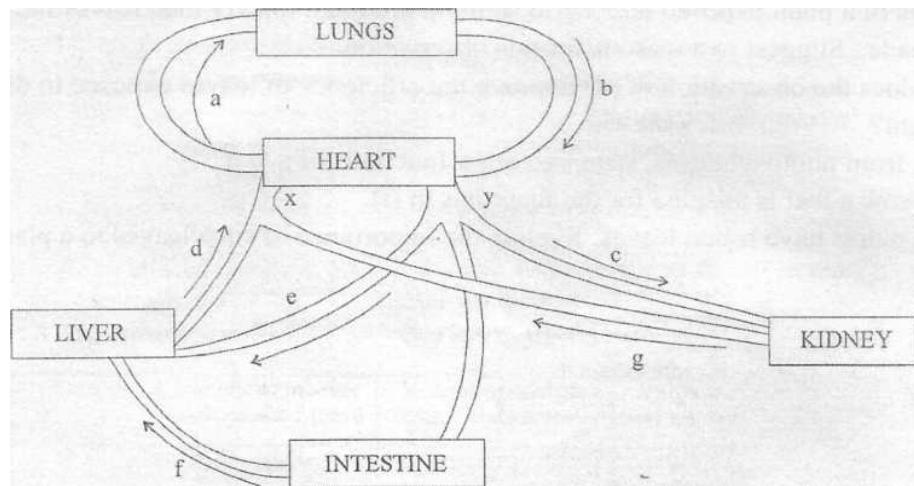
- g) State how a leaf is adapted for the functions in (f).
- h) Some plants have rolled leaves. Explain the importance of such leaves to a plant.

52. Red blood cells burst or haemolyse when immersed in low salt concentrations. The table below shows effects of salt solution on red blood cells.

% salt concentration	0.30	0.35	0.40	0.45	0.50	0.55
% red blood cells haemolysed	100	95	85	50	20	0

- a) Using % salt concentration on the X - axis and red blood cells haemolysed on Y - axis, draw a graph to represent the data in the table above.
- b) At what percentage of salt concentration are all red blood cells haemolysed?
- c) Briefly explain the process of haemolysis.
- d) i) From the figures above in the table, what is the safest percentage of concentration for human blood?
- ii) Give a reason for your answer.
- e) At what percentage of salt concentration are the numbers of haemolysed cells equal to unhaemolysed cells?
- f) What would you expect to happen to red blood cells if they are placed in 0.6% salt solution?

53. Figure below represents blood vessels supplying selected organs. The arrows show the direction of blood flow.



a) Name the vessels labeled a to f. a

- a
- b
- c
- d
- e
- f

b) State the differences in composition of blood in vessels;

- i) c and g.
- ii) a and b.
- iii) d and f.

c) Explain the difference in blood pressure in blood vessels x and y.

## SECTION C

54. a) Outline the functions of the lymphatic system.

b) Explain the changes that occur in the composition of blood as it passes through the capillaries of the following parts of the body.

- i) Wings.
- ii) Liver.
- iii) Kidneys.

55. a) List the substances transported by the blood circulatory system.

b) Give the importance of transporting each one of the substances named in (a) above.

56. a) Why are there less stomata found on the lower epidermis of a water plant than the upper epidermis?

b) Describe an experiment to show that transpiration occurs in plants.

57. a) How are red blood cells suited to their function in mammals?  
b) Describe the circulation of blood within the heart of human being.  
c) Outline the structural differences between arteries and veins.
58. a) Give the structural differences between an artery and a vein,  
b) How are red blood cells adapted to their function?
59. a) What do you understand by the term osmosis?  
b) An onion epidermis was placed in a strong or concentrated sugar solution for 40 minutes. Another epidermis was placed in pure water for 40 minutes. Explain what happened in the epidermal cells.
60. a) Describe two ways in which the white blood cells defend the body.  
b) Explain how red blood cells are adapted to their function.  
c) Describe the changes that occur in an individual's blood if the person moves from a low land and goes to live on a highland. Explain your answer.
61. a) Name the constituents of the mammalian blood.  
b) Give three structural differences between an artery and a vein.  
c) What are the differences in blood content between the blood carried by a hepatic portal vein and hepatic vein?
62. With the aid of a diagram, describe the movement of water in woody plants from the time it is absorbed from the soil to the time it is lost to the atmosphere.
63. a) Distinguish between transpiration and guttation.  
b) How do plants lose water through the leaves?  
c) Describe the features of plants which help them reduce water loss in dry condition.

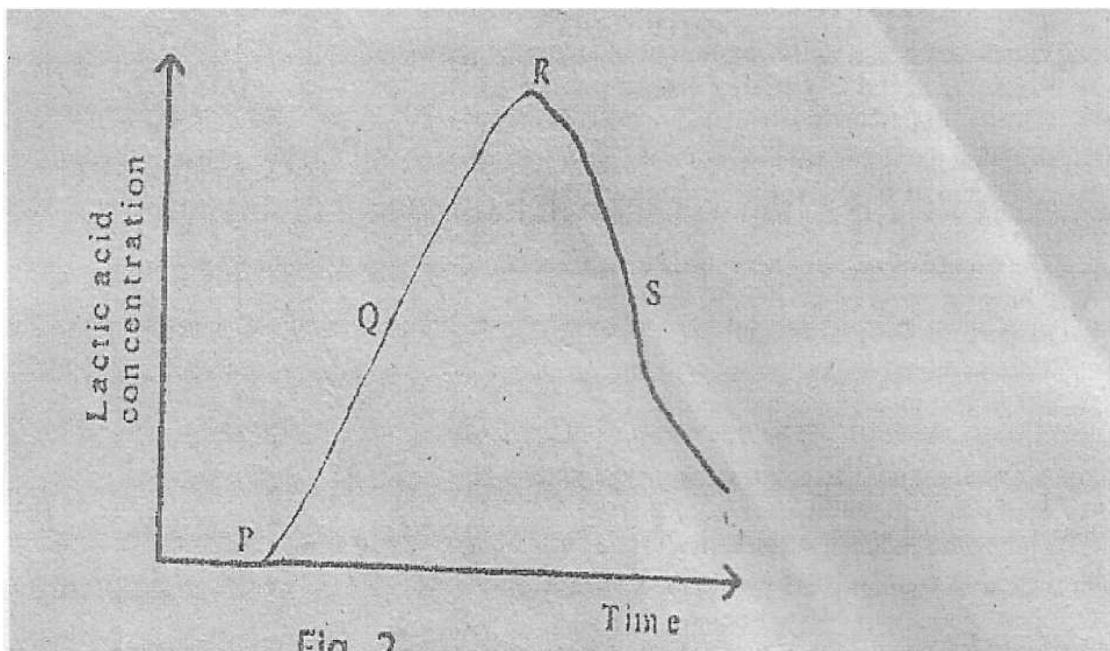
64. a) Define the term transpiration.
- b) Name the various sites of transpiration in plants.
- c) Describe the environmental and non environmental factors that affect the rate of transpiration.
- d) List the forces responsible for movement of water from the roots to the top of a tall tree.
- e) How are terrestrial plants adapted to minimize water loss?
65. a) Describe the benefits of transpiration in plants.
- b) Explain how each of the following forces contribute to the movement of water and mineral salts up the xylem vessels of a plant.
- i) Transpiration pull.
  - ii) Adhesion.
  - iii) Capillarity.

## Respiration and Gaseous Exchange

### SECTION A

1. Figure 1 shows the concentration of lactic acid in the blood of an athlete during and after a race. During which period on the graph does the athlete not experience both aerobic and anaerobic respiration?

Figure 1



- A. P-Q      B.R-S  
C. Q-R      D.P-R
2. An insect's respiratory system consists of;
- Trachea, tracheoles and bronchioles.
  - Spiracles, trachea, tracheoles.
  - Spiracles, trachea and bronchioles.
  - Trachea, bronchioles and tracheoles.

3. The best way to ensure that yeast added to sugar produces ethanol is by;
  - A. Supplying a lot of oxygen to the mixture.
  - B. Placing the mixture in warm conditions.
  - C. Excluding air from the mixture.
  - D. Using a lot of sugar in the mixture.
4. Which of the following is not a characteristic of a respiratory surface?

A. Thin walls	B. Moist surface
C. Densely supplied with capillaries	D. Smooth surface
5. Which one of the following describes internal respiration?
  - A. Breathing in and releasing of oxygen into the tissues.
  - B. Getting rid of CO<sub>2</sub> accumulated in the tissues.
  - C. Building up of complex substances.
  - D. Oxidation of food substances to release energy.
6. The best explanation for panting of an athlete immediately after a race is to;
  - A. Allow fast food blood flow to the lungs.
  - B. Restore the used up energy.
  - C. Take in more oxygen.
  - D. Allow fast blood from the muscles.
7. A good mammalian respiratory surface should be;
  - A. Dry with large surface area.
  - B. Moist with reduced surface area.
  - C. Dry with many blood tissues.
  - D. Moist with many blood vessels.
8. Which of the following are characteristics of surfaces for gaseous exchange?
  - A. Large surface area, thinness and moistness.
  - B. Thinness, moistness and presence of blood vessels.

- C. Large surface area, thinness and presence of arteries and veins.  
D. Thinness, moistness and presence of arteries and veins.
9. In which of the following animals does expired air take a different route from that of inspired air?  
A. Birds                    B. Reptiles  
C. Bony fish              D. Mammals
10. Which one of the following explains the accumulation of lactic acid in muscles during vigorous activity?  
A. Carbohydrate is completely broken down.  
B. The oxygen supply to the muscles may not be enough.  
C. Much of the stored glycogen is converted into glucose.  
D. The blood vessels leading from the muscles are constricted.
11. Which one of the following characteristics of respiratory surfaces is true of humans but not of insects?  
A. Highly vascularized      B. Moist  
C. Have large surface area   D. Thin walled
12. The following are products of tissue respiration in living organisms.  
(i) Energy      (ii) CO<sub>2</sub>      (v) Lactic acid  
(iii) Water      (iv) Ethanol

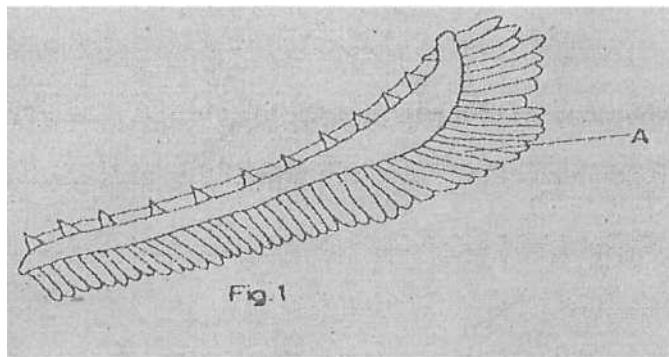
Which of them are common to both aerobic and anaerobic respiration in plants?

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

13. Which one of the following groups of animals uses gills, skin, buccal cavity and lungs for gaseous exchange at some stage in their lifecycle?

- A. Fish
- B. Reptiles
- C. Amphibians
- D. Mammals

14. Figure 1 shows a gill of a fish.



The name and function of the part labeled A is;

- A. Gill filaments for gaseous exchange.
- B. Gill rakers for filtering food.
- C. Gill bar for support.
- D. Gill arch for increasing surface area.

15. How is lactic acid produced in muscles got rid of? By;

- A. Converting it into water.
- B. Storing it in the liver.
- C. Converting it into ethanol.
- D. Oxidation.

16. The data below shows the amount of CO<sub>2</sub> in inhales air, rate of breathing at rest and volume of air in a breath, in humans.

Percentage of CO<sub>2</sub> in inhales air = 0.025%

Number of breaths per minute = 36

Volume of one breath taken in at rest = 500cm<sup>3</sup>

The volume of CO<sub>2</sub> inhales per minute while at rest is

- A. 0.9cm<sup>3</sup>      B. 45cm<sup>3</sup>      C. 12.5cm<sup>3</sup>      D. 450 cm<sup>3</sup>

17. Which of the following events occur during inhalation in a mammal?

- A. Diaphragm contracts, ribs raised.  
B. Diaphragm relaxes, ribs lowered.  
C. Internal intercostal muscles contract, pressure in chest cavity increases.  
D. Internal intercostals muscles relax, pressure in chest cavity increases.

18. Aerobic respiration is more efficient than anaerobic respiration because it;

- A. Uses more oxygen.  
B. Yields lactic acid.  
C. Uses less oxygen.  
D. Yields more energy.

19. Which one of the following is a respiratory organ in an insect?

- A.  
B.  
C.  
D.

20. The structures in insects that serve as respiratory surfaces for gaseous exchange are

- A. trachea      B. bronchioles  
C. tranchioles      D. spiracles

21. Which one of the following substances accumulates in muscles during vigorous exercise?

- A. Water      B. Lactic acid  
C. CO<sub>2</sub>      D. O<sub>2</sub>

22. Which one of the following statements is the most appropriate definition of respiration?

- A. The oxidation of sugar to produce energy and water.
- B. Breathing in oxygen, oxidation of food and release of water, CO<sub>2</sub> and energy.
- C. The exchange of O<sub>2</sub> and CO<sub>2</sub> in the lungs.
- D. The oxidation of sugar to produce CO<sub>2</sub> and energy.

23. Which one of the following structures represents the respiratory surface of a fish?

- A. Gill bars
- B. Gill rakers
- C. Gill chamber
- D. Gill filaments

24. What are the final products of aerobic respiration?

- A. C0<sub>2</sub>, H<sub>2</sub>O and energy.
- B. CO<sub>2</sub>, water and alcohol.
- C. CO<sub>2</sub>, alcohol and energy.
- D. CO<sub>2</sub> and alcohol.

25. During inspiration the;

- A. Pressure in the thoracic cavity is reduced.
- B. External intercostals muscles relax.
- C. Diaphragm becomes dome shaped.
- D. The thoracic cavity becomes smaller.

26. 2 g of a food substance was burnt and the heat produces raised the temperature of 50cm<sup>3</sup> of water from 25°C to 37°C. What is the energy content of the food substance in joules per gram? (S.H.C of water = 4.2 J per gram)

- A. 1260 joules
- B. 2520 joules
- C. 300 joules
- D. 105 joules

27. In plants, anaerobic respiration is less efficient than aerobic respiration because during anaerobic respiration;
- Not all the carbohydrates are broken down.
  - The amount of CO<sub>2</sub> released is less than in aerobic respiration.
  - There is less energy released per unit weight of carbohydrate broken down.
  - Less water is produced in anaerobic respiration.
28. Which of the following are respiratory surfaces in toads and frogs?
- The mouth, webbed toes and skin.
  - Nostrils, mouth and skin.
  - Webbed toes, lungs and mouth.
  - The mouth, lungs and skin.
29. The condition known as oxygen debt occurs during active physical exercise in animals because of the;
- Accumulation of CO<sub>2</sub> during physical exercise.
  - The high rate of breathing during physical exercise.
  - Accumulation of lactic acid in the body.
  - Accumulation of alcohol in the body.
30. An athlete has just finished a race. The phrase “oxygen debt” refers to;
- The amount of oxygen originally present in the muscles of the athlete before the race.
  - The amount of oxygen taken in after the race and used to complete the combustion of some of the lactic acid.
  - The total amount of oxygen taken in during panting after the race.
  - The amount of oxygen needed by the lungs after the race for combustion of glucose.
31. Which one of the following is not an adaptation to facilitate gaseous exchange in organisms?
- Increased surface area of organs involved.
  - Decrease in thickness of exchange surface.

- C. Increased body size of organism.
  - D. Increase in concentration gradient of gas.
32. In one day old tadpoles, gaseous exchange is performed by
- A. lungs
  - B. external gills
  - C. internal gills
  - D. skin of the tail
33. Which one of the following is not used for gaseous exchange in amphibians?
- A. Lungs
  - B. Skin
  - C. Mouth
  - D. Nostrils
34. Prolonged anaerobic respiration in plants is not good because;
- A. So much energy is lost.
  - B. An oxygen debt is increased.
  - C. Ethanol produced becomes poisonous.
  - D. Much carbon dioxide is produced.
35. Which one of the following occurs when internal intercostal muscles contract during breathing?
- A. Thoracic volume increases.
  - B. Ribs are raised.
  - C. Inhalation occurs.
  - D. Thoracic pressure increases.
36. Thinness of a respiratory surface is important in;
- A. Diffusion distance reduction for gases.
  - B. Easy carriage of the diffused gases.
  - C. Facilitation of the diffusion process.
  - D. Surface area increment.
37. Which of the following is an adaptation of a leaf for gaseous exchange?
- A. Absence of chloroplast ion the epidermal cells.

- B. Large air spaces in the spongy mesophyll layer.
  - C. Presence of hairs on the leaf.
  - D. Thick cuticle.
38. When setting up an experiment to show that energy is released by germinating seeds, the seeds are first soaked in sodium hypochlorite in order to;
- A. Produce proper PH for germination.
  - B. Provide nutrients for germination.
  - C. Kill fungal spores that can release energy.
  - D. Absorb CO<sub>2</sub> that interferes with the experiment.
39. Which one of the following is common to both aerobic and anaerobic respiration in plants?
- A. Production of water.
  - B. Formation of alcohol.
  - C. Production of CO<sub>2</sub>.
  - D. Using up of oxygen.
40. Under what condition in the body would accumulation of lactic acid be increased?
- A. When doing a vigorous physical exercise.
  - B. During deep sleep.
  - C. After consuming a lot of sugary food.
  - D. After breathing in excess C0<sub>2</sub>.

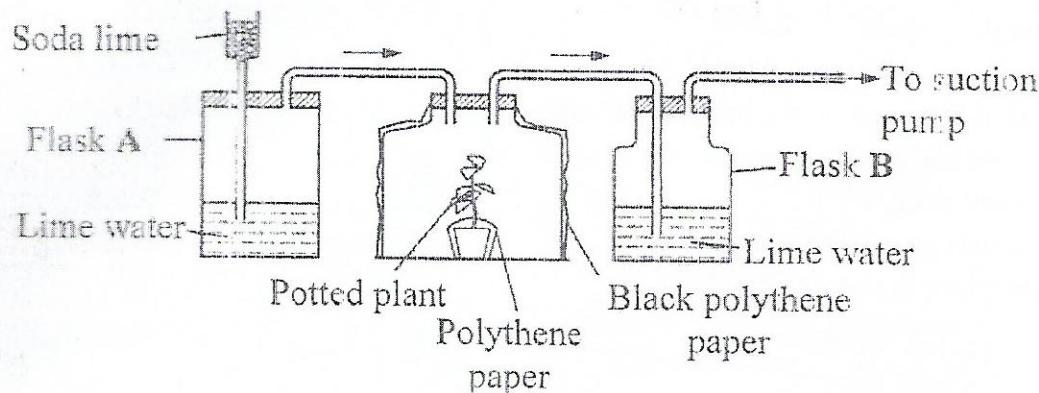
## SECTION B

41. The table below shows the percentage composition of inhaled air, exhaled air, in a human being at rest and also the composition of exhaled air during exercise. Use the information in the table to answer the questions that follow.

Inhaled air at rest	Water vapour	N <sub>2</sub>	CO <sub>2</sub>	O <sub>2</sub>
	Variable	79%	0.03%	20.96%
Exhaled air at rest	0.8%	79%	4.1%	16.2%
Exhaled air during exercise	0.92%	79%	4.5%	15.58%

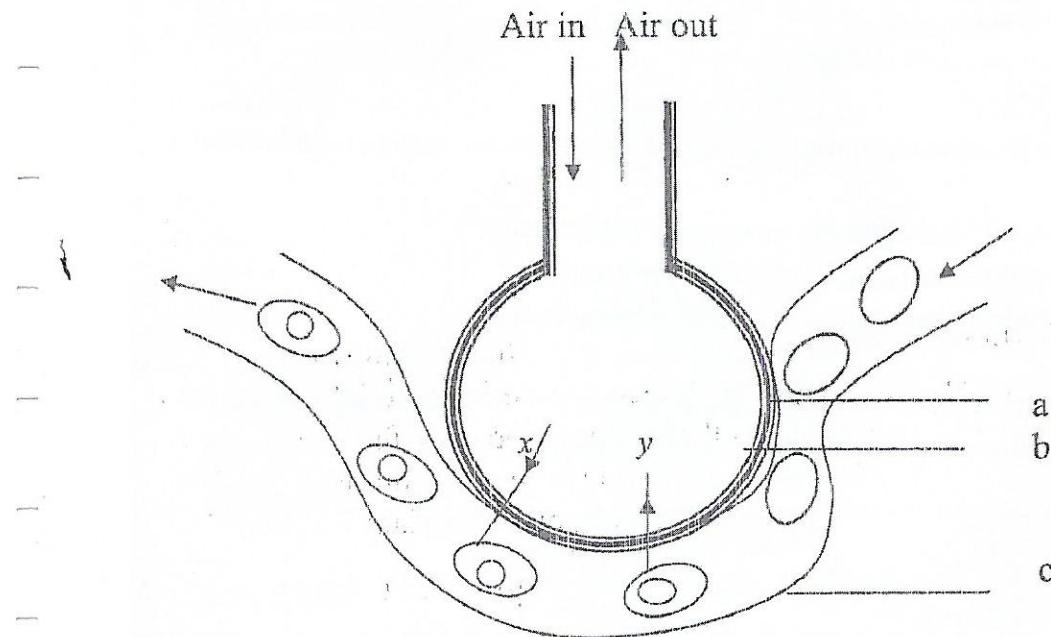
- a) State the difference in composition between inhaled and exhaled air at rest.
  - b) Give a reason for each difference in (a).
  - c) State the changes that occur in the composition of exhaled air in a human being who is previously at rest, then takes an exercise.
  - d) Give a reason why each change stated in (c) occurs.
  - e) During exercise, the breathing rate increases. From the information provided, suggest why this happens.
  - f) Why is the percentage of nitrogen constant in inhaled and exhaled air?
42. a) Give four differences between respiration and photosynthesis.
- b) Give three ways in which respiration is important to living things.
- c) Name two commercial uses of anaerobic respiration.

43. Figure below is an experimental set up to investigate a process in plants.



- a) Name the process being investigated.
- b) Explain why
  - i) the bell jar was covered with black polythene paper.
  - ii) part of the plant was covered with polythene paper.
  - iii) sodalime was used in the experiment.
- c) State what would be observed in flasks A and B at the end of the investigation.
  - i) Flask A.
  - ii) Flask B.
  - iii) Explain the results stated in c(i) and (ii).
- d) i) State what would be observed in flasks A and B if the set up was placed in a darkroom,
  - ii) Explain your answer in d(i).

44. The figure below shows a structure in the mammalian lung. Study the figure and answer the questions that follow.



- a) Name the
- Parts labeled a, b and c.  
a .....  
b .....  
c .....
  - Gases indicated by arrows X and Y.  
X .....  
Y .....
- b) Explain how the features shown in the figure enable the structure to function efficiently.
- c) State four differences between the air that goes into the structure and that which goes out of the structure.

45. The table below shows the concentration of gases in the atmosphere, alveolus and exhaled air.

Gas	Atmosphere air %	Alveolar air %	Exhaled air %
Oxygen	20.96	13.80	16.40
CO <sub>2</sub>	0.03	5.50	4.10
Nitrogen	79.01	79.01	79.01

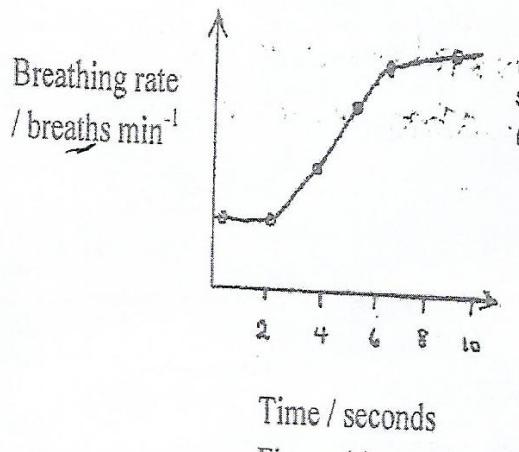
- a) Explain the difference of O<sub>2</sub> concentration
    - i) In alveolar air and exhaled air.
    - ii) Atmospheric air and alveolar air.
  - b) Explain the difference in concentration of carbon dioxide in atmospheric air and alveolar air.
  - c) Why is the concentration of nitrogen the same in all the 3 media?
  - d) i) What makes the alveolus a very efficient respiratory surface?  
ii) What is the importance of the respiratory surface being moist?
46. An experiment was carried out to determine the concentration of lactic acid in blood of an athlete during and after exercise. The table below shows the results.

Lactic acid concentration mg/10 cm <sup>3</sup>	20	80	98	90	72	40
Time (minutes)	0	10	13	18	30	57

- a) Represent the above information on a graph.
- b) Describe the variation of lactic acid with time.
- c) Explain the variation of lactic acid between
  - i) 0-13 minutes.
  - ii) 13 – 57 minutes
- d) i) From your graph, identify the period of paying back the “oxygen debt.”

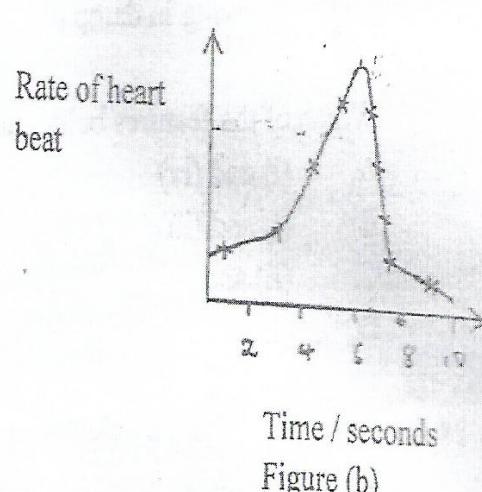
- ii) Write down the equation for the reaction which results with the production of lactic acid.
- e) i) What is the biological importance of the above process?  
 ii) Name the tissues where lactic acid accumulates in the body.  
 iii) What is the effect of lactic acid accumulation with the tissue named above?

47. A study was carried out on a human being who was under an exercise. The changes in the breathing rate and the rate of heart beat were monitored. The results are shown in the figure (a) and (b).



Time / seconds

Figure (a)

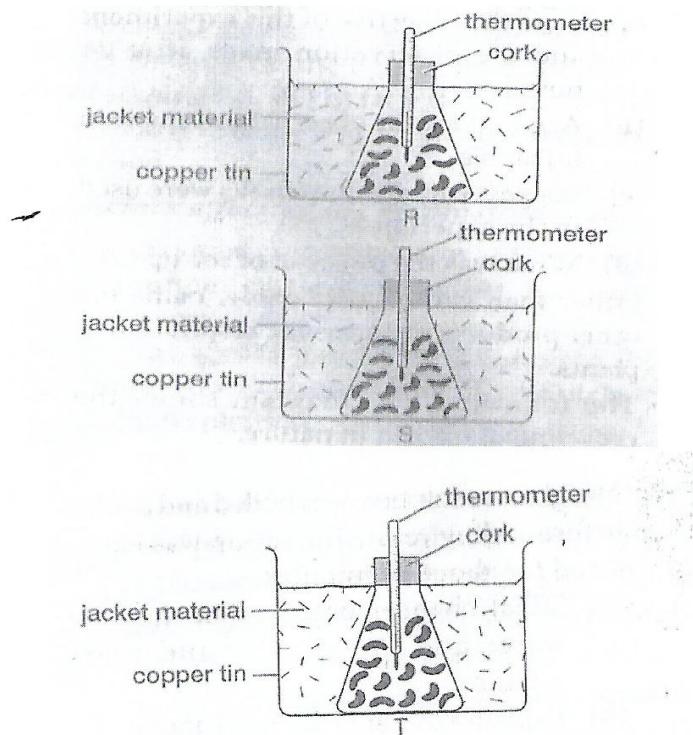


Time / seconds

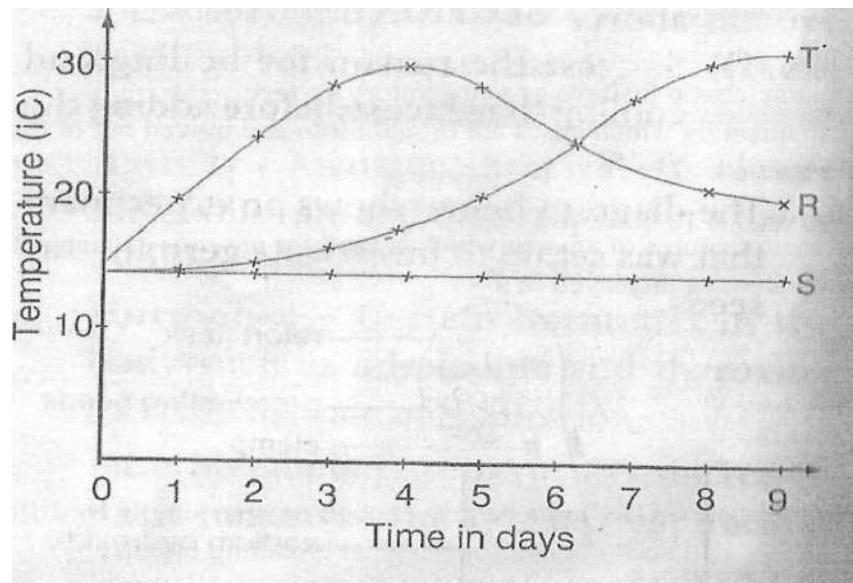
Figure (b)

- a) What was the purpose of this study?  
 b) Describe what is happening in each figure  
 i) Figure (a).  
 ii) Figure (b).  
 c) Give an explanation for the observation shown in figure (a).  
 d) From figure (b), explain why the rate of heart beat increases during exercise.  
 e) Apart from those in figures (a) and (b), what else would occur in human body during exercise?

48. A student set up the apparatus shown below to investigate certain physiological processes. In R, beans soaked inn water were introduced. Boiled beans sprinkled with antiseptic and boiled beans were introduced in S and T respectively.



The temperature in each set up of apparatus was recorded for one week. The results obtained are shown in the graph below.



- a) Using the information on the graph and the set of apparatus shown above, state the aim of the experiment.
- b) Account for the differences in the change in temperature in apparatus R and T:
  - i) From days zero to 2.
  - ii) After day 5.
- c) Explain why there was no temperature change in S for the whole week.
- d) i) Suggest one way the set up above could be improved for more accurate results. Give a reason for your answer.  
ii) Why was set up S included in the experiment?
- e) Explain the biological principle applied to make food in a refrigerator remain unspoilt for a longer period than in ordinary conditions.

## SECTION C

- 49. a) Outline the characteristic features of a respiratory surface.  
b) Describe the mechanism by which gases are brought into and moved out of the respiratory organs of a named mammal.
- 50. a) What are the main features of an area which is used for gaseous exchange?  
b) How are the above features displayed in a”
  - i) Fish
  - ii) Mammal and
  - iii) Flowering plant?  
c) Explain why a micro organism like amoeba gets enough oxygen simply by diffusion through the body's surface and does not need any special breathing organs.
- 51. a) Explain how the action of muscles causes air to pass from the atmosphere into the lungs in mammals.  
b) How does oxygen move from air in the lungs into the blood cells?  
c) Give three characteristics of an efficient respiratory system.

52. a) Explain how the action of muscles causes carbon dioxide to pass from the lungs into the atmosphere.
- b) How does oxygen move from the air in the alveoli into the body tissues?
- c) How are respiratory surfaces adapted to their functions?
53. a) What is meant by the term gaseous exchange?
- b) Explain how the skin of a frog is suitable for gaseous exchange
- c) Describe the mechanism of gaseous exchange in the mouth cavity of an amphibian.
54. a) Describe inhalation and exhalation in a bony fish,
- b) How is the surface in fish adapted for its function?
55. a) How are the alveoli adapted for gaseous exchange?
- b) State the factors that control the rate of breathing.
- c) Describe the mechanism of breathing in human beings.
56. a) explain how lungs are adapted to their function as respiratory organ,
- b) Explain why an amoeba does not have a respiratory system.
57. a) What is respiration?
- b) State three differences between aerobic and anaerobic respiration.
- c) Describe how gaseous exchange takes place in an adult toad.

**END**

**Excretion**  
**SECTION A**

1. Which one of the following organs excretes urea?  
A. Bladder              B. Skin  
B. Liver              D. Lungs
  
2. Which one of the following pairs of activities consists of correct responses to cold in a mammal?  
A. Vasoconstriction, hairs standing.  
B. Increased metabolism, hairs lying flat.  
C. Increased blood flow to the skin surface, hairs flying flat.  
D. Increased sweating, hairs standing.
  
3. Which one of the following explains why a rat loses more heat to the surroundings than an elephant?  
A. A rat has smaller ears than an elephant.  
B. A rat has a higher metabolic rate than an elephant.  
C. Surface area volume ratio of a rat is higher than that of an elephant.  
D. A rat has fewer hairs than an elephant.
  
4. The group of organs performing excretory functions is;  
A. Kidneys, lungs and skin.  
B. Liver, kidneys and pancreas.  
C. Skin, kidneys and pancreas.  
D. Lungs, spleen and gall bladder.
  
5. In which of the following are the largest amounts of nitrogenous excreted?  
A. Urine              B. Sweat  
C. Breath              D. Feaces

6. Which one of the following excretory products are removed from the body by the kidney?
- A. Urea, excess water and excess salts.
  - B. Urea, excess water and carbon dioxide.
  - C. Carbon dioxide, excess water and excess salts.
  - D. Carbon dioxide, urea and excess salts.
7. Which one of the following is a long term adaptation of mammals to low temperature environment?
- A. Raising of hair.
  - B. Increase in metabolic rate.
  - C. Deposition of fats under the skin.
  - D. Reduction of blood flow to the skin.
8. Which one of the following layers of the human skin helps the body to retain water?
- A. Granular layer
  - B. Malpighian layer
  - C. Subcutaneous layer
  - D. Cornfied layer
9. Which one of the following is a reaction to over - cooling by a mammalian body?
- A. Dilation of blood vessels.
  - B. Sweating.
  - C. Decrease in metabolic rate.
  - D. Shivering.
10. Where in the mammalian skin is the melanin pigment found?
- A. Malphighian layer
  - B. Granular layer
  - C. Cornified layer
  - D. Subcutaneous layer
11. Which one of the following organs is responsible for increasing excess amino acids from the blood?
- A. Gall bladder
  - B. Kidney

C. Liver

D. Spleen

12. In which part of the kidney nephron does reabsorption of glucose occur?

- A. Proximal convoluted tubule.
- B. Distal convoluted tubule.
- C. Descending loop of Henle.
- D. Ascending loop of Henle.

13. The reason why urine of a healthy person does not contain glucose is that;

- A. The glomerulus is impermeable to glucose.
- B. Glucose is used for respiration before reaching the collecting duct.
- C. Glucose passes back into the blood stream.
- D. The kidney converts glucose to urea.

14. Which one of the following would not be found in the glomerular filtrate?

- A. Fibrinogen      B. Glucose
- C. Mineral salts    D. Urea

15. Which one of the following would contain the highest concentration of proteins?

- A. Blood plasma    B. Glomerular filtrate
- C. Urine            D. Serum

16. The following are body responses in temperature of a mammal.

- i) Shivering.
- ii) Increased blood supply to the skin.
- iii) Decreased sweat production.
- iv) Relaxation of erector pilii muscle.

Which two of these are responses to a fall in body temperature?

- A. i) and ii)
- B. ii) and iii)
- C. iii) and iv)
- D. i) and iii)

17. The following are physiological processes that occur in the body of an animal

- i) Elimination of urea.
- ii) Regulation of salts in the body.
- iii) Regulation of water in the body.
- iv) Deamination of excess amino acids.

Which of them are carried out by the kidney?

- A. i), ii) and iv)
- B. ii), iii) and iv)
- C. i), ii) and iii)
- D. ii) and iii) only

18. What is the normal blood sugar level in an adult person?

- A. 140 mg / 100cm<sup>3</sup>
- B. 90 mg / 100cm<sup>3</sup>
- C. 100 mg /100cm<sup>3</sup>
- D. 80 mg / 100cm<sup>3</sup>

19. Urine is formed by;

- A. Ultra filtration and selective reabsorption.
- B. Selective reabsorption in the proximal tubule.
- C. Selective reabsorption at the loop of Henle.
- D. Ultra filtration in the Bowman's capsule.

20. In body temperature regulation, vasoconstriction;

- A. Allows less blood to enter the skin capillary network.
- B. Allows less urine to be secreted into the bladder.
- C. Allows more sweat to be secreted by the sweat glands.
- D. Increases heat loss by radiation

21. Which of the following substances are secreted in mammalian sweat?

- A. Urea, ammonia, water.
- B. Urea, carbon dioxide, sodium chloride.
- C. Urea, water, sodium chloride.
- D. Urea, carbon dioxide, water.

22. Which one of these processes helps to lower mammalian body temperature to normal?
- A. Vasodilation.
  - B. Vasoconstriction.
  - C. Shivering.
  - D. Raising of hair on the skin.
23. The kidney purifies blood by;
- A. Ultra filtration.
  - B. Absorption and filtration.
  - C. Selective absorption and filtration.
  - D. Ultra filtration and selective reabsorption.
24. The rate of glomerular filtration is highest in
- A. man
  - B. amphibians
  - C. fresh water fishes
  - D. marine fishes
25. Which one of the following body activities occur during cold weather?
- A. Sweat production increases.
  - B. Blood capillaries dilate.
  - C. Spasmodic contraction of muscles occur.
  - D. More blood flows to the surface of the skin.
26. In mammals, the anti-diuretic hormone (ADH);
- A. Stimulates the reabsorption of water in the uriniferous tubules.
  - B. Inhibits the reabsorption of water in uriniferous tubules.
  - C. Inhibits the action of osmoreceptors to regulate the osmotic pressure of blood.
  - D. Stimulates the nephron so that there is an increase in the formation of glomerulus.
27. Which one of the following is the final waste product of metabolism of proteins in mammals?
- A. Urea
  - B. Urine

C. Amino acids      D. Ammonia

28. Which one of the following is not a waste product?

- A. Carbon dioxide      B. Excess water
- C. Feaces      D. Urea

29. Which one of the following substances does not contain nitrogen?

- A. Glycerol      B. Amino acids
- C. Amylase      D. Urea

30. A reason for simpler excretory organs in plants as compared to those in animals is that plants;

- A. Do not excrete solid wastes.
- B. Have lower metabolic rates.
- C. Do not use proteins.
- D. Are primary producers.

31. Which one of the following is the final waste product of metabolism of proteins in mammals?

- A. Urea
- B. Urine
- C. Amino acids
- D. Ammonia

32. The difference between endotherms and ectotherms is that ectotherms;

- A. Are more active than endotherms.
- B. Cannot regulate their body temperature.
- C. Gain less heat than endotherms.
- D. Eat more food than endotherms.

33. When it's hot, dogs often pant. This is because;
- A. They use the mouth to breath.
  - B. Sweat glands are absent.
  - C. They expose their teeth when hot.
  - D. They are carnivorous.
34. The most likely habitat for a plant with many stomata on the upper surface of its leaves is
- A. desert
  - B. salty marsh
  - C. high altitude
  - D. water
35. Which one of the following is a long term adaptation of mammals to low environmental temperatures?
- A. Increased metabolism.
  - B. Reduction of blood flow.
  - C. Deposition of fats under the skin.
  - D. Rising of hair.
36. The hormone that is responsible for the conversion of glycogen to glucose in the liver is
- A. secretin
  - B. thyroid
  - C. adrenalin
  - D. insulin
37. Insects in the dry areas conserve water by passing wastes in form of
- A. urea
  - B. uric acid crystals
  - C. ammonia gas
  - D. urine

38. Eating excess proteins at one meal is wasteful because;
- A. Proteins are body building foods and very little is required to build cells.
  - B. Proteins are only used to repair broken down cells.
  - C. Excess proteins cannot be stored in the body.
  - D. Excess proteins are harmful to the circulatory system.
39. Which one of the following does not cause an increase in human body temperature?
- A. Constriction of peripheral blood vessels.
  - B. Shivering of muscles.
  - C. Increased metabolic rate.
  - D. Dilation of deep lying blood vessels.
40. The rate of glomerular filtration is highest in
- A. man
  - B. amphibians
  - C. fresh water fishes
  - D. marine fishes

## SECTION B

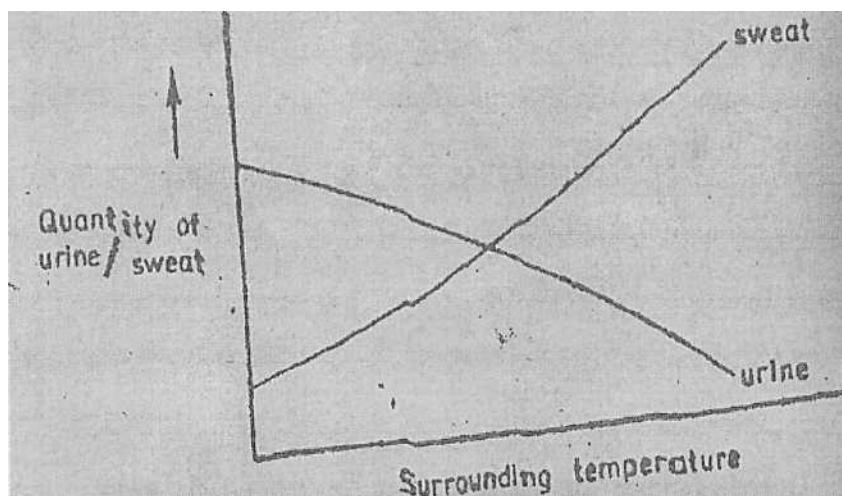
41. Table 1 shows the body surface area and volume of two land mammals A and B. Table 2 shows the rate of metabolism in arbitrary units, of the two animals at varying environmental temperatures.

Mammal	Surface area ( $\text{m}^2$ )	Volume ( $\text{m}^3$ )
A	1.2	0.92
B	0.6	0.18

Environmental temperatures ( $^{\circ}\text{C}$ )	Metabolic rate (arbitrary units)	
	Mammal A	Mammal B
16	10.5	12.9
18	8.9	10.9
20	7.5	9.2
22	6.4	7.8
24	5.6	6.7
26	5.0	5.8

- a) From table 1
  - i) Work out the surface area: volume ratio of each mammal.
  - ii) State the structural difference between mammal A and B.
- b) Using the space provided, plot on the same graph the metabolic rate of the two animals against environmental temperature.
- c) From your graph, determine the metabolic rate of each mammal; at environmental temperature of  $25^{\circ}\text{C}$ .
- d) i) How does the environmental temperature affect the metabolic rate of the mammals?
  - ii) Explain why the variation of temperature affects the metabolic rate of the Mammals as stated in (c)i).
- e) From the information provided, explain why at any environmental temperature, the metabolic rate of mammal B is higher than that of mammal A.

42. The graph below shows the variation in the amount of sweat and urine with temperature in humans.



- a) How does the increase in temperature affect
    - i) Urine production?
    - ii) Sweat production?
  - b) Explain your answers in (a)i) and (ii) above.
  - c) State three conditions under which humans pass out concentrated urine.
  - d) Apart from sweating, state three other body responses by mammals to over heating.
43. In an investigation, two persons A and B drank the same amount of a glucose solution. Their blood sugar levels were determined immediately and thereafter at intervals of one hour for the next 6 hours. The results were shown in the following table.

	Blood sugar level (Mg / 100 ml)	
Time (hrs)	Person A	Person B
0	90	120
1	220	360
2	160	370
3	100	380
4	90	240
5	90	200
6	90	160

- a) Draw a graph of blood sugar levels of persons A and B against time.
- b) Explain each of the following observations.
- Blood sugar level increased in person A between 0 and 1 hour.
  - The blood glucose level dropped in person A between 1 and 4 hours.
- c) From the graph, what is the normal blood glucose level for human beings?
- d) How can the high blood sugar level in person B be controlled?
- e) How can the high blood sugar level in B be controlled?
- f) Suggest a reason for the high sugar level in person B.
- g) What is the biological significance of maintaining a relatively constant sugar level in a human body?
- h) Account for the decrease in the blood sugar level of person B after 4 hours.

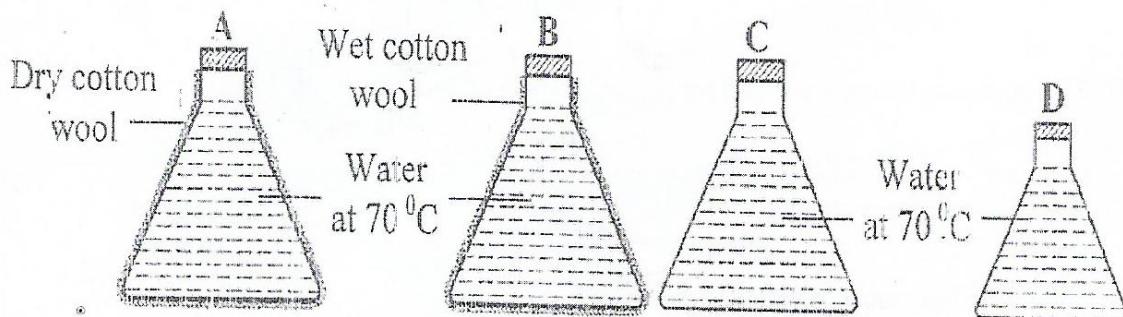
44. Study the table below which relates to the functioning of the Bowman's capsule.

Materials	Concentrations (g/100 cm <sup>3</sup> )		
	Blood plasma	Filtrate	Urine
Urea	0.03	0.03	2.00
Glucose	0.10	0.10	0.00
Amino acid	0.05	0.05	0.00
Protein	8.00	0.00	0.00

- i) Which material does not pass into the capsule?  
ii) Give an explanation for your answer in (a)i) above.
- i) Where is urea produced in the body?  
ii) From which substance circulating in the blood is urea produced?
- i) Name two mammalian organs that an excretory function other than the kidney, ii)  
Name one kidney function other than excretion.
- Which substance in the table would be excreted in larger amounts as a result of lack  
of insulin produced?,
- i) Name the hormone which affects the amount of water reabsorbed in the kidneys?  
ii) Name the process by which water is reabsorbed in the nephrons.

- iii) Name the gland which secretes the hormone named in (c) i) above.
- f. Which process is occurring in the kidney when it performs excretion and osmoregulation?

45. Figure below shows 4 flasks A, B, C. and D each filled with hot water at  $70^{\circ}\text{C}$  and left to cool. Flask A is insulated with dry cotton wool, flask B with wet cotton wool, flask C is not insulated and flask D is smaller in size and not insulated. The flasks represent mammalian bodies.



The table below shows the temperature in each flask in the figure above, recorded at 10 minute intervals for 30 minutes.

Flask	(Temperature ( $^{\circ}\text{C}$ ) at 10 minute intervals)			
	0 (min)	10 (min)	20 (min)	30 (min)
A	70	66	62	60
B	70	50	38	30
C	70	60	53	48
D	70	53	40	38

Study the information and answer the questions that follow.

- a) For each flask, draw a graph to show the changes in temperature with time. Use the same X and Y for all the graphs.
- b) Calculate the average rate of cooling in each flask.
- c) Explain the rate of cooling in
- i) Flask A.

- ii) Flask B.
  - iii) Flask C.
  - iv) Flask D.
- d) From the information, state two factors that affect the rate of cooling from a body.

46. a) State the organ in the human body that secretes insulin hormone,
- b) Explain why a person suffering from diabetes
- i) has to be given regular doses to insulin.
  - ii) has to eat more frequently.
- c) Glucose and not sucrose is recommended to be given to an athlete after a race. Explain observation.

47. The equation below summarizes the regulation of glucose in the liver.

Glucose  $\xrightarrow{\quad}$  glycogen.



- a) Name the hormones
  - i) X.
  - ii) Y.
- b) Name the gland which secretes the two hormones.
- c) State three enzymes produced by the gland named in (b).
- d) What disease is the person likely to suffer from if the gland named in (b) is faulty?
- e) For treatment of the disease named in (d), X is administered to the patient through injection, why isn't X taken orally?
- f) Give any other four functions of the liver.

48. Explain how each of the following features in a mammal affects body temperature.

- a) Size of mammal.
- b) Hair / fur on the skin.
- c) Fat under the skin.

- d) Why is it important to maintain a constant body temperature?
49. a) Which is the excretory organ for nitrogenous wastes
- i) in insects?
  - ii) in an amoeba?
- b) Where is the organ located in the insect body?
- c)
- i) What nitrogenous compound is excreted by the organ in (b) above?
  - ii) Give a reason for the form of the excretory product you have mentioned in (c)i) above.
  - iii) Name any other excretory products in insects.
- d) What other function does the excretory organ in the amoeba perform?

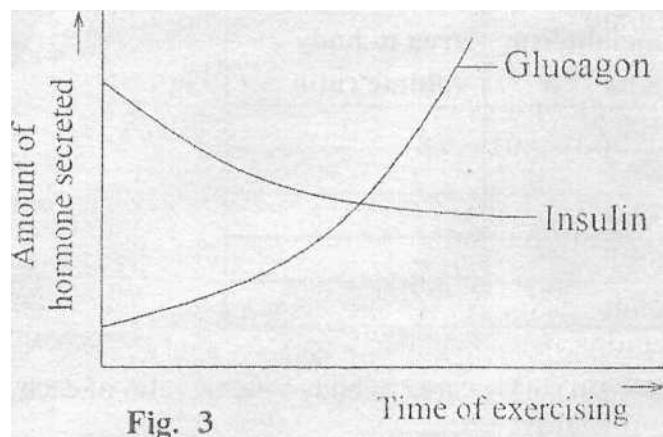
50. The table below shows the skin surface area, body volume and rates of metabolism of five adult land mammals P, Q, R, S and T.

Mammal	Skin surface area ( $\text{m}^2$ )	Body volume ( $\text{m}^3$ )	Rate of metabolism $\text{Kj m}^{-2} \text{h}^{-1}$	Skin surface area to body volume ratio
Z	1.2	0.2	100.2	
M	3.0	0.7	88.2	
Q	4.1	1.1	72.2	
X	6.1	2.5	68.1	
V	7.5	5.0	56.0	

- a. Complete the table by calculating the skin surface area to body volume ratio of each mammal.
- b. Plot a graph showing body volume and surface area to volume ratio.
- c. Using the table, describe the relationship between body volume and
  - i) surface area to volume ratio.
  - ii) the rate of metabolism.
- d. If all the above organisms live in a cold environment, which organism would eat food most frequently? Explain why.
- e. With reasons, suggest the organism that can best survive in the cold environmental conditions.

- f. Describe what happens to the body temperature of each of the following when the environmental temperature increases
- Student.
  - Frog.
- g. Explain the above observations
- Student.
  - Frog.
- h. i) What term is used to describe each of the above organisms with respect to body temperature variation?
- Student.
  - Frog.
- i. What is the importance of organism maintaining a constant body temperature?
- j. What advantages does the student have over the frog?

51. Figure is a graph showing the effect of prolonged exercise on the secretion of insulin and glucagon hormones in a human being.



- Explain the variations in insulin and glucagon during the exercise
  - Insulin.
  - Glucagon.
- Suggest how the concentration of the two hormones would vary if the individual swallowed much glucose after the exercise.
  - Insulin.

- ii) Glucagon.
- c) Explain why it is important for the human body to secrete the insulin and glucagon.
52. An experiment was done with a protozoan living in sea water. The number of times the contractile vacuole forms and discharged in a period of ten (10) minutes was recorded when the protozoa was placed in sea water with varying concentrations. The results obtained were as in the table below.

Number of times the vacuole forms	13	11	10	8	5	4	3	2	1	0
Percentage of salt in sea water	1.0	1.3	1.5	1.9	2.3	2.7	3.4	3.9	4.7	4.9

- a) Using the results in the table below above, draw a graph showing variation of number of times the vacuole forms in 10 minutes with the percentage of salt in sea water.
- b) Using the graph drawn in (a), determine the percentage of salt in sea water that will enable the protozoan form six (6) vacuoles in ten minutes.
- c) State the relationship present between the concentrations of sea water and the number of times vacuole forms in ten minutes.
- d) Explain the relationship stated in (c) above.
- e) Explain what would happen to the protozoan if it was placed in sea water.
- f) State any two substances the contractile vacuole removes from a protozoan.

53. The table below shows how the quantities of sweat and urine vary with external temperature.

External temperature ( $^{\circ}\text{C}$ )	Urine $\text{cm}^3/\text{h}$	Sweat $\text{cm}^3/\text{h}$
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

- Plot the quantities of urine and sweat produced against external temperature.
- At what temperature is the amounts of sweat and urine produced equal?
- What happens to the amount of sweat produced as the temperature rises? Explain your observation.
- Explain the observation made on the amount of urine produced as the temperature increases.
- How is the skin adapted for temperature regulation?

## SECTION C

54. a) What is excretion?

b) With the aid of a labeled diagram, describe the function of the kidney in excretion.

55. a) What is the importance of water to animals?

b) Describe how water balance in the mammalian body is maintained.

56. a) What is meant by excretion?

b) Describe how carbon dioxide is removed from the mammalian body tissues into the atmosphere.

57. a) List any four excretory organs and state the excretory substances each organ eliminates.
- b) Describe various ways through which heat may be lost from a mammal.
58. a) Explain the advantages of ectothermy and endothermy.
- b) A shrew is the smallest animal in Africa. It eats a lot of food which is mainly insects rich in fats. Explain why the shrew eats:
- i) a lot of food.
  - ii) Mainly insects rich in fats.
59. a) Distinguish between excretion and defecation.
- b) Plants face few problems with excretory products as compared to animals. Explain.
- c) Describe the excretory role played by the mammalian kidney.
60. a) Describe how the amount of water in the human body is regulated.
- b) How does the human body restore a low level of glucose in the blood to normal levels?
61. a) Describe the process of urine formation in a mammal.
- b). State any three functions of the mammalian skin.
62. Explain how the mammalian skin is adapted to perform its functions.
63. a) Draw a diagram to show the structure of a nephron. b) Define each of the following and state where it occurs.
- i) Deamination.
  - ii) Ultrafiltration.
  - iii) Selective reabsorption.
64. a) State four functions of the mammalian skin.
- b) Describe how endothermic animals regulate their body temperature.

**END**

**Locomotion**  
**SECTION A**

1. Which one of the following sets of bones makes the axial skeleton?
  - A. Ribs, femur, sternum.
  - B. Sternum, ribs, vertebrae.
  - C. Hind limbs, skull, limb girdle.
  - D. Skull, vertebrae, humerus.
  
2. Muscles are attached to bones by:
  - A. Cartilages
  - B. Tendons
  - C. Muscle fibres
  - D. Ligaments
  
3. A distinguishing feature on the thoracic vertebra is a;
  - A. Long neural spine.
  - B. Big centrum.
  - C. Small neural canal.
  - D. Pair of transverse processes.
  
4. Which one of the following is part of the axial skeleton?
  - A. Humerus
  - B. Femur
  - C. Thoracic vertebra
  - D. Ulna
  
5. Which of the following are structural adaptations to flight in birds?
  - A. Light bones and webbed feet.
  - B. Webbed feet and light feathers.
  - C. Streamlined body and light bones.
  - D. Smooth body and light feathers.
  
6. Which of the following features of an amphibian are suited for aquatic life?
  - A. Possession of wings.
  - B. Muscular hind limbs.

- C. Moist skin without scales.  
D. Webbed toes.
7. Which of the following does not aid flight in birds?  
A. Pectoral muscles      B. Hollow bones  
C. Down feathers      D. Quill feathers
8. In which region of the mammalian vertebral column do the vertebrae have long neural spine and short transverse processes?  
A. Sacrum      B. Lumbar  
C. Thoracic      D. Neck
9. Which one of the following fins provides a major propulsion force in a fish?  
A. Caudal      B. Pectoral  
C. Dorsal      D. Pelvic
10. A student noted the following characteristics on a vertebra.  
i) Long neural spine.  
ii) Wide neural canal.  
iii) Short transverse processes.  
The vertebra was  
A. Cervical      B. Atlas  
C. Thoracic      D. Lumbar
11. The fins which keep a fish stable in water are the;  
A. Anal and dorsal fins.  
B. Dorsal and pelvic fins.  
C. Caudal and pelvic fins.  
D. Pelvic and pectoral fins.

12. Which one of the following structures is found in cervical vertebrae only?

- A. Centrum
- B. Neural spine
- C. Transverse process
- D. Vertebra-arterial canal

13. What happens to insect wings which depressor muscles are relaxed? The wings;

- A. Move down wards.
- B. Move upwards.
- C. Rotate freely.
- D. Move in three directions.

14. Which one of the following pairs of bones forms a ball and socket joint?

- A. Humerus and ulna
- B. Femur and pelvis
- C. Humerus and radius
- D. femur and tibia

15. In fish, the fins which are used in population movements are

- A. Caudal
- B. Dorsal
- C. Pelvic
- D. Ventral

16. Which of the following is a characteristic of cervical vertebra?

- A. Broad neural spine.
- B. Long transverse processes.
- C. Presence of vertebral arterial canals.
- D. Presence of facets.

17. Which one of the following types of feathers is most wide spread?

- A. Covert feather
- B. Floplumes
- C. Quill feathers
- D. Down feathers

18. Which of the following is not a component of joints in the endo skeleton?

- A. Cartilage
- B. Tendon
- C. Ligament
- D. Synovial fluid

19. The following are features in birds. Which of the following is an adaptation of birds for flight.

- i) Light bones                      ii) Webbed feet
  - iii) Presence of feathers        iv) Streamlined body
- A. i) and ii)    B.    ii) and iii)  
C. iii) and iv)    D.    i) and iv)

20. Which of the following conditions are necessary for producing movement in vertebrates?

- i) Muscles must be attached to the end of bones.
  - ii) Muscular bundles must occur in pairs.
  - iii) One of the pair of muscles must be more strongly developed than the other.
  - iv) One pair of muscles must consist of a smooth muscle.
- A. i), iii) and iv)    B. i), ii) and iv)  
C. i), ii) and iii)    D. iii) and iv)

21. Which fins in fish are used for creating a current of water to facilitate breathing while the fish is stationary?

- A. Dorsal fins
- B. Pectoral fins
- C. Pelvic fins
- D. Caudal fins

22. What would happen if a ligament is broke?

- A. Muscles would be detached from bones.
- B. Muscle pull would result.
- C. There would be dislocation of bones during movement.
- D. Synovial fluid would leak out of a synovial membrane.

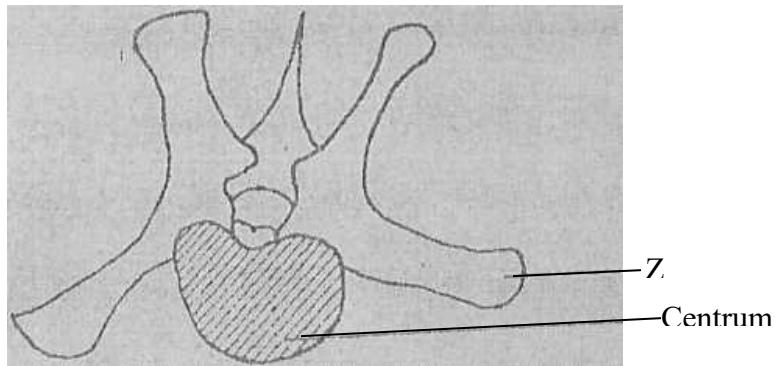
23. Which one of these is not means of movement in protozoa?

- A. Coelom                      B. Flagella
- C. Cilia                        D. Pseudopodia

24. Which one of the following protozoa has cilia?

- A. Amoeba
- B. Euglena
- C. Paramecium
- D. Plasmodium

25.



The diagram above shows a lumbar vertebra. The function of the part labeled Z is for the attachment of

- A. abdominal muscles
- B. diaphragm
- C. thoracic vertebra
- D. rib

26. The most typical characteristic feature of a thoracic vertebra is the presence of

- A. centrum
- B. demifacets
- C. long neural spine
- D. short transverse processes

27. The femur is connected to the pelvic girdle of a mammal by

- A. cartilage
- B. synovial fluid
- C. ligaments
- D. ball and socket joint

28. Which of the following is true of an atlas vertebra?

- A. It has a prominent neural spine.
- B. It has a short neural spine.
- C. The neural canal is very large.
- D. The centrum is modified into odontoid process.

29. From which of the following regions of the body would you find vertebrae with less developed centra?

- A. Thoracic
- B. Lumbar
- C. Cervical
- D. Sacral

30. A tendon is a;

- A. A tissue joining bone to bone.
- B. A tissue joining bone to muscle.
- C. A tissue joining muscle to muscle.
- D. A point where two bones meet.

31. In vertebrates the joint between an axis and atlas vertebrae is known as

- A. ball and socket joint
- B. Hinge joint.
- C. pivot joint
- D. gliding joint

32. A vertebra has a short neural spine, a neural canal, and a vertebral arterial canal, from the description, the vertebra belongs to:

- A. cervical region
- B. thoracic region
- C. lumbar region
- D. caudal region

33. To which of the following bones is the biceps muscle attached?

- A. clavicle
- B. radius
- C. humerus
- D. Ulna

34. When the triceps contracts

- A. The arm is straightened.
- B. The hand is pulled closer to the shoulder.
- C. The arm is raised.
- D. The hand is straightened.

35. Which of the following sets of bones make up the hind limb in humans?

- A. Radius, tibia, fibula.
- B. Femur, tibia, fibula.
- C. Tibia, fibula, humerus.
- D. Tibia, radius, ulna.

36. Which one of the following features of a bird does not aid flight?

- A. Long quill feathers.
- B. Hollow bones'.
- C. Strong flight muscles.
- D. Thick down feathers.

37. To which one of the following bines is the biceps muscle attached by tendons?

- A. Scapula and radius.
- B. Humerus and radius.
- C. Scapula and ulna.
- D. Humerus and ulna.

38. A mammalian lumbar vertebra has the following structures except;

- A. zygapophyses
- B. vertebraterial canals
- C. neural canal
- D. metapophyses

39. Which of the following are used by the fish to stabilize while in water?

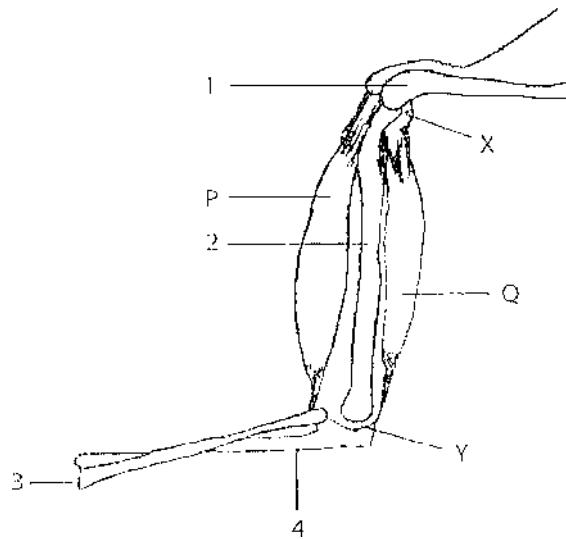
- A. Dorsal fins and pectoral fins.
- B. Pectoral fin.
- C. Dorsal and vertebral fins.
- D. Ventral fins.

40. The most typical characteristic feature of a thoracic vertebra is the presence of;

- A. Centrum.
- B. Short neural canal.
- C. Long neural spine.
- D. Short transverse process.

## SECTION B

41. The figure below shows the bones and two of the muscles in the human arm.



a) Name the parts labeled A to F on the figure above.

1..... 2 .....

P ..... 4 .....

Q ..... 3 .....

b) Name the type of joint present in the part labeled Y.

c) Briefly describe the changes that occur in the human arm to bring about its;

i) Bending.

ii) Straightening.

d) Distinguish between movement and locomotion.

42. a) Explain why an exo skeleton restricts the size to which an animal can grow,

b) Name the part that:

i) attaches bones to bones.

ii) attaches bones to muscles.

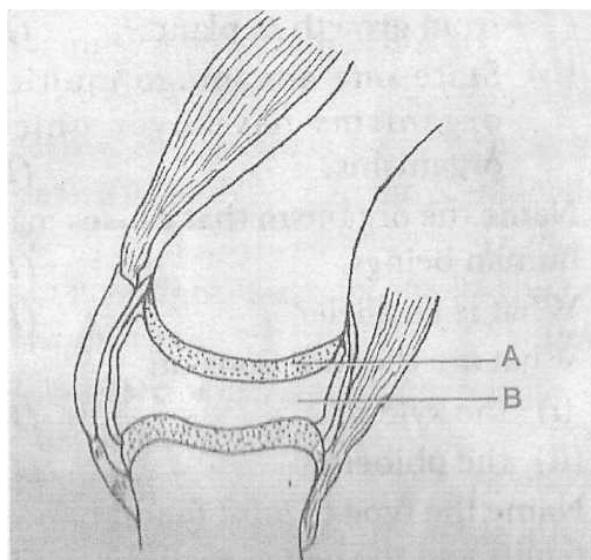
iii) acts as shock absorber where two bones articulate.

43. a) Name the parts of the body where the following joints are found:

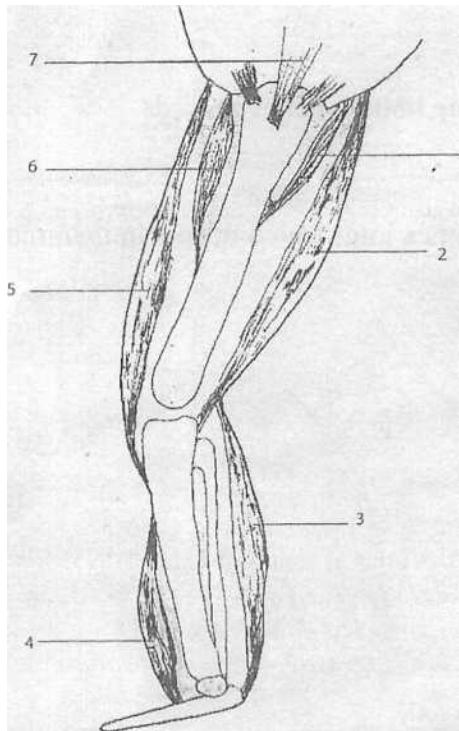
- i) Fixed joints.
- ii) Pivot joints.
- iii) Ball and socket joints.
- iv) Gliding joints

b) State the importance of having hollow bones in birds.

44. The diagram below represents a joint which occurs in mammalian limb.



- a) Name the parts labeled A and B.
- b) Explain how the joint is adapted to its functions.
- c) State two characteristics of the joint.
- d) What are the structural characteristics of smooth muscle?



45. The figure above represents a human leg and its main muscles.

a) State the function of the muscles labeled 1, 2, 3 and 4.

b) Which muscle is antagonistic to muscle:

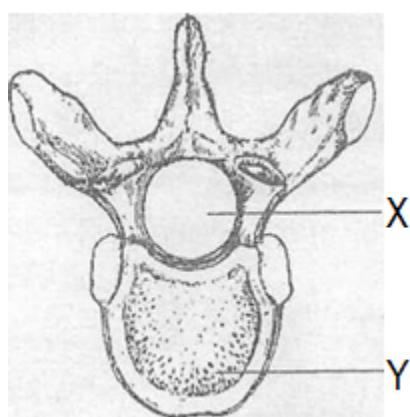
(i) 2?                   (ii) 4?

c) To which bones is muscle labeled 1 attached?

d) i) How many bones are there in the ankle region?

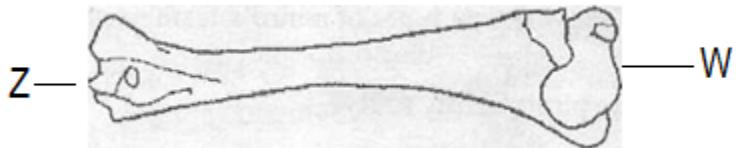
iii) What are those bones called?

46. The figure below is the front view of a human bone.



- a) State the characteristics that the bone is a vertebra
- b) (i) What type of vertebra is it?  
 ii) Give reasons to support your answer.
- c) What features shown in the figure indicates that it is the front and not the back view?
- d) What structure passes through X?
- e) (i) Name the structure found between two such vertebrae at place marked Y.  
 (ii) How is the structure suited to its function?

47.



- a) Identify the long bone in the figure above
- b) Which bone articulates at point marked W?
- c) Which type of joint is formed at W?
- d) Which bone articulates at point marked Z?
- e) What type of joint is formed at Z?

48. Figure 1 and figure 2 represents the parts of a mammalian skeleton.

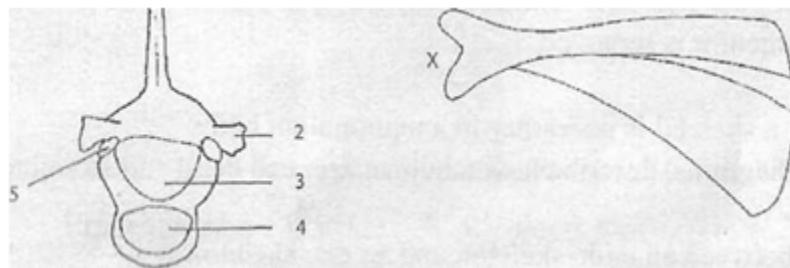


Fig. 1

Fig. 2

- a) (i) Identify the bone given in the figure 1.  
 ii) Name the parts labeled 1 to 5.  
 iii) (i) Identify the bone given in figure 2.  
 ii) Name the long bone which articulates at X.  
 iv) Name the type of joint formed at X.

## **SECTION C**

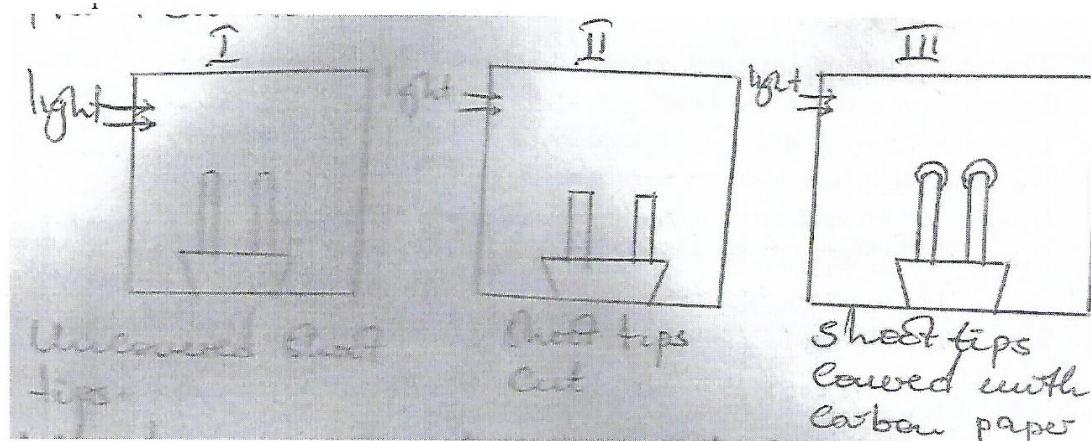
49. a) How are birds adapted to flight?
- b) With the aid of diagrams, describe how wings are moved up and down during flight in a bird.
50. a) Describe the structure of the different types of a bird's feathers stating the function of each type.
- b) What factors contribute to the bird's ability to fly?
51. a) What are the functions of a skeleton in mammals?
- b) With the aid of a labeled diagram, describe how movement is caused in a named hinge joint in a mammal.
52. a) Explain why skeleton is necessary in a mammalian body.
- b) With the aid of diagrams, describe how a human arm can be bent and straighten.
53. a) Describe the structure of the different types of skeletons in animals, giving an example in each case.
- b) Explain how the vertebral column in mammals is adapted to its functions.
54. A small insect lands on your nose and you remove the insect with your hand. Explain what happens in your nervous, muscular and skeletal systems from the moment the insect lands to the moment it is removed.
55. a) Explain why a skeletal is necessary in a mammalian body.
- b) With the aid of diagrams, describe how a human arm cab bend and straighten.
56. a) Distinguish between an endo skeleton and an exo skeleton.
- b) Give five functions of the mammalian skeleton.
- c) Explain how muscles cause movement of the lower arm in man.

**END**

**Coordination**  
**SECTION A**

1. Which one of the following parts of the ear regulates air pressure?  
A. Ear drum                      B. Round window  
C. Oval window                  D. Eustachian tube
  
2. Which one of the following is a nastic response?  
A. Bending of a plant shoot towards light.  
B. Folding of a plant leaflets when touched.  
C. Growing of plant roots towards water.  
D. Bending of plant root towards gravity.
  
3. Under activity of the thyroid gland in a child may result into;  
A. Over weight and sluggishness.  
B. Thinness and over activity.  
C. Stunted growth and mental retardation.  
D. Increased metabolic rate and restlessness.
  
4. The hormone which causes ovulation is called  
A. Follicle stimulating hormone.  
B. Progesterone.  
C. Luteinizing hormone.  
D. Oestrogen.

5. The figure represents a set up of experiments to show the effect of unilateral lighting on plant shoots.



Which experiment(s) would the shoots grow straight?

- A. I and II
  - B. II and III ,
  - C. I and III
  - D. Ill only
6. Which of the following is affected when the cerebrum is damaged?
- A. Breathing and heart beat.
  - B. Memory and voluntary actions.
  - C. Body balance and osmoregulation.
  - D. Osmoregulation and temperature control.
7. Which one of the following sets of hormones produced by mammalian reproductive organs?
- A. Follicle stimulating hormone and testosterone.
  - B. Progesterone and testosterone.
  - C. Oestrogen and luteinizing hormones.
  - D. Follicle stimulating hormone and oestrogen.
8. Stunted growth and mental retardation in children may be due to;
- A. Under production of pituitary hormone.

- B. Under production of insulin.  
C. Deficiency of thyroxine hormone.  
D. Deficiency of adrenaline hormone.
9. Which of the following organs contain glands which are part of the endocrine system?  
A. Liver, pancreas, heart                    B. Brain, pancreas, ovary  
C. Brain, testes, heart                    D. Kidney, heart, liver
10. Which one of the following best describes the effect of one - sided illumination on the distribution of auxins in a shoot tip?  
A. The auxins are evenly distributed around the tip.  
B. The light inhibits movement of auxins down the tip.  
C. There is a reduction of auxins on the illuminated side of the tip.  
D. The auxins increase on the illuminated side of the tip.
11. Which one of the following structures of the ear equalizes pressure on both sides of the ear drum?  
A. Oval vein dowe                        B. Round window  
B. Eustachian tube                        D. Semi-circular canal
12. Which one of the following parts of the mammalian ear is concerned with balance?  
A. Cochlea                                B. Semi circular canal  
C. Eustachian tube                        D. Oval window
13. When a growing shoot is placed horizontally, it bends upwards after sometime. Which of the following best explains this response?  
A. High auxin concentration on the upper side inhibits growth on the upper side.  
B. High auxin concentration on the lower side makes the lower side grow faster.  
C. Lack of auxin on the upper side inhibits growth on the upper side.  
D. Low auxin concentration on the lower side makes the lower side grow faster.

14. Which one of the following is not caused by oestrogen?
- A. Healing of the uterine wall.
  - B. Growth of the uterine wall.
  - C. Inhibiting further secretions of follicle stimulating hormone.
  - D. Causing ovulation.

15. What happens when the ciliary muscle of a mammalian eye contract?
- A. Thicker lens sees far objects.
  - B. Thinner lens sees near objects.
  - C. Thicker lens sees near objects.
  - D. Thinner lens sees far objects.

16. What effect does light have on the distribution of auxin at the top of a plant shoot?
- A. Causes equal distribution of auxins at the shoot tip.
  - B. Has no effect on the distribution of auxins at the shoot tip.
  - C. Concentrates more auxins on the dark side of the shoot tip.
  - D. Causes auxins to concentrate more on the illuminated side of the shoot tip.

17. When a seedling is fixed on a clinostat and placed in a horizontal position, the shoot continues to grow horizontally but without the clinostat it bends upwards. Which one of the following is true about the role of the clinostat?
- A. Enables the seedling to receive uniform light.
  - B. Causes auxins to accumulate on the upper side of the seedling.
  - C. Causes auxins to accumulate on the lower side of the seedling.
  - D. Causes auxins to accumulate uniformly on all sides.

18. Which one of the following controls the rate of heart beat in a mammal?
- A. Cerebrum
  - B. Medulla oblongata
  - C. Pituitary
  - D. Cerebellum

19. What is the main function of the choroid layer in the human eye?
- A. Focusing rays of light on the retina.
  - B. Supplying nutrients to the eye.
  - C. Bringing about accommodation.
  - D. Controlling the amount of light entering the eye.
20. The effect of unidirectional light on the distribution of auxins in the tip of a plant shoot is;
- A. Uniform distribution of auxins around the tip.
  - B. Reduction in concentration of auxins on the illuminated side of the plant.
  - C. Increase in auxins on the illuminated side of the plant.
  - D. Inhibition of movement of auxins down the plant.
21. What is the function of Eustachian tube in the human ear?
- A. Detection of body pressure.
  - B. Equalizing pressure in middle ear.
  - C. Transmission of sound waves to the inner ear.
22. Which of the following is a function of thyroxine hormone?
- A. Promotes development of follicles in the ovary.
  - B. Prepares the body for fight - flight action.
  - C. Controls the body metabolic rate.
  - D. Regulates sugar content of the body.
23. Which one of the following responses is a directional growth movement?
- A. Taxis
  - B. Reflex
  - C. Tropic
  - D. Nastic
24. Which one of the following hormones is responsible for ovulation in a mammal?
- A. Oestrogen.
  - B. Progesterone.

- C. Follicle stimulating hormone.  
D. Luteinizing hormone
25. Which of the following is not true about mutation?  
A. Mutation may affect single genes or chromosomes.  
B. All mutations produce harmful effects.  
C. A mutant gene can be passed on to the offspring during fertilization.  
D. Mutations are the raw materials for evolution.
26. Which one of the following parts of the ear transmits sound waves from the middle ear to the inner ear?  
A. Tympanic membrane  
B. Ossicles  
C. Auditory nerve  
D. Oval window membrane
27. Removal of the thyroid gland in a young child may lead to;  
A. Stunted growth and mental retardation.  
B. Failure to develop secondary sexual characteristics.  
C. Development of diabetes.  
D. Increased metabolic rate and restlessness.
28. Which one of the following hormones is not secreted from the pituitary gland?  
A. Gonadotrophic hormone      B. Luteinizing hormone  
C. Progesterone hormone      D. Follicle stimulating hormone
29. Which one of the following represents a reflex arc?  
A. Receptor → motor neurone → central nervous system → sensory neurone → effector.  
B. Receptor → sensory neurone → central nervous system → motor neurone.  
C. Receptor → CNS → motor neurone → sensory neurone → effector.  
D. Receptor → sensory neurone → central nervous system → motor neurone → effector.

30. Which one of the following controls the activities of other ductless glands?

- A. Thyroid
- B. Adrenal
- C. Pituitary
- D. Islets of langerhans

31. Which of the following is true about nastic response?

- A. Depends on the direction of the stimulus.
- B. Does not involve hormones.
- C. It is relatively slow.
- D. Does not involve only growth.

32. Short sightedness is caused by the;

- A. Lens becoming thicker.
- B. Suspensory ligament becoming shorter.
- C. Contraction of the ciliary muscles.
- D. Expansion of Iris muscles.

33. Which one of the following is true about the nervous system of a mammal?

- A. Cell bodies of the sensory neurons are found in the ganglia.
- B. Cell bodies of the sensory neurons are found in the grey matter.
- C. Sensory neurones transmit impulses from the central nervous system.
- D. Cell bodies of sensory neurones are found in the receptors.

34. The main function of the Eustachian tube in the mammalian ear is to

- A. Concentrate the sound waves into the middle ear.
- B. Transmit sound waves to the brain.
- C. Transmit sound waves to the middle ear.
- D. Regulate pressure in the middle ear.

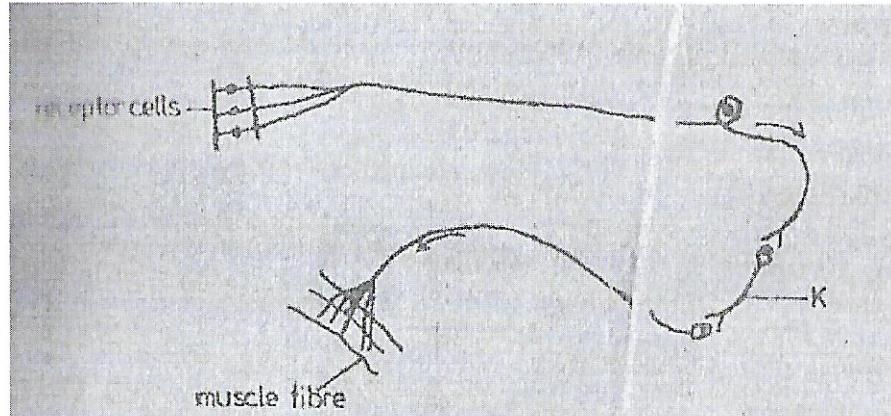
35. Which one of the following is an example of a tactic response?

- A. Rolling up of leaves on a sunny day.
- B. Withdrawal by blowfly larvae from light.
- C. Withdrawal of the hand from a hot object.
- D. Bending of a plant shoot towards light.

36. Nerves, the spinal cord and the brain make up

- A. a tissue
- B. an organ
- C. a system
- D. an organism

37.



The figure above is a simplified reflex arc. The part labeled K is

- A. The relay neurone
- B. A ganglion
- C. The sensory neurone
- D. The motor neurone

38. Which one of the following shows the correct path followed by light rays to produce an image at the retina?

- A. Cornea, aqueous humor, lens, pupil, vitreous humor, retina.
- B. Cornea, vitreous humor, pupil, lens, aqueous humor, retina.
- C. Cornea, pupil, vitreous humour, lens, aqueous humor, retina.
- D. Cornea, aqueous humor, pupil, lens, vitreous humour, retina.

39. The part of the brain that controls breathing is the

- A. cerebellum
- B. medulla oblongata
- C. cerebrum
- D. hypothalamus

40. Which of the following links the middle ear with the skull?

- A. Stapes
- B. Ear drum
- C. Round window
- D. Oval window

## SECTION B

41. A biologist carried out an experiment to determine how auxins affect root and shoot growth. Different amounts of auxins in (ppm) were supplied to roots and shoots, the resulting growth responses of both shoot and roots are as follows in the table below (negative values are as a result of growth inhibition, while positive value are as result of growth stimulation).

Concentration of auxin / ppm	$10^{-6}$	$10^{-3}$	$10^{-4}$	$10^{-3}$	$10^{-2}$	$10^{-1}$	0	1	2	3
Percentage growth response of	0	0	0	0	20	100	200	100	0	-75
Percentage of growth response of	0	25	30	10	-20	-60	-80	-100	-100	-100

- a) Using an appropriate scale (s) and on the same graph, draw graphs to represent the percentage growth response of shoots and roots with varying auxin concentration.
- b) Form your graphs; describe the growth response of shoots and roots at different concentration of auxins.
- c) i) How does light influence the distribution of auxins and what effect does this induce in shoots and roots?

Shoots

Root

ii) Give the significance of the plant responses you have stated in c(i) above to plants.

d) State any two properties of hormones.

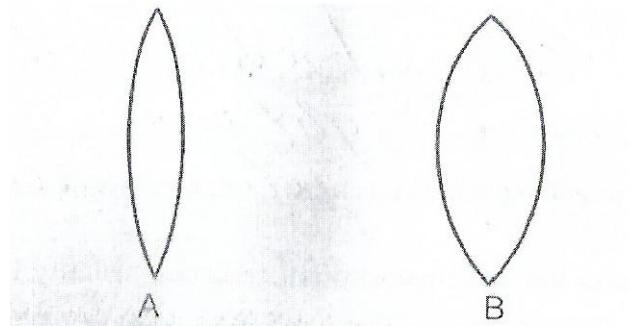
42. A student carried out an experiment using three transparent boxes X, Y and Z with each box containing two small holes at the top. In each case, 100 termites were placed in the separate boxes, with box Y containing four big stones. Three boxes were then placed in different conditions where the boxes Y and Z were transferred to a bright light while box was introduced to a dark room. Then three hens which fled on these termites were introduced in each of the boxes and the change in the number of termites was determined at intervals of 30 seconds for a period of 3 minutes. The results are shown in the table below.

Time / minute	Number of termites		
	X	Y	Z
0	100	100	100
30	98	95	85
60	97	90	70
90	96	85	59
120	96	83	53
150	96	82	50
180	96	81	47

- a) Using the same axes, draw three graphs to show the changes in the number of termites in each box with time.
- b) Describe what happens to the number of the termites in each of the boxes.

- i) X.
  - ii) Y.
  - iii) Z.
- c) Explain the observed change in the number of termites in each of the box.
- i) X.
  - ii) Y.
  - iii) Z.
- d) Why were all the boxes used containing small holes at their top?

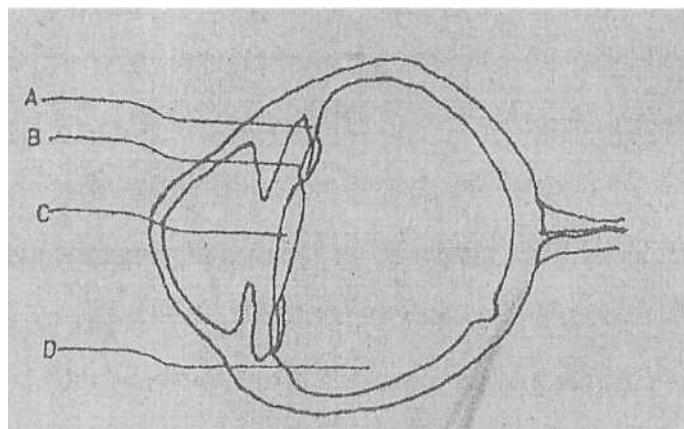
43. Figure below shows the shapes of lenses A and B in a mammalian eye when accommodating for a near and distant object.



- a) Giving a reason, identify which of the lenses in figure 4, represents accommodation for a
- i) Near object.
  - ii) Distant object.
- b) Describe how the shape of the lenses is brought about during accommodation.
- i) Shape A.
  - ii) Shape B.

- c) Explain the importance of adjustment in pupil size when an individual moves into a bright light.

44. Figure below shows a section through the human eye.



- a) Name the parts labeled A, B, C and D

A

B

C

D

- b) What function is performed jointly by the parts A, B, C and D?

- c) Other than the join function, state two other functions of the part labeled D.

- d) Give the state of parts A, B and C when the eye is viewing

- i) Near objects                    ii) Distant objects

A

A

B

B

C

C

45. a) i) Name one organ in mammals which has roles in both digestion and endocrine system.

- ii) Give one role in each case of the organ named in the

Digestion system

Endocrine system

- b) Draw a diagram to show the location of the major endocrine glands in the human body,
- d) State any three functional differences between endocrine and nervous systems.

46. a) What is accommodation?

- b) How does the human eye adjust itself in order to focus a
- i) Near object.
  - ii) Distant object.
- c) Describe the adjustments of the eye when viewing an object in
- i) Bright light.
  - ii) Dim light.
- d) Using diagrams, describe what is meant by short and long sightedness.
- e) Illustrate how each is corrected.
- f) Describe the path taken by light from an object to when it is interpreted by the brain.

47. a) The table below refers to the hormones involved in human reproduction. Complete the table by writing the appropriate work in the spaces.

Hormone	Role in reproduction
	Repair of uterine endometrium
Prolactin	
	Terminates ovulation
Progesterone	
	Sperm production
Follicle stimulating hormone (FSH)	

- b) Give three advantages a human embryo has over a frog's embryo during development.

48. a) State the functions of each of the following parts of the ear.

- i) Tympanic membrane.

- ii) Eustachian tube.
  - iii) Ear ossicles.
  - iv) Auditory nerve.
- b) How is each of the following parts of the ear adapted to its function?
- i) Organ of corti.
  - ii) Cochlea.
  - iii) Semi circular canals.
- c) Explain how hearing occurs in human beings.

49.

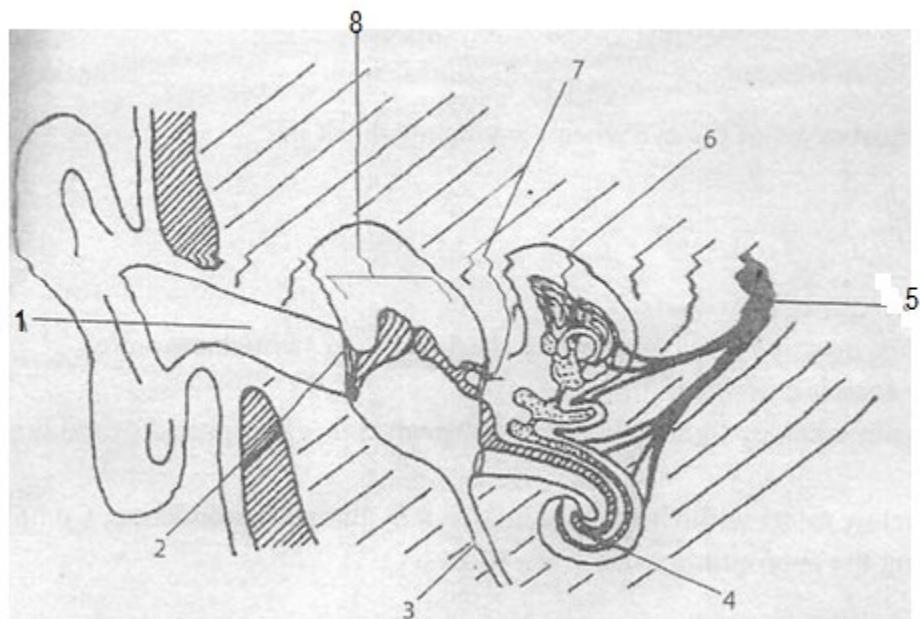


Figure above shows the structure of a human ear.

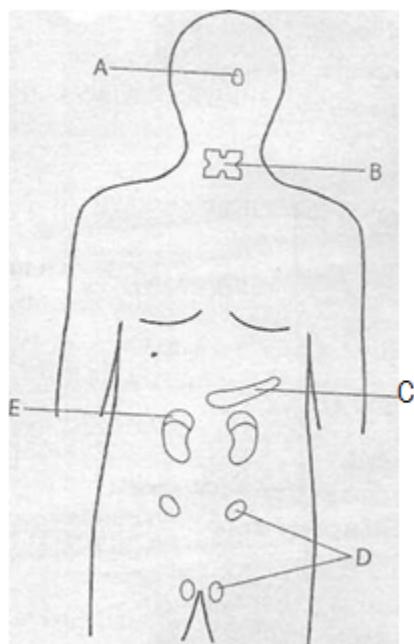
- a) Name the parts labeled 1 to 8
- b) State the functions of parts labeled 2, 3, 4, 5 and 6.

- c) Where does part 3 lead to?
- d) When part 3 is blocked, part 2 becomes?
- e) Hardening of part 7 causes?

49. a) Distinguish between tropism and taxis in plants,
- b) Name the types of responses exhibited by:
    - i) Leaves of mimosa pudica when touched.
    - ii) Plants growing in a dark room with one source of light.
    - iii) Roots growing in a pot with water one side.
    - iv) Opening of flowers of morning glory during the day time and closing later at night.
    - v) Shoot of a plant growing upwards out of the ground.
    - vi) Flowers of insectivorous plants when they are touched by an insect.

50. a) Define the term nerve impulse.
- b) Write two structural differences between the sensory and the motor neurones.
  - c) What is the functional difference between the sensory and the motor neurones?

51.



The figure above represents the position of endocrine glands in the human body

- a) Name the glands labeled A to E
- b) i) Which gland produces the hormone that prevents cretinism?  
iii) Which hormone does the gland produce?
- c) Which of the glands labeled A to E is called the master gland?
- d) Mr. Joseph had an accident at the age of seven. A hospital diagnosis revealed that part of his endocrine system had been affected. He is now 30 yrs old, yet he sounds like a boy and has not grown any beard. Which gland has been affected?
- e) Name the hormone in blood which decreases the blood glucose level.
- f) Name the gland that produces this hormone
- g) When a man is frightened, which hormone in the blood stream increases the blood glucose concentration?
- h) If the gland in (f) above does not function properly, blood glucose can not be retained and is lost from the body. Name the organ from which this glucose is eliminated from the blood.

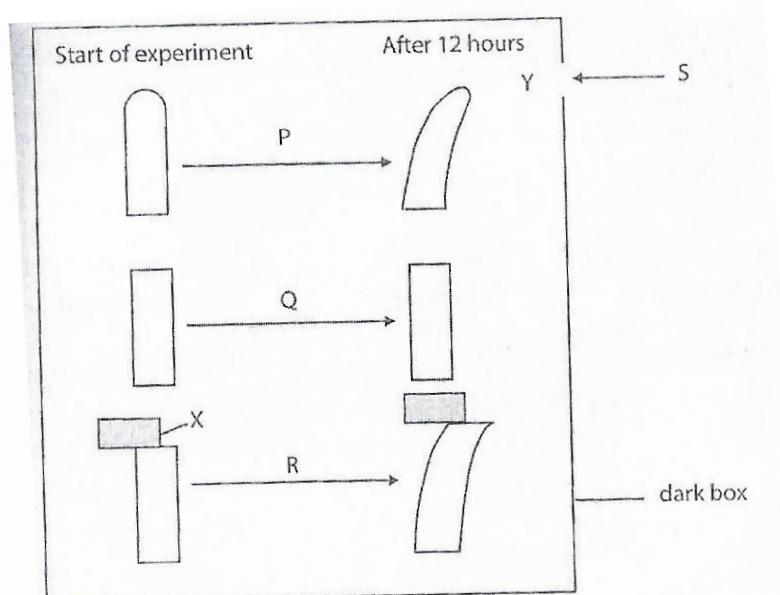
52. The figure below represents an experiment set up by a biologist to demonstrate the effect of stimulus S on the coleoptiles of oat seedlings.

The coleoptiles were treated as follows:

P- Tip untouched Q- Tip cut off

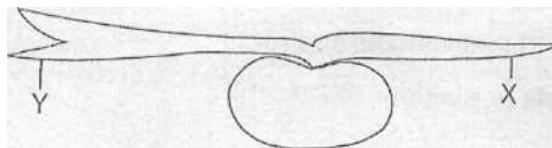
R- Tip cut off and replaced with agar block X.

The three seedlings were left for 12 hours in a dark box with a hole at Y.



- a) (i) Name the stimulus S  
ii) Which part of the coleoptiles is affected by stimulus S? Give reasons to support your answer.
- b) (i) Which substances in the coleoptiles, brings about the observed behavior of the seedling?  
(ii) How does stimulus S affect the distribution of this substance?  
(iii) How does the distribution of this substance affect the growth of coleoptile P?
- c) Why did the coleoptiles R respond in the same way as coleoptiles P responded?  
d) Name the type of response exhibited in the above experiment.  
e) What does the above experiment demonstrate?  
f) Which of the above seedlings P, Q, R can be regarded as control experiment? Give reasons for your answer.  
g) In another experiment, the coleoptiles tip of the oat seedling was cut off and replaced. The seedling was kept in a dark box with a hole on one side. How did the coleoptiles of the seedling respond to stimulus S?

53. The figure below is a bean seedling. It is placed in a dark box in moist conditions such as cotton wool, to supply water all around the seedling.



- a) Why was the seedling kept in the dark?  
b) Why was water kept equally all round the seedling?  
c) Name the parts labeled X and Y.  
d) Any change that occurs in parts X and Y whilst in the dark will be brought by a stimulus and a response.

- (i) Name the stimulus.
- (ii) Name the response in X.
- (iii) Name the response in Y.

## **SECTION C**

54. a) What is meant by tropism?
- b) Describe the importance of the different types of tropisms in plants.
55. Describe how sound produced externally is heard by the human ear.
56. a) Define
- i) Photo tropism
  - ii) Geo tropism
- b) Describe an experiment you would carry out to determine the effects of gravity on the root of a dicotyledonous plant.
57. a) What is accommodation?
- b) Suppose a boy was sitting in a dimly - lit room reading a book, then he suddenly stepped out of the room into a bright sunshine to look at an aeroplane in the sky. Describe the sequence of events which would occur in his eyes to enable him see the aeroplane clearly. C
- c) Explain why many old people use glasses to read.

58. a) What are tropisms?  
b) Explain how auxins affect growth in plant shoots and roots.  
c) Describe the importance of tropisms in plants.
59. A small insect lands on your nose and you remove the insect with your hand. Explain what happens in your nervous, muscular and skeletal systems from the moment the insect lands to the moment it is removed.
60. a) Give four differences between nervous and hormonal coordination.  
b) Draw a well labeled diagram of a motor neurone.  
c) Briefly describe Pavlov's experiment on the conditioned reflex action.
61. a) Define the term geotropism.  
b) With the help of diagrams, describe an experiment to show that plant roots are positively geotropic.  
c) Outline the importance of tropic responses in plants.
62. a) State the structural differences between a motor neurone and a sensory neurone.  
b) With illustrations, describe what happens when a person unexpectedly touches a hot object.
63. a) What is an endocrine gland?  
b) Draw and label a diagram showing the location of the endocrine glands in the human.  
c) Outline the role of the master gland in the body.

**END**

**Ecology**  
**SECTION A**

1. Which of the following would not contribute to the accuracy of the capture - re capture method of estimating population size?
  - A. Using a stable population.
  - B. Capturing animals selectively.
  - C. Use of very small marks.
  - D. Allowing time before the recapture.
2. In a parasitic association between two organisms;
  - A. Both members benefit.
  - B. Only one member benefits.
  - C. Both members suffer harm.
  - D. Neither member is harmed.
3. Lichens are usually the first plants to colonise a rocky surface because they;

- A. Possess strong roots.
  - B. Require little water.
  - C. Are resistant to desiccation.
  - D. Are able to photosynthesize.
4. Which one of the following would occur if the number of predatory bugs was increased in the food chain below?
- Plants → caterpillars → predatory → birds.
- A. Decrease in number of birds.
  - B. Increase in number of plants.
  - C. Increase in number of caterpillars.
  - D. Decrease in number of plants.
5. Which one of the following associations do both organisms benefit?
- A. Malarial parasite and human.
  - B. Tapeworm and human.
  - C. A fungal parasite and plant.
  - D. Nitrogen fixing bacteria and leguminous plant.
6. Which one of the following methods would be the best for estimating population density of rats in a bush?
- A. Direct continuing
  - B. Quadrant method
  - C. Line transect
  - D. Capture - recapture method
7. Which one of the following would be a correct sequence of plant succession on an abandoned tarmac road?
- A. Mosses → herbs → shrubs → trees.
  - B. Herbs → mosses → shrubs → trees.
  - C. Shrubs → herbs → trees → mosses.
  - D. Mosses → herbs → trees → shrubs.

8. Which one of the following is likely to cause pollution in water?
- A. Over fishing                    B. Boat racing  
C. Use of fertilizers              D. Use of farmyard manure
9. Which of the following describes the carrying capacity of a population?
- A. Maximum number of organisms that can reproduce freely in a habitat.  
B. Area occupied by organisms of different species.  
C. Maximum number of organisms that can be supported by a specific area.  
D. Maximum number of plants that can support animals in a given area.
10. Which of the following biological processes describes a fungus growing on the leaves of a living potato plant?
- A. Predation                      B. Competition  
C. Parasitism                    D. Saprophytism
11. Which one of the following methods can be used to estimate the population of butterflies in a flower garden?
- A. Direct count                  B. Quadrat  
C. Line transect                D. Capture - release – recapture
12. Bacteria that often live in their hosts where both partners cannot survive without the other are called
- A. parasites                      B. symbionts  
C. commensals                    D. saprophytes
13. Which one of the following is the possible sequence of plant succession on an underdeveloped piece of land?
- A. Fungi      ferns              shrubs              tress.  
B. Fungi      mosses              shrubs              trees.  
C. Mosses      trees              fungi              ferns.

D. Mosses      herbs      shrubs      trees.

14. The tapeworm *Taenia solium* has a primary and a secondary host. Which of the following are primary and secondary hosts in that order?

- A. Pig and man
- B. Cow and man
- C. Man and cow
- D. Man and pig

15. Which one of the following would be the first to colonize a rocky surface?

- A. Lichens
- B. Mosses
- C. Shrubs
- D. Ferns

16. Why does the tissue of the lizard contain the highest concentration of organic chloride?

Because the;

- A. Lizard eats all the organisms in the food chain.
- B. Organic chloride remains persistent in the food chain.
- C. Organic chloride is cumulative in the tissues of the organisms.
- D. Organic chloride is not toxic to lizard.

17. Which one of the following is an example of biological control of pests?

- A. Application of pesticides.
- B. Destruction of pests' habitats.
- C. Interruption of pests' breeding cycle.
- D. Introduction of pests' predators.

18. Which one of the following has the best energy content in a food chain?

- A. Producer
- B. Secondary consumer
- C. Tertiary consumer
- D. Primary consumer

19. Which of the following vegetative plant would appear earliest in a rocky habitat?

- A. Moss
- B. Lichens
- C. Algae
- D. Ferns

20. Which one of the following methods would you use to estimate the frequency of a plant species in an area?

- A. Quadrat method
- B. Belt transect
- C. Line transect
- D. Random sampling

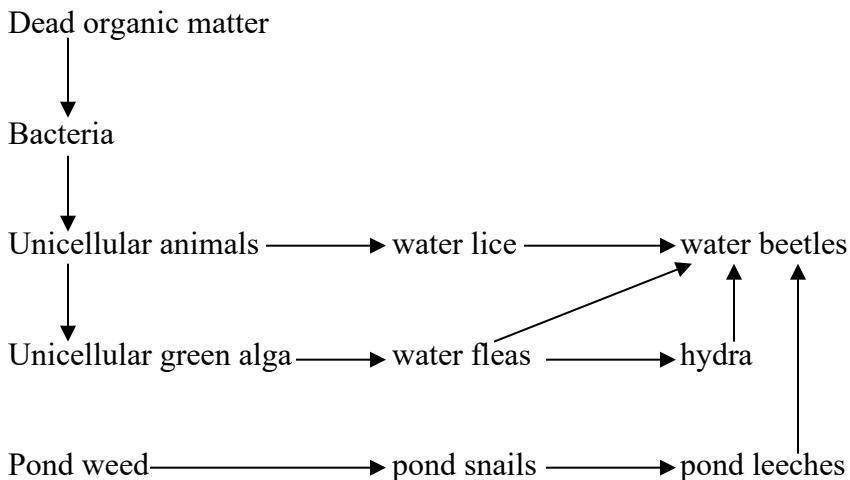
21. Within an ecosystem, the total number of secondary consumers must be;

- A. Less than the total number of herbivores.
- B. Greater than the total number of the herbivores.
- C. Equal to the total number of producers.
- D. Constant year after year.

22. What do the rhizobium bacteria gain in their association with leguminous plant?

- A. Air
- B. Heat
- C. Shelter
- D. Nitrates

Study the food web below and use it to answer questions 25 and 26.



23. In this food web, which of the following groups of organisms are primary consumers?

- A. Pond leeches and water falls.

- B. Pond snails and unicellular animals.
- C. Hydra and water beetles.
- D. Bacterial and water fleas.

24. In this food web which one of the following groups of organisms are decomposers?

- A. Unicellular green algae
- B. Water beetles
- C. Water lice
- D. Bacteria

25. Which of these statements is not true of an ecosystem?

- A. Consumers use less food compared to what producers make.
- B. One of the ways of constructing a food chain is by observing the animals feeding.
- C. The numbers of organisms decrease from the bottom to the top of the pyramid of numbers.
- D. Because of mains feeding habits, he can be placed in any of the feeding levels.

26. Below are some food chains: Which one of them is correct?

- A. Dead wood → termite → chicken.
- B. Chameleon → mantid → grasshopper.
- C. Termite → hawk → snake.
- D. Carnivore → plant → herbivore.

27. The living together of a fungus and an alga as a lichen is called

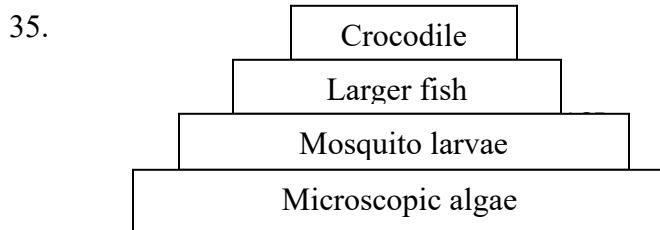
- A. symbiosis
- B. parasitism
- C. saprophytism
- D. commensalism

28. In an eco system, the survival of all living things depends on

- A. decomposers
- B. primary producers
- C. primary consumers
- D. secondary consumers

29. If a gecko on a wall is seen eating mosquitoes, flies, moths and grasshoppers, this animal is said to be

- A. parasite
- B. symbiont



Which one of the following would help in reducing the number of mosquito larvae?

- A. Increase in the number of microscopic algae.
- B. Increase in the number of larger fish.
- C. Increase in the number of crocodiles.
- D. Decrease in the number of small fish.

36. Which group of organisms is least limited in the sources of food?

- A. Carnivores
- B. Saprophytes
- C. Omnivores
- D. Herbivores

37. Ecological systems often have producers, consumers, predators and preys. Which organisms maintain the balance of the ecosystems?

- A. Preys
- B. Consumers
- C. Producers
- D. Predators

38. There were many termites in leaf litter layer decomposing it while ant eaters fed on the termites faster. The relationship can best be illustrated using;

- A. pyramid of biomass
- B. food web
- C. food chain
- D. pyramid of energy

39. The term used to describe the process in changes in types of organisms in a given location is known as

- A. competition
- B. food chain
- C. habitat
- D. succession

40. Which one of the following is the definition of a community?

- A. Place where an organism lives.
- B. Number of species interacting in a locality.
- C. Nutritional inter-relationships of organisms.
- D. Influence of one organism on another.

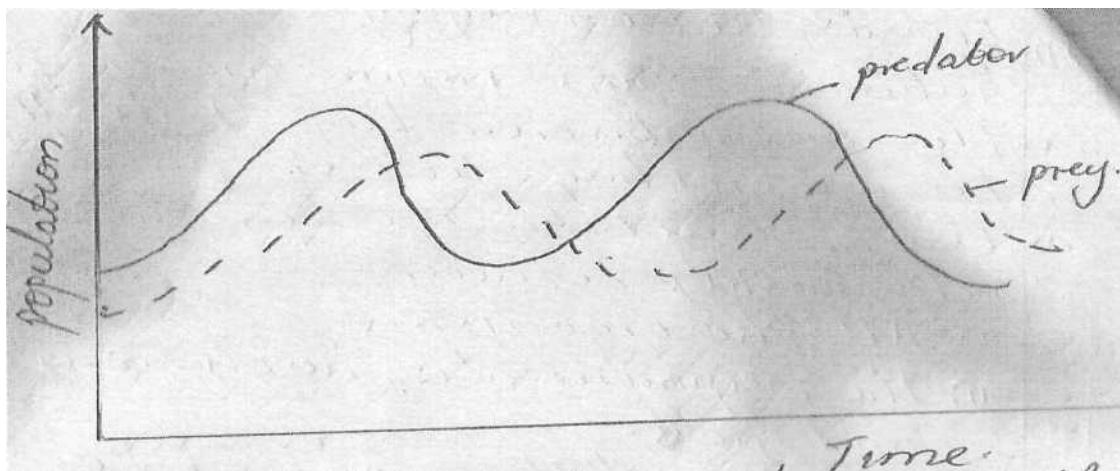
## SECTION B

41. Lizards, feed on preying mantis, butterflies and herbivorous bugs. Preying mantis feed on butterflies and herbivorous bugs. Butterflies and herbivorous bugs feed on grass.

- a) Using a suitable method, show the feeding relationship between
  - i) All the organisms.
  - ii) The preying mantis, herbivorous bug, lizards and grass.
- b) How would the population of the organisms in (a) (i) above be affected if the preying mantis were removed from the ecosystem?
- c) i) State one group of important organisms that have not been included in the ecosystem,
  - ii) Why are the organisms named in (c)i) above important in an eco system?

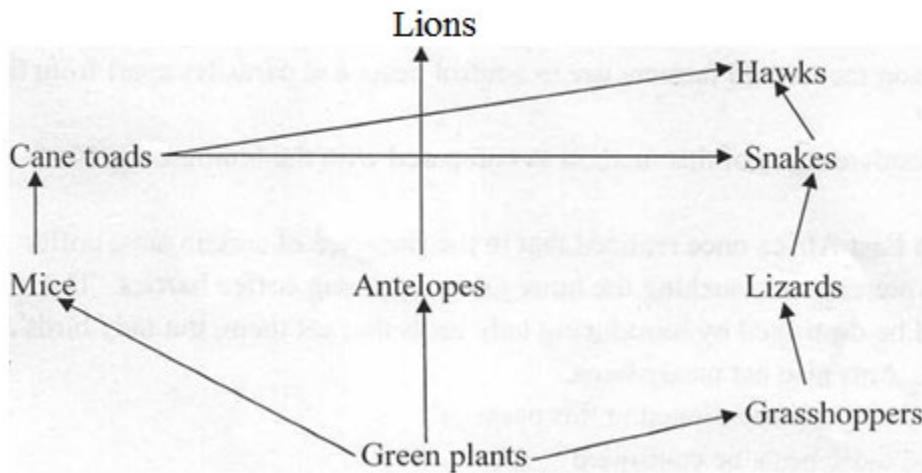
42. a) Distinguish between predator and prey.

b) Figure below shows predator / prey relationship. Study the figure and answer the questions that follow.



- i) Describe the relationship between the predator and prey.
- ii) Explain the relationship of the predator and prey described in (b)i) above.
- iii) Name two other external factors that may affect the population of the prey in the habitat.

43. The diagram below represents a food web in a terrestrial ecosystem.



- a) From the food web, construct a food chain with five organisms.
- b) State the trophic level occupied by
  - i) Hawks.
  - ii) Cane loads.

c) What would happen if leopards were introduced into the ecosystem?

44. The following results were obtained from a study of the population of fruit flies

Drosophila

Time (weeks)	1	2	3	4	5	6	7	8	9	10
No. of flies	20	44	82	145	221	275	320	312	295	270

- a) i) On the graph paper provided, plot the graph of drosophila population against time.
  - ii) Describe the trend of the graph during the 10 weeks.
  - iii) Explain the trend of the graph.
  - iv) Give two reasons for the change which took place after seven weeks.
- b) At the 7th week, it was observed that some of the flies were red-eyed and others white eyed. In the previous generation, however all the flies were red-eyed.
  - i) If the two alternative eye colors are inherited according to the mendelian laws, which one of them is recessive?
  - ii) How many of the flies counted at the 7th week were red - eyed? (Show your working).

45. One of the methods used by farmers to control crop parasites and pests is the biological control method.

- a) How is biological control used to reduce the numbers of crop parasites and pests?
- b) What other common method do farmers use to control pests and parasites apart from the manual methods?
- c) Give two main disadvantages of this method as compared with the biological control method.
- d) Coffee farmers in East Africa once realized that in the presence of certain ants, coffee mealy bugs were piercing and sucking the inner juices of young coffee berries. The mealy bugs could be destroyed by introducing lady birds that eat them, but lady birds are eaten by the ants. Ants also eat mealy bugs.
  - i) What are crop pests mentioned in this passage?
  - ii) How could these pests be controlled?
- e) Construct a food web to illustrate the feeding levels in (d) above.

46. a) Define the following terms.

i) Ecosystem.

ii) Habitat.

b) In a certain woodland, some trees were cut and one of the tree trunks was infested with black ants. There were also hawks and insect eating birds in the same locality.

i) Draw one food chain from the above information.

ii) Draw a labeled pyramid of numbers to represent the food chain you have drawn in

(b)i) above.

iii) What would happen to the food chain in (b)i) above if all insect eating birds were killed?

47. a) Define the term

i) Ecological niche.

ii) Community.

b) The following organisms were found in an eco system: termite, preying mantis, grasshopper, locust, lizard, snake and kite. Construct a food web for the organisms.

c) What is the importance of each of the following organisms in the eco system?

i) Green plants.

ii) Termites.

48. Rats are herbivores that usually live in filthy human dwellings. Bacteria of the species *pasteurella pestis* live and feed on the blood of the rats. Fleas feeding on the blood of the rat suck up the bacteria and transfer them to humans when the fleas bite humans in turn. The bacteria feed on human blood too and this sometimes results into humans developing bubonic plague.

a) In the space below, draw a food web to show the feeding relationships described.

b) Which organisms are

i) Parasites?

ii) Vectors?

- c) Suggest the name of the producer for the food web and explain it would enter the food web.
- d) From the information above
- State the trophic levels in the food web and give one organism in each level.
  - Describe what would happen if rats were removed from the food web.

49. Results in the table below show changes in population of a herbivorous mammal after it was introduced in a woodland ecosystem.

Time / years	0	1	2	3	4	5	6	7	8	9	10	11
Population of animals	100	190	420	1000	1200	1400	1600	1620	1630	1630	800	50

- On the graph paper below, put a graph to show how the number of animals in the ecosystem changed with time.
- Explain the changes observed in the population of animals between
  - 0 and 2 years.
  - 2 and 3 years.
- What is the approximate carrying capacity of the ecosystem?
- List down four factors that may be responsible for the change in population between 9 and 11 years.

50. a) What is meant by the following

- Eco system.
- Ecological succession.
- Describe an experiment to determine the population of a small weed cyperus alba in the football pitch.
- i) what is the role of the ozone layer in the atmosphere?  
 ii) Name the chemicals that are destroying the ozone layer.  
 iii) What are the effects of destroying the ozone layer?

- d) In an experiment to determine the population of mongoose in a forest measuring 0.5 km by 200 km, 250 animals were caught, marked and released. A week later 220 were caught out of which 25 had been marked.
- State the method used to determine the population.
  - Calculate the total population and density of mongoose in the forest.

51. In an ecological study, a biologist obtained the following data.

<b>Organism</b>	<b>Number</b>	<b>Biomass in kg</b>
S	10,000	10
T	1,000	0.1
R	100	0.01
M	10,000	1000
N	10	0.01

- a) i) Write down a possible food chain from the above ecosystem,  
ii) Construct a pyramid of biomass using the above data.
- b) Which two organisms are most likely to  
i) Occupy the same trophic level? Give a reason for your answer.  
ii) Be producers? Give reasons for your answer.
- c) Describe seven adaptations of desert plants.
52. a) Leptomonas is a parasitic flagellate protozoan, thousands of which may be found in a single flea. Fleas suck blood from the mammal. In a community, a herbivorous mammal feeds on grass,
- Construct a food chain for the above organisms.
  - Construct the pyramid of energy.
  - Construct a pyramid of numbers from the above information.
- b) The figure below shows the energy content in different groups of organisms comprising of plants and animals in an ecosystem.

<b>Groups of organisms</b>	<b>Energy content</b>	<b>Trophic level</b>
----------------------------	-----------------------	----------------------

A	87	
B	14098	
C	1603	
D	87110	

i) From the above data, construct

A food chain.

A pyramid of energy.

A pyramid of numbers.

ii) Complete the table by stating the trophic level for each group.

iii) Calculate the percentage energy loss between the first and the second trophic level.

c) Describe the biotic and abiotic factors that affect the distribution of plants and animals.

53. A suspension of Saccharomyces (yeast) was added to a dilute sucrose solution and kept at 25°C for 16 days. Each day 10cm<sup>3</sup> samples were withdrawn and the number of yeast cells counted. On the fifth day, a small quantity culture of paramecium was added. The results of the experiment are shown in the table below.

Days	Number of yeast counted	Number of paramecium counted
1	20	0
2	84	0
3	224	0
4	264	0
5	266	30
6	224	150
7	144	168
8	154	766
9	222	72
10	218	138
11	120	162

12	84	96
13	180	54
14	178	90
15	120	144
16	60	120

- a) Plot a graph on the same axes to show the number of yeast cells and paramecium vary during the period of the experiment.
- b) Name the relationship illustrated by this experiment.
- c) From your answer in (b) above, what type of organisms is;
- i) Yeast.
  - ii) Paramecium.
- d) Explain the changes taking place in the population of the two organisms over the of study.
- e) Name the shape of the graph that would be obtained if the yeast had been cultured alone.
- f) How does the growth of human population differ from that of wild life?
54. The information of acid rain is a serious environmental concern today. Sulphuric acid is present in acid rain and has adverse effects on both plants and animals.
- a) Name two other acids (other than sulphuric acid) that can be found in acid rain.
  - b) An experiment was carried out to investigate the effects of dilute sulphuric acid on the growth of plant seedlings.

Batches of seedlings were grown in gas dishes on filter paper to which dilute sulphuric acid was added. The dishes were then incubated. The root and shoot lengths were measured after 65 hours. The results obtained are shown in the table below.

Sulphuric acid concentration (mol dm <sup>-3</sup> )	Mean root length (mm)	Mean shoot length (mm)
0	55.5	25.2
$1 \times 10^{-3}$	63.4	18.4
$3 \times 10^{-3}$	6.5	9.5

$4 \times 10^{-3}$	2.0	4.6
$6 \times 10^{-3}$	1.8	0.8
$7 \times 10^{-3}$	1.5	0.5
$8 \times 10^{-3}$	1.3	0.3
$9 \times 10^{-3}$	1.3	0.0
$10 \times 10^{-3}$	1.0	0.0

- a) Plot a graph of the mean root length and the mean shoot length against sulphuric acid concentration on the same grid.
- b) Describe the relationship between the concentration of sulphuric acid and the:
- i) Growth of the shoots.
  - ii) Growth of the roots.
- c) Estimate the mean root and the mean shoot lengths when the concentration of sulphuric acid is  $5 \times 10^{-3}$ .
- d) State two other effects of acid rain.
55. a) What is meant by the following terms as applied to wild life in a game park?
- i) Game cropping
  - ii) Carrying capacity
- c) In an ecological study it was observed that organism A feeds on green plants, while C feeds on A, B feeds on C and that D feeds on B. if all the letters A, B, C and D represent living organisms in an ecosystem, which organism is;
- i) Producer
  - ii) Secondary consumer
  - iii) Tertiary consumer
- iv) Draw a pyramid of numbers using the data above.
- d) In a practical experiment to determine the population of rats in the neighboring bush at Johns school, 75 rats were captured, marked and released.

After 2 days, a second capture of 200 rats was made. It was observed that in the second capture 150 of them had not been captured before.

- i) Identify the method used to determine the population of rats in this experiment.
- ii) Calculate the population of rats in the bush next to John's school.

## SECTION C

56. a) Outline the causes of water pollution.

- b) What are the effects of water pollution?
- c) Suggest ways of controlling water pollution.

57. a) Outline the importance of wildlife conservation.

- b) What are the likely problems to be faced in wild life conservation?
- c) Suggest ways of controlling water pollution.

58. a) What do you understand by environmental degradation?

- b) Describe how man's activities lead to degradation of soil.

59. a) Give the effects of four air pollutants on living things.

- c) Describe how human activities interfere with soil environment in Uganda.

60. a) State the dangers of a parasitic mode of life.

- b) Describe how a tape worm is adapted to its mode of life.

61. Describe human activities which may cause environmental pollution.

62. a) What causes global warming?

- b) Describe how man's activities lead to air pollution.

63. a) Define the term pollution.

- b) Explain the origins and effects of major pollutants to air.

c) How can air pollution be avoided?

64. a) What is air pollution?

b) State the main air pollutants and their effects on human health.

65. a) Give reasons why wildlife conservation is encouraged in Uganda today,

b) What problems are associated with wild life conservation?

66. a) What is a natural resource?

b) Give four importances of natural resources in your community.

c) State the various ways in which man has destroyed the existing natural resources. In each case, give a suitable example.

**END**

**Growth and Development**  
**SECTION A**

1. Which one of following tissues brings about an increase in width of a stem in a flowering plant?

- A. Xylem                  B. Phleom

C. Cambium

D. Cortex

2. The following events occur during germination of a bean seed;

- (i) Development of lateral roots.
- (ii) Growth of radical out of the testa.
- (iii) Hypocotyl pulls cotyledons out of soil.
- (iv) Growth of root hairs.

Which one of the following gives the correct sequence of the events?

- A. (i), (ii), (iii) and (iv)
- B. (ii), (iii), (iv) and (i)
- C. (ii), (iv), (i) and (iii)
- D. (ii), (i), (iii) and (iv)

3. Mitosis is different from meiosis in that mitosis results into;

- A. Four daughter cells with equal genetic matter.
- B. Two daughter cells with equal genetic matter.
- C. Four daughter cells with half the genetic matter.
- D. Two daughter cells with half the genetic matter.

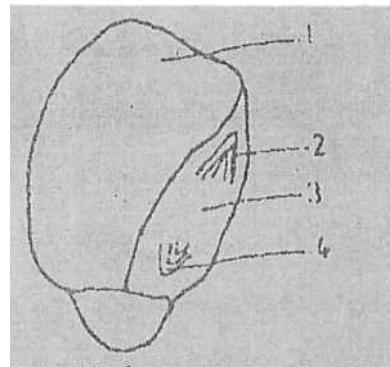
4. The rapid elongation of the hypocotyl during germination causes;

- A. Delay in emergence of photosynthetic leaves.
- B. Cotyledons to grow above the ground.
- C. Early emergence of photosynthetic leaves.
- D. Cotyledons to remain below the ground.

5. Meiosis leads to the production of;

- A. Two daughter cells each with original number of chromosomes.
- B. Four daughter cells each with original number of chromosomes.
- C. Two daughter cells each with half the original number of chromosomes.
- D. Four daughter cells each with half the original number of chromosomes.

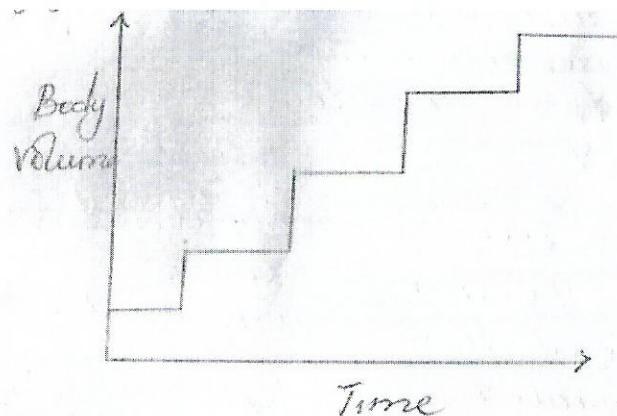
6.



Which of the parts 1 - 4 of the grain would you expect to decrease in weight during germination?

- A. 1      B. 2      C. 3      D. 4

7. Which one of the following organisms below has a growth represented by the figure below?



- A. Bacterium      B. An Insect  
C. Human being      D. Bony fish

8. Which one of the following structures is not essential in the life of a tadpole?

- A. lungs      B. Horny jaws  
C. Gills      D. Tail

9.



In a germinating grain, the function of X is to;

- A. Absorb food from the endosperm.
- B. Provide the first leaves.
- C. Hydrolyse the food in the endosperm.
- D. Protects the plumule.

10. In which part of the flowering plant does meiosis occur?

- A. Seed
- B. Flower
- C. Fruit
- D. Shoot apex

11. During seed germination, the dry weight initially decreases because;

- A. Stored food is used up for growth and respiration.
- B. Soluble food materials diffuse out of the seedlings.
- C. Rate of water absorption is low.
- D. Rate of cell division is low.

12. Meiosis normally results in;

- A. Halving the number of chromosomes.
- B. Production of identical cells.
- C. Maintaining the number of chromosomes.
- D. Propagation of new organisms.

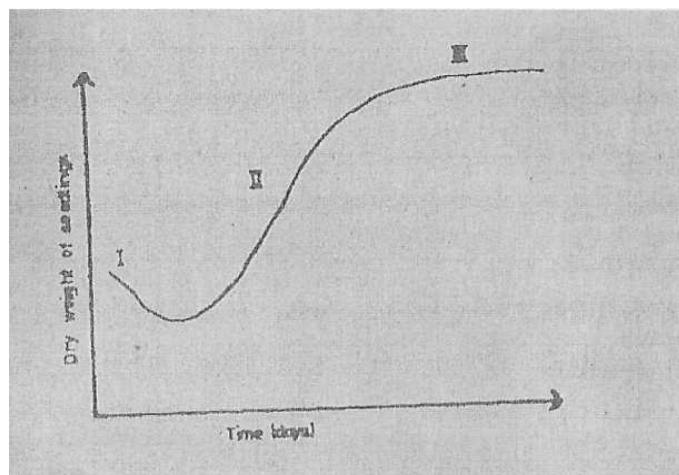
13. Which one of the following seed parts plays both roles of protection and nutrition during germination?

- A. Endosperm
- B. Coleoriza
- C. Testa
- D. Cotyledons

14. Meiotic cell division is important because it ensures that;

- A. There is variation in the number of chromosomes.
- B. The number of chromosomes of a species is not doubled at fertilization.
- C. The chromosomes of the daughter cells are identical.
- D. Bad traits are not passed on from parents to offspring.

15. The graph below shows changes in dry weight of a seedling of a non woody plant.



What is the possible explanation for the shape of the curve in phase III? Rate of

- A. Respiration is constant.
- B. Respiration is greater than that of photosynthesis.
- C. Growth is highest.
- D. Assimilation is equal to respiration.

16. Which of the following methods would best determine the rate of growth of a seedling?

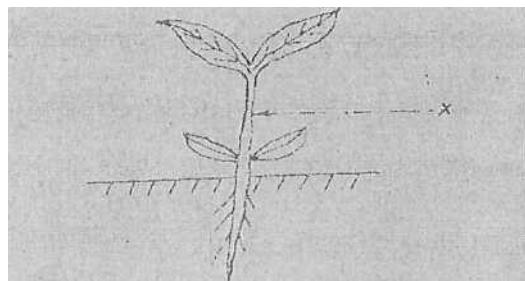
- A. Length of radical and fresh weight.
- B. Diameter of radical and fresh weight.
- C. Length of radical and dry weight.

- D. Diameter of radical and dry weight.
17. Secondary growth in plant causes an increase in
- A. length                  B. thickness  
C. height                  D. number of branches
18. In which of the following tissues does mitosis occur? In the
- A. cambium                  B. phloem  
C. Pith                  D. xylem
19. Which one of the following is the correct sequence of events that occur during mitosis?
- A. Prophase, metaphase, anaphase and telophase.  
B. Prophase, anaphase, metaphase and telophase.  
C. Metaphase, anaphase, telophase and prophase.  
D. Telophase, anaphase, metaphase, and prophase.
20. What is the main function of the apical meristem in a root?
- A. Formation of lateral roots.  
B. Secondary thickness of the root.  
C. Formation of new cells.  
D. Protection of the root tip.
21. How is seed dormancy due to embryo immaturity overcome?
- A. By improving seed coat permeability.  
B. Allowing for an after ripening period.  
C. Putting hydrated seeds in a cold room or refrigerator.  
D. Dry storage at high temperature.
22. If a species has 24 chromosomes in each somatic cell, how many chromosomes will a sperm cell contain?
- A. 6                  B. 12                  C. 24                  D. 48

23. The part marked X in figure 1 is the

- A. hypocotyls
- B. epicotyl
- C. coleoptiles
- D. plimule

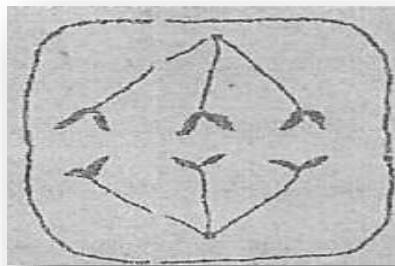
Figure 1



24. The increase in girth of woody stems mainly due to formation of

- A. sclerenchyma cells
- B. secondary xylem
- C. Secondary
- D. secondary cortex

25. What stage of cell division is represented in the diagram below?



- A. Anaphase
- B. Prophase
- C. Metaphase
- D. Telophase

26. Which one of the following is not correct about growth in plants?

- A. Plants grow throughout life.
- B. Higher plants grow in phases.
- C. Higher plants grow in limited parts.
- D. Growth in plants is during young stage.

27. The process of meiosis in living organisms is very important during;

- A. Growth of living organisms.
- B. Formation of gametes.
- C. Cell division.
- D. Cell rejuvenation.

28. Which of the following is the first to occur during cell division?

- A. Formation of nuclear spindle.
- B. Separation of chromatids.
- C. Disintegration of nuclear membrane.
- D. Duplication of chromosomes.

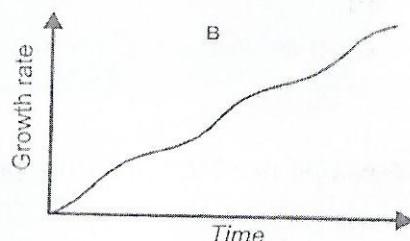
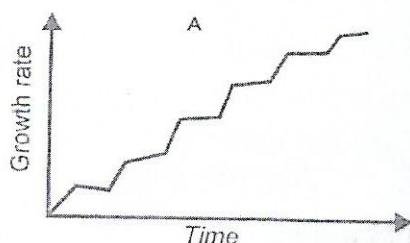
29. The best method of measuring growth in a seedling is by;

- A. Measuring fresh mass.
- B. Measuring dry mass.
- C. Observing increase in volume.
- D. Observing increase in leaf size

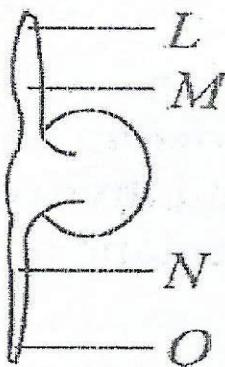
30. Which of the following is true about hypogea germination?

- A. The cotyledons are pushed out of the soil.
- B. The epicotyl grows faster than the hypocotyls.
- C. It occurs in monocotyledons.
- D. The hypocotyl grows faster than the epicotyl.

31. Which one of the following curves in the figure below correctly represents the growth curve of a locust?



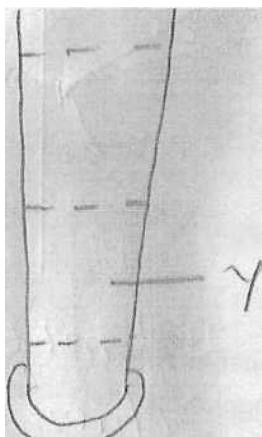
32. The figure below shows a diagram of a seedling.



The region that elongates most rapidly during epigeal germination is indicated by letter

A. L      B. M      C. N      D. O

33. The figure below shows a section through the tip of a root.



Their main activity taking place in region labeled Y on the figure is

- A. Cell division
- B. Cell expansion
- C. Cell differentiation
- D. Maturation

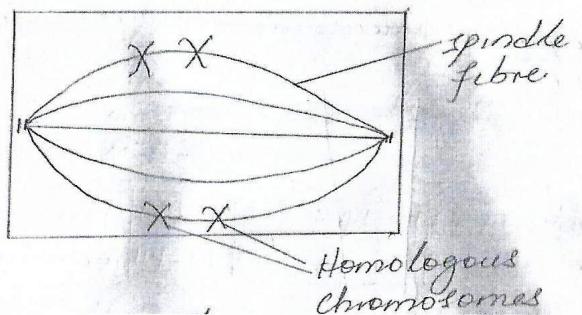
34. The following events occur in seeds during germination;

- (i) Seed coat split.
- (ii) Hypocotyl grows fast.
- (iii) Epicotyl grows fast.
- (iv) Cotyledons appear above the ground.
- (v) Cotyledons remain below the ground.

Which of the following occur during epigeal germination?

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

35. The figure shows the condition of a cell dividing one of the stages of meiosis.



Which stage does the figure above show?

- A. Prophase I
- B. Metaphase II
- C. Metaphase I
- D. Anaphase I

36. In which stage of meiosis do chromosomes cross over and exchange parts?

- A. Prophase I
- B. Prophase II

C. Metaphase II

D. Metaphase I

37. Which one of the following stages of cell division may be related to dormancy?

- A. Interphase                      B. Metaphase  
C. Telophase                      D. Early prophase

38. Where in the bean seed are most carbohydrates stored?

- A. Cotyledon                      B. Radicle  
C. Endosperm                      D. Plumule

39. Which one of the following statements would explain why a bean seedling loses weight during the first weeks after germination?

- A. The seedling loses more water than it absorbs.  
B. Soluble food materials are converted to starch.  
C. The stored food is used up during respiration.  
D. Soluble food materials are lost into the soil.

40. The phase of mitosis when the chromatids arrange themselves along the equator is

- A. metaphase                      B. anaphase  
C. telophase                      D. prophase

## SECTION B

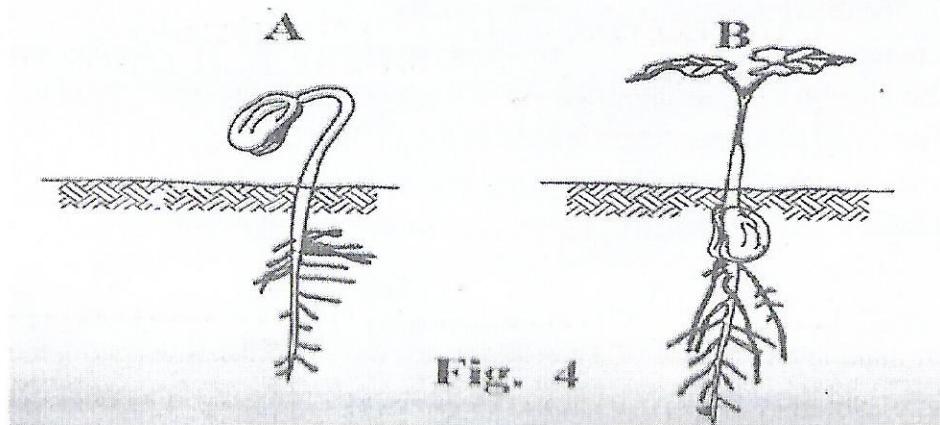
41. The table below shows results of an experiment carried out on the growth rate of a bean seed from the time of planting to maturity.

Time (weeks)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10
--------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----

Dry mass (g)	114	1.0	5.0	10	22	40	48	60	56	48	45
--------------	-----	-----	-----	----	----	----	----	----	----	----	----

- a) Describe the growth curve of the plant.
- b) Explain the changes in the shape of the growth curve of the plant.
- c) Explain the role of each of the following during germination.
- i) Water.
  - ii) Oxygen.
- d) What would happen if the seeds were grown in a dark? Explain your answer.

42. The figure represents germination in seeds A and B.



- a) Giving reasons, identify the type of germination in each seed
- i) A.
  - ii) B.
- b) Explain how germination in seed A is brought about.
- c) Explain the advantage of the type of germination in seed A to the growing seedling.

43. A 10 gram sample of wheat grains was germinated on moist filter paper. Half of the sample was grown in normal day light and the other half in permanent darkness. Samples from each group were weighed every 48 hours. The fresh mass was found in each case and the following results were obtained.

<b>Day</b>	<b>Fresh mass of seeds grown in light (g)</b>	<b>Fresh mass of seeds grown in darkness (g)</b>
0	10.0	10.0
2	13.9	13.8
4	16.0	16.6
6	20.0	21.2
8	26.6	26.6
10	34.7	32.2
12	43.8	31.6
14	53.6	28.0
16	61.4	25.0
17	68.2	20.6

- a) On the same axes, plot graphs of the fresh mass against time.
- b) Account for the differences between the two graphs.
- c) What difference would it make to the results of the graph if the dry mass and not the fresh mass was obtained for the seedlings grown in the dark and in the light? Explain.
- d) What was the mass of the seedlings in light of the 17th day?
- e) State two external conditions necessary for germination to take place.
- f) List down three hormones that affect plant growth and development.

44. During germination and growth of a cereal, the dry weight of the endosperm, the weight of the embryo and the total dry weight were determined at two day intervals. The results are shown in the table below.

<b>Time after planting (days)</b>	<b>Dry weight of endosperm (mg)</b>	<b>Weight of embryo (mg)</b>	<b>Total dry weight (mg)</b>

0	43	2	45
2	40	2	42
4	33	7	40
6	20	16	37
8	10	25	35
10	6	33	39

- a) On the same axes, draw a graph of the dry weight of the endosperm, weight of the embryo and the total dry weight against time.
- b) What was the total dry weight on day 5?
- c) Account for the:
- i) Decrease in the dry weight of the endosperm from days 0 to 10.
  - ii) Increase in dry weight of the embryo from day 0 to 10.
  - iii) Decrease in the total dry weight from day 0 to 8..
  - iv) Increase in the total dry weight after day 8.
- d) State two factors within the seed and two outside the seed that cause dormancy.
- e) Give two characteristics of meristematic cells.
45. A farmer wanted to plant some trees of a certain species on his plantation. The seeds of this species however took very long to germinate. To overcome this delay, he put the seeds in hot water at 45°C. Batches of 20 seeds were removed at one minute intervals and then planted in different plant nurseries where they were well watered. After 14 days, he counted the number of seedling in each nursery and recorded the results as shown in the table below.

Batch of seeds	Time intervals (mins)	Germinated seeds
1 <sup>st</sup>	0	4
2 <sup>nd</sup>	1	4
3 <sup>rd</sup>	2	10

4 <sup>th</sup>	3	17
5 <sup>th</sup>	4	20
6 <sup>th</sup>	5	15
7 <sup>th</sup>	6	12
8 <sup>th</sup>	7	8
9 <sup>th</sup>	8	4
10 <sup>th</sup>	9	0
11 <sup>th</sup>	10	0

- a) Calculate the percentage germination rate for each batch and record it in an additional column on the table.
- b) Use the results of your calculations to plot the graph of percentage germination against time taken to soak the seeds.
- c) How many seeds would germinate if they were soaked for 5.5 minutes?
- d) Account for the seeds' failure to germinate after being soaked for 9 to 11 minutes.
- e)
  - i) What do you think the seeds did not germinate before soaking? Give reasons.
  - ii) Besides hot water treatment, what other method could be used to increase the rate of germination?
- f) What causes seed dormancy?

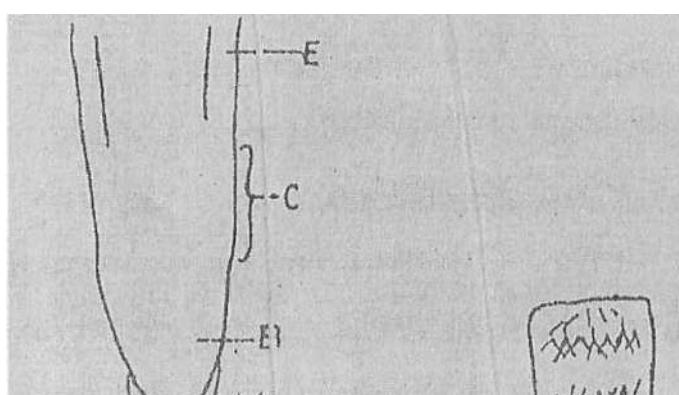
46. A research was carried out to determine the trend of growth of some boys and girls. Their average mass in kgs was taken separately for a period of 20 years and tabulated as shown in the table below.

Age	Average mass of boys (kgs)	Average mass of girls (kg)
-----	----------------------------	----------------------------

0	2.5	2.5
2	11.1	11.5
4	15.0	16.0
6	18.5	19.3
8	22.1	27.1
10	25.1	27.1
12	27.5	30.5
14	37.0	35.5
16	44.0	40.0
18	46.9	52.5
20	48.5	55.5

- a) On the same axis, draw a graph of the average mass of the girls and of boys against the age.
- b) From the graph, determine the:
- i) Mass of boys at the age of 11 years.
  - ii) Growth rate in girls between ages 13 and 15.
- c) Account for the change in mass of girls during the age stated in (ii) above.
- d) Explain the trend observed in the curves for boys and girls.
- e) Why do girls above 10 years require intake of food that is richer in iron than boys of the same age?
- f) Mention other factors apart from the diet that affect the rate of growth in boys and girls.
- g) Apart from using average mass to estimate growth in human beings, name two other parameters that can be used.

47. The figure (a) below shows a vertical section of the end region of a growing root and figure (b) shows an enlargement of a cell from the root.



- a) i) Name the region labeled A.  
iii) How does growth occur in the region labeled B?  
iv) Describe briefly what happens to the cells in the region labelled C.  
v) What structures might be expected to grow at the region marked D?  
b) State the function of region marked A.  
c) Figure b) shows a cell from region B Name the process taking place in the cell.  
Briefly describe what is happening at this particular stage of the process.

## **SECTION B**

48. a)i) What is meant by mitosis?  
ii) What is the importance of mitosis to living things?  
b) Give the differences between mitosis and meiosis.
49. a) What factors are necessary for germination in seeds?  
b) Using labeled diagrams, describe experiments to show necessity of each factor for germination.
50. a) With the aid of well labeled diagrams, explain the difference between hypogea and epigeal germination.  
b) Describe an experiment you would carry out to show that heat is liberated by germinating seeds.
51. a)i) Distinguish between hypogea and epigeal germination,  
ii) State the conditions necessary for germination to take place.

b) Describe the series of events that lead to germination of a seed.

52. a) Explain the importance of each of the conditions necessary for germination, b)

Describe an experiment to show the necessity of oxygen in seed germination.

53. a) Define the term seed dormancy.

b) i) Outline the causes of seed dormancy and in each case, give method (s) of breaking it.

ii) Why is seed dormancy important?

**END**

**Genetics  
SECTION A**

1. In a certain plant, offspring of crosses between round - seeded and long seeded plants were found always to be oval seeded. Which one of the following results would be most likely to occur if oval - seeded plants were self pollinated?
  - A. 100% oval - seeded.
  - B. 25% oval seeded, 50% long seeded, 25% round seeded.
  - C. 67% oval seeded, 33% long seeded.
  - D. 25% long seeded, 50% oval seeded, 25% round seeded.
2. A pure breeding red - flowered plant was crossed with a pure breeding white flowered plant and all the resulting F<sub>1</sub> generation had pink flowers. What percentage of the F<sub>2</sub> plants would have red flowers if the F<sub>1</sub> plants were self pollinated?
  - A. 100%
  - B. 50%
  - C. 33%
  - D. 25%
3. Which one of the following is not affected by environmental factors?
  - A. Height.
  - B. Skin colour.
  - C. Albinism.
  - D. Intelligence.
4. When homozygous red - flowered plants were crossed with homozygous white flowered plants, all the plants produced had pink flowers. What would be the phenotypic ratio of plants resulting from a cross of pink flowered plants?
  - A. 3 red flowered : 1 white flowered.
  - B. 1 red flowered : 3 white flowered.
  - C. 1 red flowered : 2 pink flowered : 1 white flowered.
  - D. 2 red flowered: 1 pink flowered : 1 white flowered.
5. Which of the following features show continuous variation?
  - A. A, B and O blood groups.

- B. Sickle cells.
  - C. Haemophilia.
  - D. Height.
6. In pea plants, tallness is dominant over shortness, if a heterozygous tall plant is crossed with a short plant, the proportion of the offspring will be
- A. 50% tall, 50%'short.
  - B. 100% tall.
  - C. 25% tall, 75% short.
  - D. 75% tall, 25% short.
7. In cattle, when a white bull is mated with a red cow, the offspring is roan. This indicates that the gene for white is;
- A. Dominant to that for red.
  - B. Recessive to that for red.
  - C. Codominant with that for red.
  - D. Mutated to show roan.
8. What would be the ratio of the phenotypes if a roan bull and roan cow from the offspring referred to in question 7 were mated?
- A. 1 red : 2 roan : 1 white.
  - B. 2 red : 1 roan : 1 white.
  - C. 1 red : 1 roan : 2 white.
  - D. 1 red : 1 white.
9. Which one of the following sets contains only characteristics of continuous variation?
- A. Tongue rolling, blood groups, skin colour.
  - B. Height, body weight, intelligence.
  - C. Sex, haemophillia, height.
  - D. Fingerprints, intelligence, albinism.

10. When round seeded bean plants and long seeded bean plants were crossed, all the offspring were oval - seeded plants. This is an example of:
- A. Complete dominance.
  - B. Incomplete dominance.
  - C. Mutation.
  - D. Recessive genes.
11. Which one of the following is an example of discontinuous variation?
- A. Height
  - B. Weight
  - C. Eye in colour in Drosophilla
  - D. Skin colour
12. Albinism is caused by having a double recessive gene for skin pigmentation. What is the probability of the children having normal skin colour if an albino woman marries a man who is heterozygous for albinism?
- A. 100%
  - B. 75%
  - C. 50%
  - D. 25%
13. When a homozygous black mouse (BB) was mated with homozygous white mouse (WW). The offspring were all brown. What would be the colour of the mice produced if  $F_1$  offspring is crossed with homozygous white parent?
- A. 3 brown : 1 white
  - B. 1 brown : 3 white
  - C. 1 brown : 1 white
  - D. All white
14. If a man of blood group A is married to a woman of blood group O, what are the possible genotypes of their children?
- A. AA, OO
  - B. AA, AO
  - C. AO, OO
  - D. AO only
15. Which of the following characteristics show discontinuous variation?
- A. Body weight
  - B. Blood groups

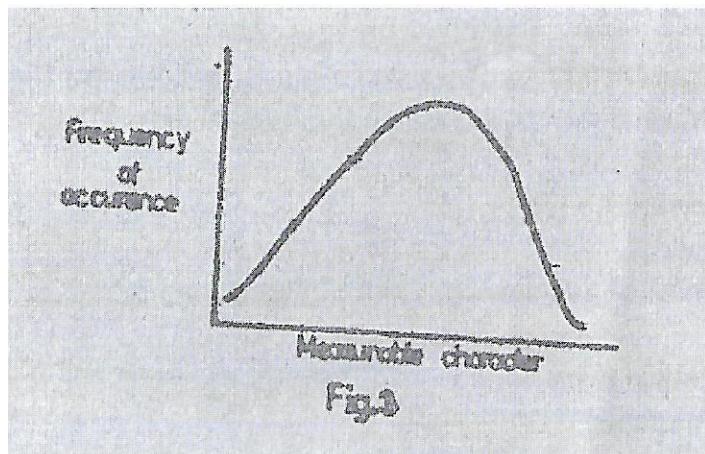
C. Size of leaves

D. Colour of flowers

16. Which of the following is not true about mutation?

- A. Mutation may affect single genes or chromosomes.
- B. All mutations produce harmful effects.
- C. A mutant gene can be passed on to the offspring during fertilization.
- D. Mutations are the raw materials for evolution.

17. The diagram below represents the frequency of occurrence of a character in human population.



Which one of the following characteristics in the population does not confirm to this pattern?

- A. Height
- B. Weight
- C. Length of feet
- D. Eye colour

18. A heterozygous red flowered plant ( $Rr$ ) is crossed with a homozygous white flowered plant ( $rr$ ). If  $R$  is dominant over  $r$ , what will be the phenotypes of the offsprings?

- A. All red
- B. All white
- C. Pink and white
- D. Red and white

19. In cattle the gene for red coat colour  $R$  is codominant to that for white coat colour  $W$ . If a red cow was mated to a white bull. What would be the phenotype of the  $F_1$  generation?

- A. All red                    B. All white  
C. 3 red : 1 white        D. Intermediate coat colour (roan)
20. In humans, the male sex chromosomes are X and Y (X Y) and the female sex chromosomes are X and X (X X). When a male gamete fuses with a female gamete, the sex ratio is  
A. 1:2                    B. 1:3                    C. 1:1                    D. 1:4
21. A heterozygous red flowered plant (Rr) is crossed with a homozygous white plant (rr). If R is dominant over r, what will the phenotypes of the offspring?  
A. All red                    B. All white  
C. Pink and white        D. Red and white
22. A couple produced four children who were of different blood groups with the following genotypes AO, BO, AB and OO. What were the genotypes of their parents?  
A. AA and OBB.            B. AO and OB  
C. BB and OB D.        D. AB and OO
23. Six fingers in man is controlled by a sex linked recessive gene. If a normal woman marries a six fingered man, which of the children will have six fingers?  
A. All the sons.  
B. All the daughters.  
C. All will be normal.  
D. Half of the number of girls and boys will be normal.
24. One of two identical twins brought up differently was fatter and healthier than the other. What kinds of variation do this show?  
A. Discontinuous variation.  
B. Genetic variation.  
C. Social variation.  
D. Habitat variation.

25. Albinism is inherited through double recessive genes. If A stands for normal skin colour and a the recessive character. Which of these parental crosses would produce 25% albino offspring?
- A. AA x Aa      B. AA x aa  
C. Aa x Aa      D. aa x aa
26. A red flowered peas were crossed with white flowered peas. The F<sub>1</sub> were all pink flowered. What would be the results of selfing these pink flowered peas?
- A. All the flowers would be pink.  
B. Half the flowers would be pink and half would be white.  
C. Half the flowers would be red and half would be pink.  
D. A quarter of the flowers would be red, half would be pink and a quarter white.
27. A trait which does not express itself unless homozygous is said to be
- A. sex-linked      B. linked and cumulative  
C. multiple allele      D. recessive
28. Which one of the following causes variation which is always inherited?
- A. Mutation      B. Radiation  
C. Geographical position      D. Environmental factors
29. In peas, the gene for tallness (T) is dominant over that for shortness (t). If peas of different genotypes were crossed and all offsprings appeared tall. What would be the genotypes of the parental peas?
- A. Tt x Tt      B. tt x tt  
C. TT x tt      D. TT x TT
30. Genes responsible for ABO blood groups in man are examples of
- A. multiple alleles      B. multiple genes

C. sex linked genes

D. mendelion factors

31. Which one of the following chromosomal changes results in the loss of genetic materials?

- A. Duplication                  B. Inversion  
C. Translocation                  D. Deletion

32. In cattle, the gene for hornless condition is dominant to the gene for horns. If a bull and cow with genotypes Pp are crossed, what percentage of the offspring would be expected to have horns? (Gene P and p respectively)

- A. 25%                  B. 50%  
C. 75%                  D. 100%

33. Cattle may be red or white and a hybrid is described as roan colour. If a roan cow is crossed with a roan bull. The offspring would be expected to be

- A. All roan                  B. All red  
C. All white                  D. Mixture of red, white and roan

34. In humans, the gene for brown eyes B is dominant to the gene for blue eyes b. If a heterozygous brown eyed male married a blue eyed female, what is the probability of producing blue eyed offspring?

- A. 0%                  B. 25%  
C. 50%                  D. 75%

35. The chromosomes in human males are represented by

- A. XXY                  B. YY  
C. XX                  D. XY

36. The probability of producing a boy or a girl in human is

- A.  $\frac{1}{4}$                   B.  $\frac{1}{3}$

- C.  $\frac{1}{2}$               D.  $\frac{1}{8}$

37. Mendel's law of segregation is based on the F<sub>2</sub> ratio of

- A. 3:1              B. 1:2:1  
C. 9:3:3:1              D. 1:3

38. During the process of meiosis crossing over takes place at the stage

- A. prophase I              B. prophase II  
C. metaphase I              D. metaphase II

39. A trait which does not express itself unless homozygous is said to be

- A. sex linked              B. linked and cumulative  
C. multiple alleles              D. recessive

40. If a certain species of wheat has a diploid chromosome number of 4. What would be the chromosome number of the endosperm cell?

- A. 42              B. 21              C. 7              D. 28.

41. Alleles which are not identical for example Bb are considered to be

- A. homologous              B. homozygous  
C. heterozygous              D. genotype

## SECTION B

42. The information below was collected by a geneticist concerning the number of individuals with their corresponding heights in a given population.

Number of individuals (000)	1.5	2.0	5.0	9.0	16.0	22.0	14.0	4.0	3.0
Height (cm)	155	160	167	170	173	176	186	191	195

- a) i) Using the information provided, plot a graph of the number of individuals (000) (on Y - axis), their height (cm) on the X — axis.  
ii) From the graph, determine the number of individuals measuring 180 cm in height.
- b) i) Describe the number of individuals varies with height.  
ii) Which type of variation is exhibited by the individuals regarding the character in question?  
iii) Apart from height, outline three characters that show similar behavior in man.  
iv) State three properties of the characters you have just mentioned in (b)iii) above.

43. Haemophilia is a genetic disease transmitted through a recessive gene found on X - some. The normal gene is dominant.

- a) With respect to the gene for haemophilia, and using suitable symbols, give all the possible genotypes in a human population and state their phenotypes.
- b) A woman who is a carrier for the haemophilia gene married a normal man. Work out the genotypic and phenotypic ratio of their offspring. Show your working.
- c) Explain why haemophilia is more common in men than in woman.

44. a) Distinguish between the following.

- i) Genotype and phenotype.
  - ii) Homozygote and heterozygote.
- b) In an experiment, pure red flowering plant was crossed with a pure white flowering plant. All the plants of F<sub>1</sub> generation had pink flowers. Later, the F<sub>1</sub> plants were selfed.
    - i) Explain why F<sub>1</sub> plants had pink flowers.
    - ii) Using suitable symbols, determine the phenotypes and genotypes of the F<sub>2</sub> generation.

- iii) If the total number of offsprings in  $F_2$  were 326, determine the number of each phenotype in  $F_2$ .
- c) State the applications of genetics.

45. Sex in man is determined by chromosomes.

- a) What is the genetic constitution in males and in females?
- b) There are 46 chromosomes in the check cell of man. How many are present in a sperm cell. Why is this so?

46. Red green colour blindness is an example of a sex linked character in humans.

- a) What do you understand by sex linkage?
- b) Give three other examples of sex - linked characters in humans.
- c) A colour blind man married a normal woman. What proportion of their sons will be colour blind. Show your working.

47. a) What is meant by each of the following?

- i) Gene.
- ii) Allele.
- iii) Chromosome.
- iv) Genotype.
- v) Phenotype.

b) Colour blindness is a sex linked recessive charter in human beings. If a colour blind marries a carrier woman. Illustrate using, defined symbols the possible genotypes and phenotypes of the offspring.

c) In a plant species, the allele for white flowers and red flowers are codominant. In an experiment, pure red flowering plant was crossed with a pure white flowering plant. All the plants of the  $F_1$  generation had pink flowers. Later the  $F_1$  plants were selfed.

- i) Explain why all the  $F_1$  offsprings had pink flowers.

- ii) Using suitable symbols, work out the F<sub>2</sub> phenotypes and genotypes.
- d) If the total number of offsprings in F<sub>2</sub> were 224, how many had
- White flowers?
  - Red flowers?
  - Pink flowers?
- e) Albinism in man is due to a recessive gene. A man heterozygous for albinism marries a heterozygous woman. What proportion of the offsprings will be expected to be albinos?
- f) A boy heterozygous for blood group A was accessed by a girl heterozygous for blood B of being responsible for the baby of blood group B. Was the boy guilty? Show your working.

### SECTION C

48. a) Distinguish between dominant and codominance in genetics.
- b) When tall pea plants were crossed with sort pea plants, all the plants in F<sub>1</sub> generation were crossed, both tall and short plants were produced in F<sub>2</sub> generation.
- Why were all plants tall in the F<sub>1</sub> generation?
  - Using suitable symbols show the crosses to produce the F<sub>1</sub> and F<sub>2</sub> generation.
- c) In rose plants, when a red flowered plant is crossed with a white flowered plant, all tall plants produced bear pink flowers. Using suitable symbols show the result of crossing a pink flowered plant and a white flowered plant.
49. a) i) What is the difference between complete dominance and co-dominance?
- What are sex-linked characteristics?
- b) In a breeding experiment, a true breeding tall species was crossed with a true breeding short species. All the F<sub>1</sub> offsprings were tall?

- i) Why was the F<sub>1</sub> generation all tall?
  - ii) Using appropriate symbols show the expected phenotypes and genotypes of the F<sub>2</sub> generation when two of the offsprings of the F<sub>1</sub> generation were crossed.
  - iii) In what ratios are the genotypes and phenotypes of F<sub>2</sub> generation?
50. a) Give the differences between the following terms:
- i) Natural selection and artificial selection.
  - ii) Homologous and vestigial organs.
  - iii) Mutagens and mutation.
- b) Give four examples of factors which can influence the rate of mutation in an organism.
- c) i) Give four examples of characteristics improved by selective breeding.  
ii) Give an example of a human condition caused by a chromosome mutation.
51. a) Define the term mutation.  
b) Outline any four causes of mutation.  
c) i) Albinism, a condition in which external pigment of the skin fails to develop is caused by a recessive allele. Using appropriate genetic symbols, determine the possible offspring genotypes and phenotypes when a phenotypically normal but carrier marries an albino female.  
ii) State three characteristics that an albino possesses.
52. a) Differentiate between a recessive gene and a dominant gene.  
b) i) Colour blindness is a sex linked recessive character in human beings. If a colour blind man marries a carrier woman. Illustrate using well defined symbols the possible genotype and phenotypes of offsprings.  
ii) State the phenotypic ratio of the offsprings.  
iii) State the genotypic ratio of the male offsprings.

53. a)i) In human, the normal skin colour is dominant over albino colour, denote the gene for normal skin colour, work out a cross to show how obtained in a phenotypically normal couple.

ii) State three ways by which human skin protects the body tissues.

b) State the importance of variation.

54. a) What is sex linked genes?

b) Name two sex linked characteristics in man.

c) In Angola goats, the condition of absence of horns is dominant to the one of presence of horns. A dehorned female goat was crossed with a male without horns. The  $F_1$  generation contained a mixture of goats with horn and those without. One hornless of the  $F_1$  was back crossed with the hornless parent. Work out the crosses from the parental generation.

55. a) Define the following terms.

i) A gene.

ii) Mutagen.

iii) Genotype.

iv) Sex linked genes.

v) Chromosomes.

b) During some experiments in genetics a scientist wanted to determine the type of offsprings that would be produced in the second generation. Considering the length of stems in plants, work out the type of offsprings that would be produced by second generation, if pure breeding tall pea plants were crossed with pure breeding short pea plants, and the offspring of the first generation self crossed. (Use appropriate defined symbols).

**END**

**Reproduction**  
**SECTION A**

- 1. Which one of the following modes of reproduction is sexual?**  
A. Spore formation                      B. Budding  
C. Fragmentation                      D. Conjugation
  
- 2. Which one of the following organisms can reproduce both sexually and asexually?**  
A. Amoeba                              B. Spirogyra                              C. Bacteria                              D. Yeast
  
- 3. Cutting of the fallopian tubes in a woman prevents conception, because**  
A. Ovaries stop producing eggs.  
B. Implantation does not occur.  
C. Sperms do not reach the egg.  
D. Sperms are destroyed.
  
- 4. Which one of the following is true of vegetative reproduction?**  
A. Involves spores.  
B. Maintains varieties.  
C. Gametes are transported by water.  
D. Does not lead to overcrowding.
  
- 5. Which one of the following shows the correct path followed by the sperms during ejaculation?**  
A. Seminiferous tubules → epididymis → urethra.  
B. Epididymis → seminiferous tubules → urethra → spermduct.  
C. Sperm ducts → seminiferous tubules → epididymis → urethra.  
D. Seminiferous tubules → urethra → sperm ducts → epididymis.

6. Which one of the following structures of a flower develops into a seed coat after fertilization?
- A. Embryo sac      B. Integuments  
C. Receptacle      D. Ovary
7. Which one of the following is an advantage of vegetative propagation?
- A. Competition between parent and offspring is minimal.  
B. Colonization of new habitats is fast.  
C. Variation among offsprings occurs.  
D. Maintenance of parental characteristics in offsprings.
8. During pregnancy in humans, the substances that pass from the mother to the embryo are;
- A. Oxygen, nitrogenous wastes and glucose.  
B. Carbon dioxide, mineral salts and nitrogenous wastes.  
C. Carbon dioxide, amino acids and mineral salts.  
D. Glucose, amino acids and oxygen.
9. An endosperm is formed in plants when the second male nucleus fuses with the
- A. egg nucleus      B. polar nuclei  
C. antipodal nuclei      D. embryo sac
10. Which part of Irish potato plant is used in its vegetative reproduction?
- A. Stem      B. Root  
C. Leaf      D. Flower
11. Which one of the following organisms reproduce by budding?
- A. Yeast      B. Amoeba  
C. Spirogyra      D. Mucor

12. Which one of the following may result from lack of progesterone hormone in a woman?
- A. Implantation may not occur.
  - B. Miscarriage may occur.
  - C. Menstruation may not occur.
  - D. Ovulation may not occur.
13. Mucor undergoes asexual reproduction to produce
- A. spores                    B. zoo spores
  - C. zygosporangia           D. sporangia
14. Which one of the following pairs of hormones is produced by reproductive organs in mammals?
- A. Follicle stimulating hormone and testosterone.
  - B. Follicle stimulating hormone and testosterone.
  - C. Oestrogen and luteinizing hormone.
  - D. Insulin and oestrogen.
15. In humans, the hormone progesterone stimulates the;
- A. Formation of egg cells.
  - B. Formation of sperm cells.
  - C. Production of milk by a lactating mother.
  - D. Thickening of the uterine wall.
16. Which one of the following hormones is responsible for ovulation in a mammal?
- A. Oestrogen.
  - B. Progesterone.
  - C. Follicle stimulating hormone.
  - D. Luteinizing hormone.

17. Which one of the following is a diploid cell?

- A. Pollen grain
- B. Ovum
- C. Spermatozoan
- D. Alveolus

18. What is the function of albumen in an egg? It;

- A. Is a source of fat and protein for the embryo.
- B. Is a source of protein and water for the embryo.
- C. Suspends the embryo.
- D. Stores the embryo's excretory products.

19. A mammalian embryo exchanges materials with the mother by

- A. osmosis
- B. secretion
- C. circulation
- D. diffusion

20. The main function of the luteinizing hormone in the reproductive cycle of a mammal is that it;

- A. Causes ovulation.
- B. Causes thickening of the uterine walls.
- C. Initiates the growth of the graafian follicle.
- D. Maintains pregnancy for the first three months.

21. The function of a amniotic fluid in foetal development is;

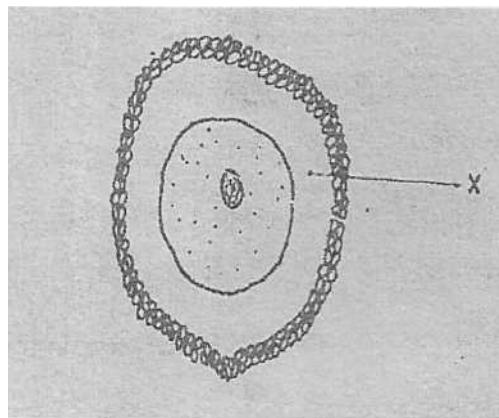
- A. Protection of the foetus from the shock.
- B. Transfer of nutrients from mother to foetus.
- C. Allowing of nutrients form mother to foetus.
- D. Prevention of dangerous substances from reaching the foetus.

22. Which of the following is a function of progesterone?

- A. Prepares the uterine wall for implantation.
- B. Initiates the process of birth.
- C. Initiates ovulation.

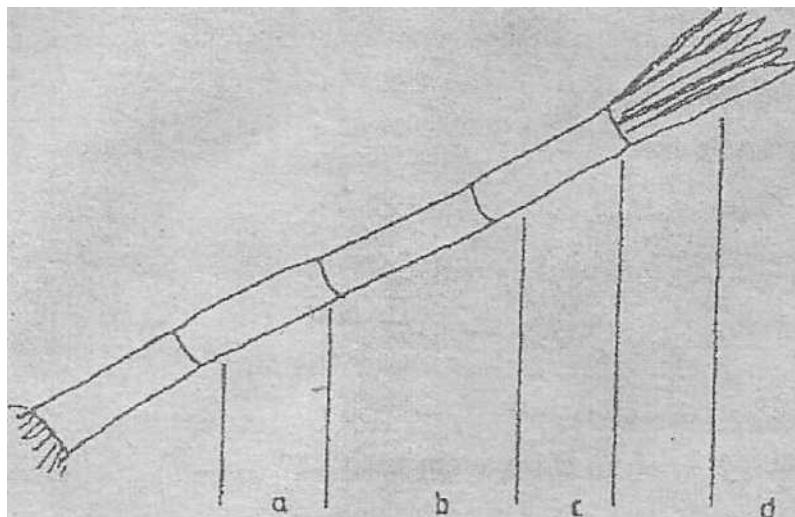
- D. Initiates formation of corpus luteum.
23. In favourable conditions, yeast reproduces by
- A. Fragmentation              B. Conjugation  
C. Sporulation              D. Budding
24. Which one of the following structures in the mammalian male reproductive organ secretes seminal fluids?
- A. Prostate glands              B. Vas defens  
C. Epididymis              D. Seminiferous tubules
25. Spirogyra normally reproduces by
- A. binary fission              B. conjugation  
C. budding              D. hyphae
26. In man, oestrus cycle is also known as
- A. heat period              B. gestation period  
C. menstrual cycle              D. lactation cycle
27. The normal reproductive cycle of the human female involves the interaction of the;
- A. Oviduct, thyroid gland and ovary.  
B. Pituitary gland, ovary, uterus.  
C. Adrenal gland, ovary and vagina.  
D. Placenta, pituitary gland and uterus.

28. In the diagram of an ovum below, the part marked X is



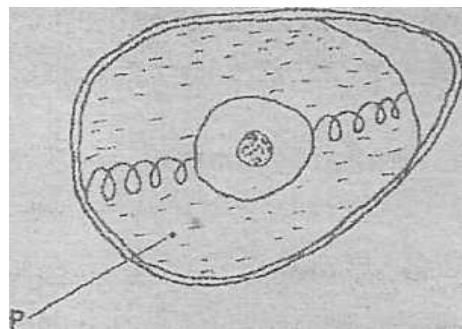
- A. Corona radiate
- B. Ovum
- C. Follicle cells
- D. Zona pellucid

29. Which portion labeled a- d in the diagram in the figure can be used for propagation?



- A. a
- B. b
- C. c
- D. d

30. Figure below shows a diagram of a bird's egg. The main function of the structure labeled P is to;



- A. Provide food and oxygen.
- B. Store excretory products.
- C. Protect the embryo.
- D. Provide food and water.

31. In higher flowering plants the first male gamete fuses with

- A. polar nucleus
- B. secondary nucleus
- C. synergid nucleus
- D. egg nucleus

32. Which one of the following animals produces the smallest egg cell?

- A. Frog
- B. Snake
- C. Chicken
- D. Elephant

33. Asexual reproduction in spirogyra takes place by

- A. fragmentation
- B. cell division
- C. conjugation
- D. binary fission

34. The nucleus in the embryo sac that fuses with male nucleus to form a zygote in a flowering plant is

- A. polar nuclei
- B. antipodal nucleus
- C. synergid nucleus
- D. egg nucleus

35. During the development of a mammalian embryo, four structures develop around the embryo.

- i) allantois              ii) chorion              iii) ammon              iv) yolk sac

Which of these are protective membranes?

- A. ii) and iii)              B. i) and iv)  
C. iii) and iv)              D. i) and ii)

36. The following are advantages of vegetative propagation except;

- A. Maintenance of parental characteristics in the offspring.  
B. Early maturity of the offspring.  
C. Production of more vigorous offspring.  
D. Possibility of raising offspring where otherwise would not grow.

37. Plants can often be propagated from stems but rarely from roots because;

- A. Stems have more vascular bundles than roots.  
B. Stems often have buds which can easily sprout.  
C. Stems are stronger than roots and can withstand adverse conditions.  
D. Stems have thicker epidermis which prevents water loss.

38. Which one of the following hormones stimulates the production of progesterone from the corpus luteum?

- A. Testosterone  
B. Luteinizing hormone  
C. Oestrogen  
D. Follicle stimulating hormone

39. The equivalent of copulation in lower plant is:

- A. fission  
B. fertilization  
C. fragmentation

D. conjugation

40. A sudden rise in the concentration of hormone leads to ovulation

- A. Luteinizing
- B. follicle stimulating
- C. Oestrogen
- D. progesterone

## SECTION B

41. a) A number of organisms of kingdom plantae reproduce by seed or spore formation.

i) State how advantageous and disadvantageous it is for such an organism to reproduce by seed as opposed to spore formation. (Give two answers for each).

Advantages.

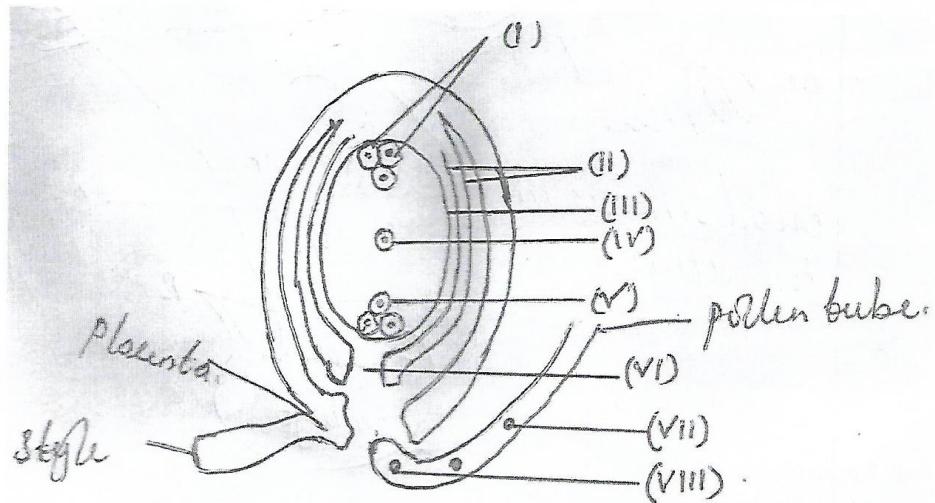
Disadvantages.

b) i) Give the reproductive behavior that justifies why advanced chordates increase in number even when their rate of reproduction is low.

ii) Give two specific examples of such chordates that are applicable in b(i).

c) State three roles played by the placenta in man.

42. The figure below is a diagram of an ovule. Study it carefully and answer the questions that follow.



Name the parts

- |      |       |
|------|-------|
| I)   | V)    |
| II)  | VI)   |
| III) | VII)  |
| IV)  | VIII) |

b) What do structures labeled (II), (III), (V), (VI), (IV) develop into after fertilization?

(II)

(III)

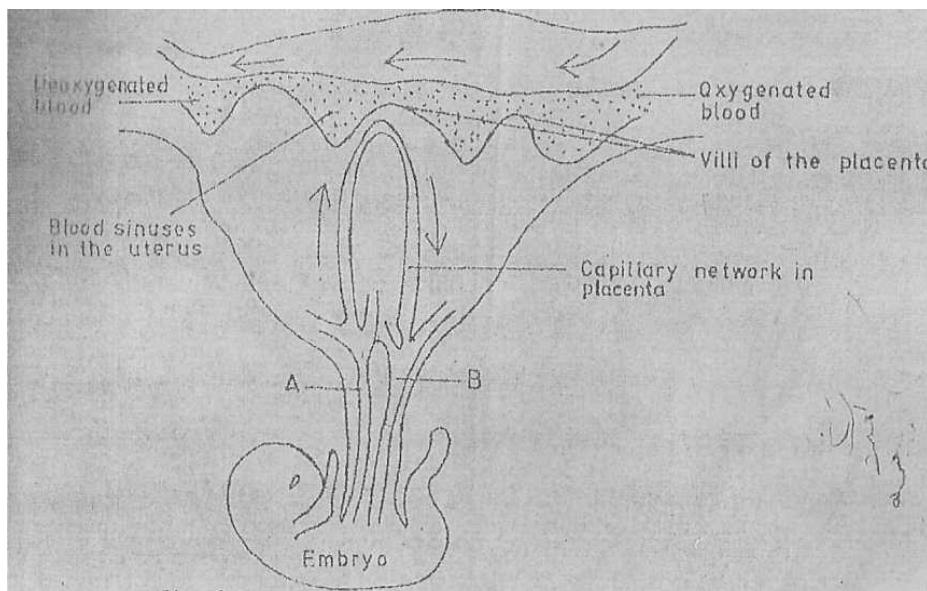
(IV)

(V)

(VI)

c) What are the functions of structures (VI) and (IV) at germination?

43. Figure below shows the relationship between blood supply of the embryo, placenta and uterus.



a) State the functions of the

i) placenta to the embryo.

ii) villi to the placenta.

b) Give two reasons why the mother's blood does not mix with that of the embryo.

c) Give two differences in the composition between the blood in vessel A and B.

44. The table below shows the changes of oestrogen and progesterone levels during female reproductive cycle over a given set of days. The recording was done every two days. Recording started in April and ended in May.

Date	14	16	18	20	22	24	26	28	30	2	4	6	8	10	12	14
Level of oestrogen in mg/1	8.0	8.0	8.1	8.5	8.9	9.3	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Level of progesterone in	7.8	7.8	7.8	7.8	7.8	7.9	8.1	8.3	8.5	10	10	10	8.5	8.0	7.8	7.8

a) Represent in the same axis, construct graphs to represent the above information.

(NOTE: Start with day 14 on the horizontal axis).

b) Describe the hormonal changes as revealed by your graph.

c) i) Name two main processes in this cycle.

ii) State the days when they are taking place as revealed by the graph.

d) i) How long is the female's cycle?

ii) From the graph, give reasons for (i) above.

iii) State the unsafe days in this cycle.

iv) Why is it called unsafe?

45. a) Draw a well labeled diagram of the male and female gamete.

b) What are the differences between an ovum and sperm?

c) How is the male gamete adapted to its function?

46. a) Draw a well labeled diagram of

i) Male reproductive system.

ii) Female reproductive system.

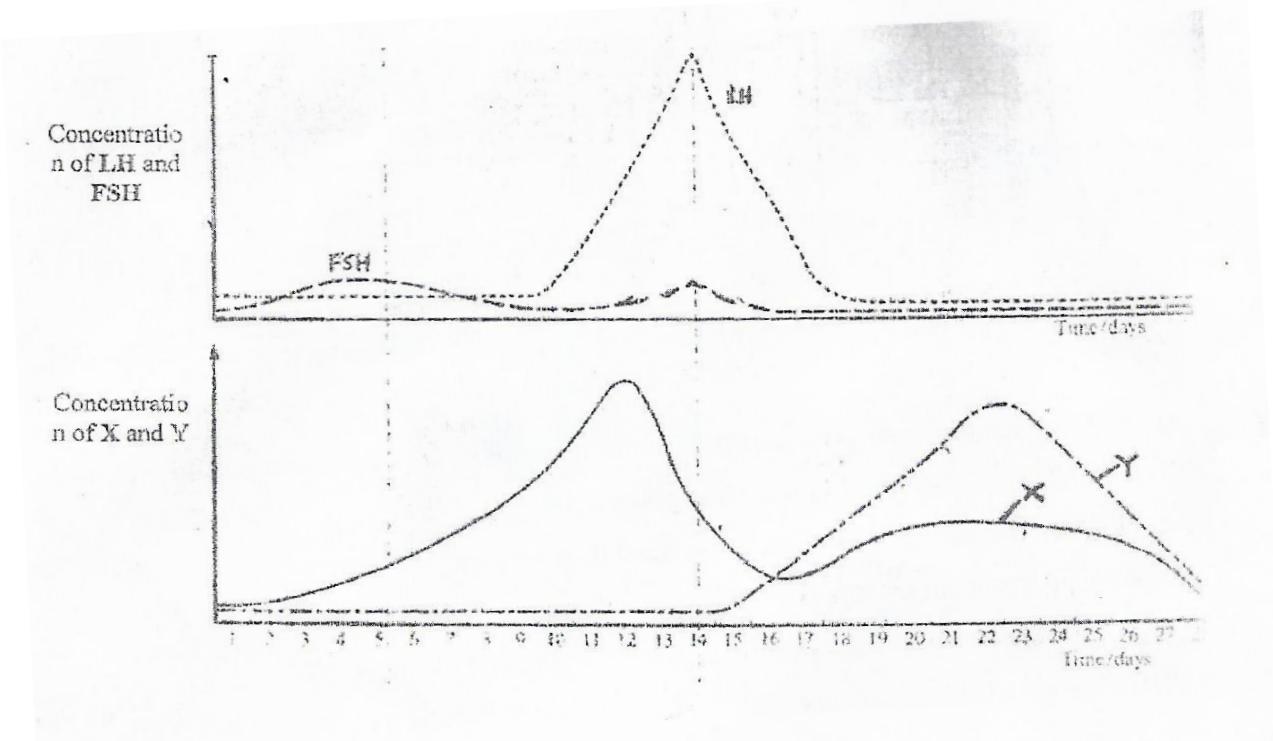
b) State the function(s) of each of the parts.

c) State the functions of the placenta.

d) How is the placenta adapted for its function(s)?

47. a) Describe the menstrual cycle in man.

b) The figure below shows the changes in blood levels of hormones that take place during menstrual cycle in a human female.



- a) i) Name the two hormones whose concentrations are represented by the curves X and Y.  
ii) From the graph, state the difference and similarities in the level of the two hormones X and Y.  
iii) State two effects of the hormone X during the menstrual cycle.
- b) What is the role of FSH in female reproduction?
- c) Describe what happens in the human female
- after day 5.
  - from day 1 to day 14.
- d) State four differences between the composition of foetal blood entering the placenta and foetal blood leaving the placenta.