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NAME:.....

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**SENIOR FOUR**

553/1

**BIOLOGY**

**PAPER 1**

**EXAM 3**

**2 HOURS 30 MINUTES**

**Instructions to Candidates.**

**Answer all the questions in Section A and B, plus two questions in section C.**

**Answers to section A and B must be written in the spaces provided.**

**SECTION A**

**All questions are compulsory**

1. Which of the following groups of terrestrial animals is least adapted to water conservation?

- A. Mammals
- B. Insects.
- C. Birds.
- D. Reptiles

A

2. Which of the following is a kingdom?

- A. Mollusca
- B. Amphibia
- C. Annelida
- D. Monera

D

3. Some live millipedes were put in a glass tubing. Both ends were blocked with dry cotton wool. The middle part had moist cotton wool. After 20 minutes all the millipedes had moved to the moist cotton wool because they.....

- A. show a negatively nastic response to moisture.
- B. show a positively nastic response to moisture.
- C. show a negatively tactic response to dryness.
- D. show a positively tactic response to dryness

C

In tactic response the whole organism moves

4. Mosquitoes get rid of nitrogenous wastes through structures called

- A. Nephridia
- B. Tracheoles
- C. Nephrons
- D. Malpighian tubules.

D

Mosquitoes are insects and insects get rid of nitrogenous wastes through malpighian tubules

5. Which one of the following animals has an exoskeleton?

- A. Liver fluke
- B. Mite
- C. Earthworm
- D. Roundworm

B

Mites are in class arachnida and phylum Arthropoda. Arthropods have exoskeleton

6. The ability to taste a certain chemical is due to a dominant gene among humans. If both parents are heterozygous, the percentage of children likely to be non tasters is

- A.25
- B.50
- C.75
- D.100

A

Non-taster carry both recessive alleles

7. Which one of the following would happen to flaccid cells that have been placed in a very dilute salt solution for a long time?

- A. Their cell vacuoles would enlarge.
- B. They would not experience any change in size.
- C. They would decrease in volume.
- D. They would become shorter.

A

They would absorb water such that their vacuoles enlarge.

8. If the liver of a person is damaged which of the following activities is likely to be affected?

- A. Digestion of proteins
- B. Elimination of urine
- C. Formation of glycogen
- D. Regulation of water

C

Formation of glycogen is one of the functions of the liver

9. The response of a dog when it smells or sees food is salivation. Pavlov modified this action to a new reflex in which the dog salivated when a bell was rung. The path of this new conditional reflex was

- A. ear, brain, spinal cord, salivary glands
- B. nose, spinal cord, brain, salivary glands
- C. mouth, salivary glands, spinal cord, brain
- D. eyes, brain, spinal cord, salivary glands

A

10. One of the properties of clay which distinguishes it from sand is that

- A. it has less air in between the particles
- B. it holds less water in between and around the particles
- C. water moves through it more easily
- D. its capillarity is lower.

A

Clay soil particles are smaller than those of sand soil and thus has smaller air spaces

11. When the biceps contract

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

C

12. 'The Sahara Desert's rapid spread to the South is a danger to human life.' Which one of the following methods would be most effective in stopping the spread of the Sahara southwards?

- A. Planting of trees
- B. Stop nuclear tests in the atmosphere
- C. Stop charcoal-burning
- D. Practice crop rotation

A

13. The following parts are involved in the transport of oxygen from the atmosphere to the capillaries in the lungs.

1. Nostrils
2. Air sacs
3. Bronchi
4. Trachea
5. Capillaries

Which of the following is the correct route of oxygen from the atmosphere to the capillaries?

- A. 1, 2,3,4,5
- B. 1, 4,3,2,5
- C. 1, 3, 2, 4, 5
- D.1, 4, 2, 3, 5

B

14. The muscular energy used by a squirrel while climbing up a tree originates from the sun. Which of the following is the correct sequence in which the energy has been transformed?

- (i) Digestion of starch in the squirrel
- (ii) Deposition of starch in a fruit
- (iii) Tissue respiration in the squirrel
- (iv) Synthesis of sugar in a leaf

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

C

15. Where in the maize grain are most carbohydrates stored?

- A. Cotyledon
- B. Radicle

C

- C. Endosperm
- D. Plumule

16. In which one of the following places would the plant have the lowest transpiration rate?

- A. In a dark and hot room.
- B. In a cool and well lighted room.
- C. In a dark and cool room
- D. In a hot and well lighted room.

C

Light leads to opening of the stomata while heat supplies the energy for evaporation

17. In which region of the mammalian kidney does pressure filtration occur?

- A. Glomerulus
- B. Proximal convoluted tubule
- C. Loop of Henle
- D. Distal convoluted tubule.

A

18. If a woman who is heterozygous for colour blindness marries a normal man, which of the following will be true of their offspring?

- A. All of their sons will be colour blind.
- B. All of their daughters will be carriers of colour blindness.
- C. One half of their children of either sex may receive the abnormal allele.
- D. All of their children will be carriers.

C

19. In the classification of organisms which of the following arrangements has the correct order of the increasing number of species?

- A. Dictyoptera, insecta, arthropoda, animalia.
- B. Animalia, arthropoda, insecta, dictyoptera.
- C. Arthropoda, dictyoptera, insecta, animalia.
- D. Insecta, animalia, dictyoptera, arthropoda.

A

Dictyoptera is an order; Insecta is a class; Arthropoda is a phylum while Animalia is a kingdom

20. Where in the bean seed are most carbohydrates stored?

- A. Cotyledon
- B. Radicle
- C. Endosperm
- D. Plumule

C

21. To which trophic levels do the organisms that are found in a grassland having zebras grazing in it belong?

	zebras	Grass
A	Decomposers	Primary Consumers
B	Decomposers	Secondary consumers
C	Primary consumers	Primary producers
D	Primary producers	Primary Consumers

B

22. Which hormones promote the processes shown?

	Development of the graafian follicle	Development of the corpus luteum	Proliferation of the endometrium
A	Progesterone	Luteinising hormone	Follicle stimulating hormone
B	Luteinising	Progesterone	Follicle stimulating

	hormone		hormone
C	Progesterone	Follicle stimulating hormone	Luteinising hormone
D	Follicle stimulating hormone	Luteinising hormone	Progesterone

D

23. A biologist found an animal which he thought was a new species. It had a cylindrical body about 13 cm long and 10 mm in diameter. It had a hard outside skin with many body segments and more than 20 legs. Into which one of the groups below would you have classified this animal,?

- A. Insecta
- B. Myriapoda
- C. Crustacea
- D. Arachnida

B

24. Which of the following bacteria is responsible for nitrogen fixation?

- A. Azotobacter.
- B. Nitrobacter.
- C. Nitrosomonas.
- D. Staphylococcus.

A

25. Which of the following mineral nutrients are constituents of hemoglobin?

- A. Potassium and sulphur.
- B. Nitrogen and Iron.
- C. Calcium and phosphorus.
- D. Zinc and copper.

B

26. Contraction of the internal intercostal muscles results into

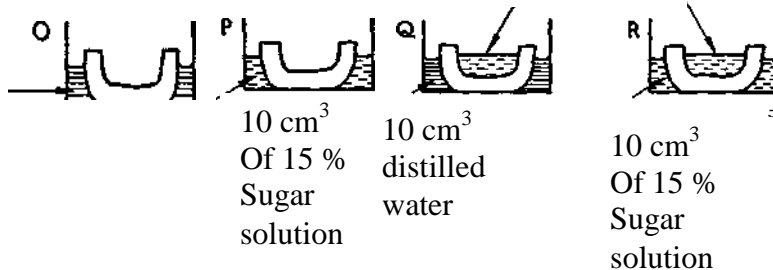
- A. increased pressure in the chest cavity.
- B. ribs moving outwards and upwards.
- C. increased volume of the chest cavity.
- D. flattening of the diaphragm.

A

27

10 cm<sup>3</sup>  
Of 15 %  
Sugar  
solution

10 cm<sup>3</sup>  
distilled  
water



O, P, Q, and R are sets of experiments to study osmosis using freshly cut potato tubers. To start with, each petridish contains 10 cm<sup>3</sup> of a liquid. In which of the petridishes will the level of the liquid be lowest?

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

C

Water would be absorbed into the Irish potato by osmosis

28. Which one of the following statements would explain why a bean seedling loses weight during the first 2 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.

C

29. Which of the following is NOT a role of humus in the soil?

- A. Improving soil aeration.
- B. Prevention of soil erosion.
- C. Water retention.
- D. Increasing soil fertility.

A

30. Which of the following fins in a fish is used for braking when the fish is locomoting?

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

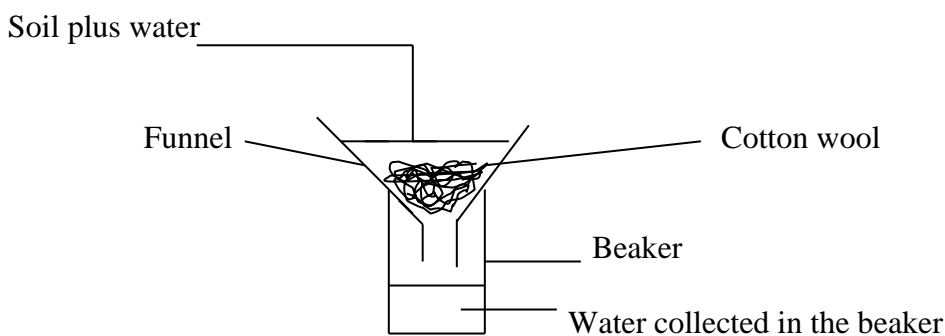
B

The **pectoral fins along with the pelvic fins** help the fish by acting as brakes and can assist the fish with difficult maneuvers

### SECTION B

All questions are compulsory

31. A student carried out an experiment on three different types of soil whereby the student added 100 cm<sup>3</sup> of water to 100 cm<sup>3</sup> of each type of soil then measured the amount of water that drained through each type of soil and collected in a beaker after every 5 minutes for 30 minutes. The student did not pour away the water collected. The experimental set up was as shown in the diagram.

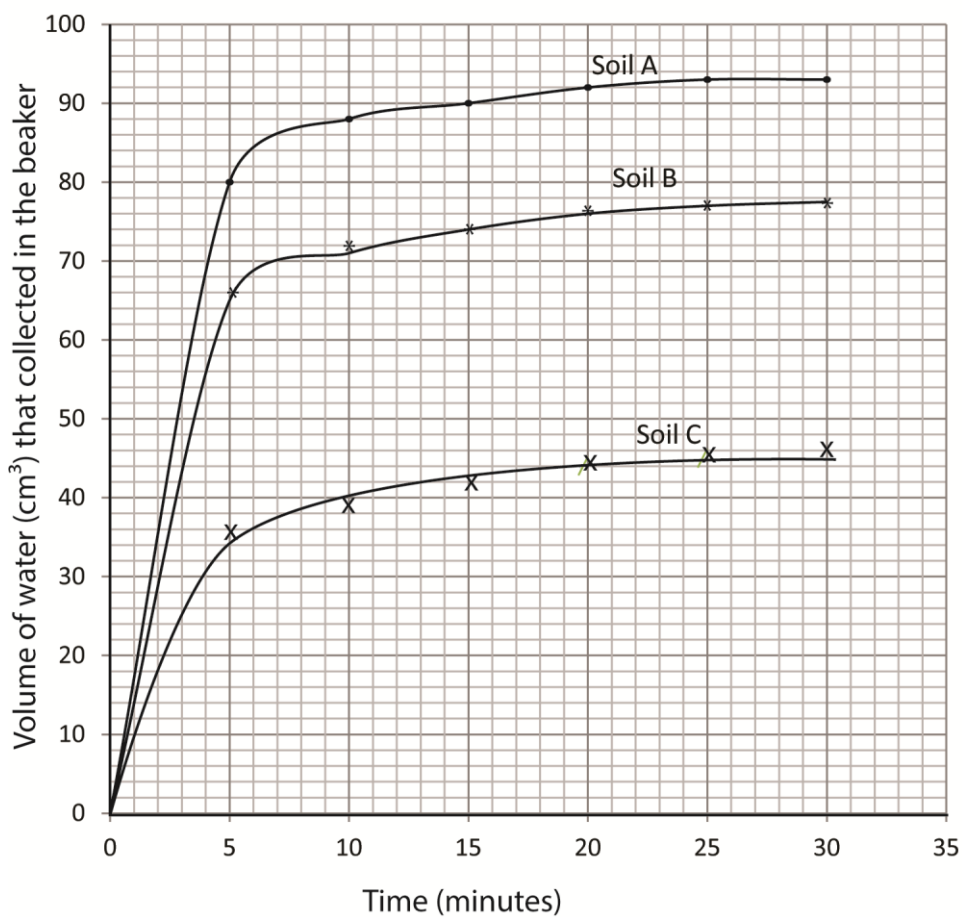


These were the students' results of the volume of water (cm<sup>3</sup>) that collected in the beaker for each type of soil.

Time(minutes)	5	10	15	20	25	30
Soil A	80	88	90	92	93	93
Soil B	65	71	74	76	77	77.5
Soil C	35	39	42	44	45	46

a) Represent the above information in form of a graph using the same axes.(08 marks)

Volume of water colled in the beaker through soil samples with time



b) What was the aim of the experiment?(1 mark)  
Drainage

c) Describe the trends of the graphs. ( 05 marks)

Soil A

Passes through soil A rapidly in the first 5minutes reaching  $80\text{cm}^3$  and then slowly up to  $93\text{cm}^3$  by the 30<sup>th</sup> minute

Soil B

Passes through soil B moderately fast in the first 5minutes reaching  $35\text{cm}^3$  and then slowly up to  $46\text{cm}^3$  by the 30<sup>th</sup> minute

Soil C

Passes through soil C slowly reaching  $35\text{cm}^3$  and then very slowly up to  $77.5\text{cm}^3$  by the 30<sup>th</sup> minute

d) Explain the trends of the graphs. ( 05 marks)

Soil A

Soil A has very high drainage and low water retention

Soil B

Soil B has moderate drainage and moderate water retention

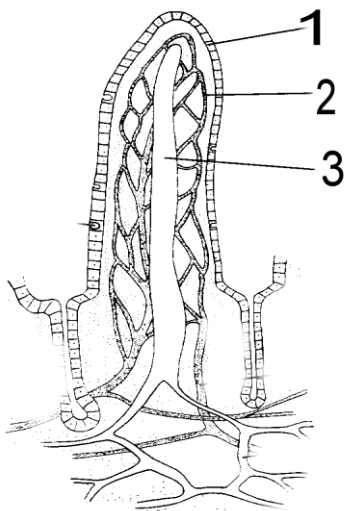
Soil C

Soil C has low drainage and high water retention

e) Which one of the three soil types is best for farming? Give a reason for your answer( 01mark)

Soil B has moderate drainage and hence moderate water retention

32. The structure below is found within the human alimentary canal



a) Name

(i) The structure: villus ( 01mark)

(ii) Name the parts labeled

(01 ½ marks)

- 1 Epithelial lining
- 2 Blood capillaries
- 3 lacteal

Name three materials transported in structure labeled 2

(01 ½ marks)

Water  
Glucose  
Amino acids  
Vitamins

b) Explain how the features shown in the figure enable the structure to function efficiently  
( 04 marks)

- Villi are thin to increase surface area for absorption
- Well supplied by blood to carry away absorbed food so as to maintain diffusion gradient
- The villi have thin membrane to reduce diffusion gradient
- Villi have high concentration of mitochondria to provide energy for active transport.
- Villi contain lacteal for absorption of fat

c) State four differences between the materials in structure 2 and 3 in the above figure.

( 02 marks)

Material absorbed by 2	Material absorbed by 3
Water soluble	Lipid soluble
Have low calorie value	Have high calorie value

33.a) Give the definition of the term Mitosis.

( 01mark)

It is a type of cell division that results in two daughter cells each having the same number and kind of chromosomes as the parent nucleus,

b) What is the significance of:

i) Mitosis in living organisms?

(03 marks)

- Genetic stability: It ensures that the daughter cells carry the exact genetic material as the parent cells
- Growth: growth results in increase in the number of cells by mitosis.
- Body repair: worn out cells are replaced by the cells produced by mitosis
- Asexual reproduction

ii) Meiosis in living organisms?

(02 marks)

- Sexual reproduction: Meiosis results in half the number of chromosomes, during fertilization the nuclei of the two gametes fuse to form a zygote restore the diploid number of chromosomes for its species.

- Genetic variation: Meiosis provided opportunities for new recombination of genes to occur in the gametes and off springs in two ways
  - (i) Crossing over
  - (ii) Independent assortment i.e., random distribution of chromosomes into the gametes at metaphase 1

d) Differentiate between Mitosis and Meiosis.

( 04 marks)

	Mitosis	meiosis
1.	Homologous chromosomes remain separate	Homologous chromosomes pair up
2	There no crossing over	Crossing over occurs
3.	No formation of chiasmata	Formation of chiasmata
4.	Single division	Two series of division
5.	Results into two diploid daughter cells	Results in four haploid daughter cells
6.	Occurs in somatic cells	Occurs in gonards

### SECTION C

34.a) What is meant by the term enzyme? (02 marks)

Enzyme are biological catalysts or are organic substances the speed up of biological reactions

b).Describe an experiment to show the action of Saliva on cooked starch. (13 marks)

- Two test tubes A and B add equal amount of cooked starch
- To test tube A add 1cm<sup>3</sup> of saliva
- To test tube B add 1cm<sup>3</sup> of water
- Incubate the two test tubes at 35<sup>0</sup> for 60minutes
- After 60minutes divide the contents of each test tube into two and use one portion to test for starch by adding drops of iodine solution and the second portion add Benedict's solution and boil to test for reducing sugars

Results

Test tube A contain little or no starch but much reducing sugars

Test tube B contains much starch but no reducing sugars

Conclusion

Saliva breaks down starch to reducing sugars

35. Describe the menstrual cycle in man. (15 marks)

#### **The menstruation/ sexual/ oestrus cycle**

This cycle found in female; ensures that female reproductive physiology events are synchronised. For the uterus prepares itself for implantation before ovulation.

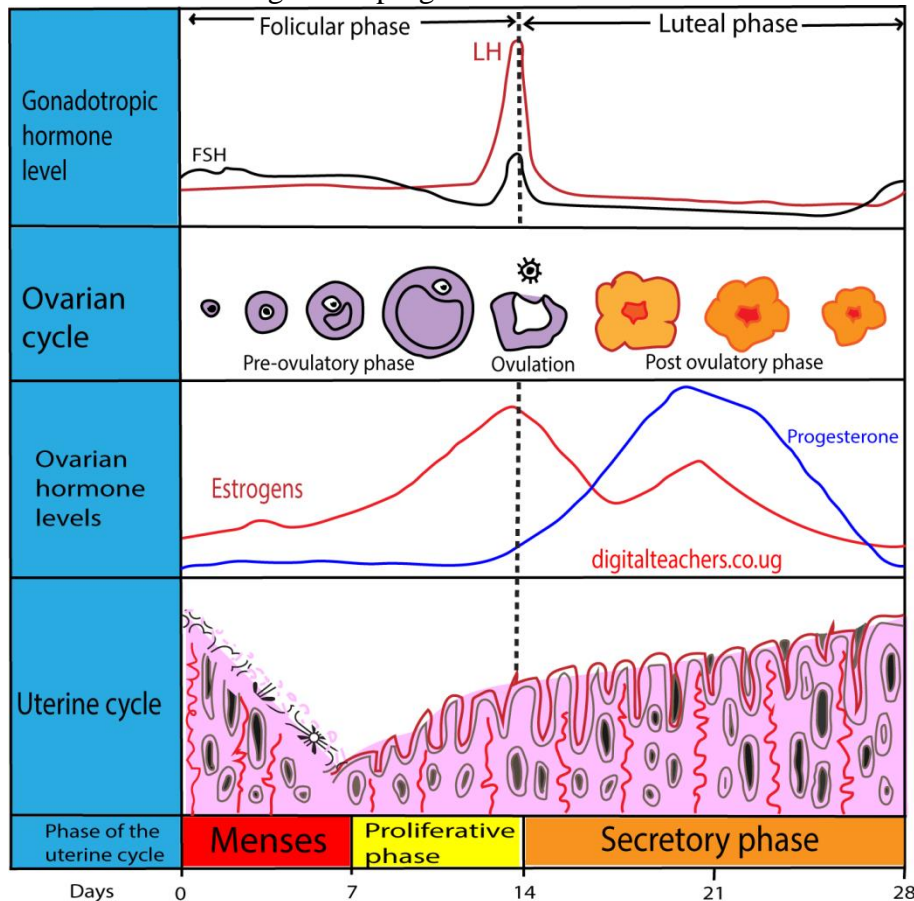
The events that occur in the course of the cycle follow a set of regulated pattern by hormone which are produced by the pituitary gland and the ovary. A complete cycle takes about 28 days. If pregnancy occurs the cycle is interrupted by other hormones produced by the placenta. The woman is most likely to get pregnant between 12<sup>th</sup> and the 17<sup>th</sup> day from the onset of menstruation.

## Hormonal control of the cycle

Pituitary hormones secreted by the anterior lobe of pituitary gland are Follicle stimulation hormones (FSH) and luteinising hormone (LH).

Ovarian hormones produced by the ovary are oestrogen and progesterone.

The menstrual cycle of the human female showing the events occurring in ovary together with relative levels of oestrogen and progesterone.



1. Just after menstruation, the anterior lobe of the pituitary gland starts secreting FSH.
2. FSH cause a Graafian follicle to develop in the ovary to secrete oestrogen.
3. Oestrogen
  - brings about the healing and repair of the uterine endometrium following menstruation.
  - inhibits production of FSH
  - stimulates production of LH.

In the course of 11 days or so the amount of oestrogen in blood stream steadily increases. Then shortly before evolution takes place, LH is released.
4. LH
  - causes ovulation
  - promotes development the Graafian follicle into a corpus luteum to secrete progesterone
5. The corpus luteum secretes progesterone.

6. Progesterone
  - This along with oestrogen, causes the continued thickening and vascularization of the uterine endometrium in preparation for implantation.
  - Inhibits secretion of LH leading to degeneration of corpus luteum
7. For a week or so after ovulation the concentration of progesterone and oestrogen gradually increase and then suddenly decrease.
8. With the fall in the levels of the two hormones, the uterine endometrium begins to disintegrate and menstruation starts and the cycle repeats.

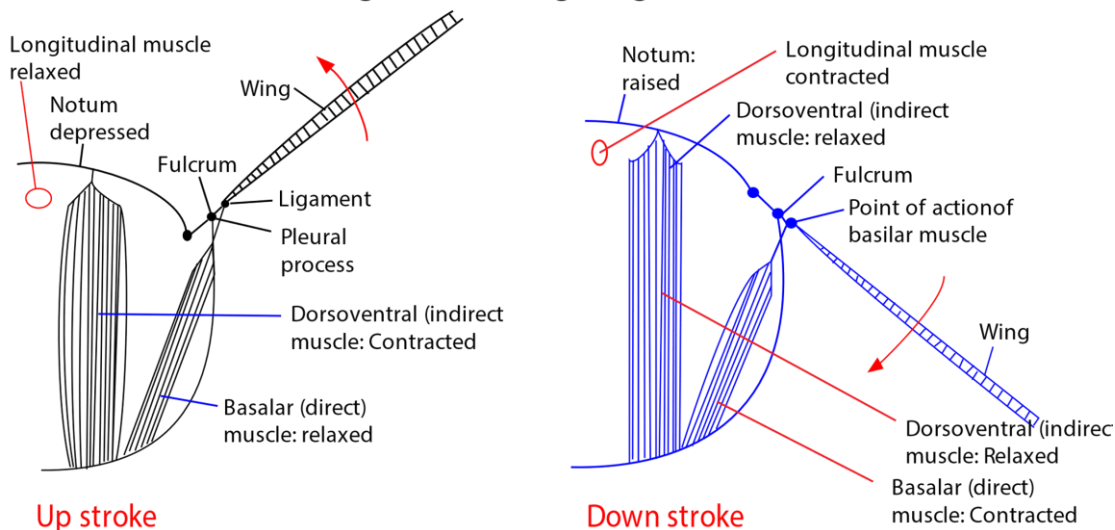
36. a) Define the term locomotion. (01 mark)

Locomotion is movement from one place to another

b) Give a detailed description of the mechanism of flight in insects. (10 marks)

- Insects thorax contain two sets of antagonistic flight muscle;
- a pair of dorso-ventral muscle (indirect muscle- not attached to the wing) run from the roof to the floor of the thorax; and a pair of longitudinal muscles run from the anterior surface of the dome- like roof to the posterior surface.
- When the dorso-ventral muscle contract the roof attachment of the wing is pulled downwards to the wall attachment with a result that the wing goes up.
- When the longitudinal muscles contract the top of the dome – like roof rises slightly and the roof attachment is pulled upwards relative to the wall attachment with the result that the wing goes down.

## Action of muscle in raising and lowering wings



c) What makes an insect are suited for flight. (04 marks)

- have streamline body
- have strong flight muscles
- have exoskeletons for attachment of flight muscles
- have extensive tracheal system that delivers oxygen directly to the muscles
- some insects have two pairs of wings to increase the surface area
- some have halteres for balancing
- are small to reduce weight
- have protective exoskeleton

37.a)i)With an example define what active immunity is? (03marks)

Active Immunity results when exposure to a disease organism triggers the immune system to produce antibodies to that disease. Active immunity can be acquired through natural immunity or vaccine-induced immunity example is resistance to polio after immunization with polio vaccine

ii) With an example define what passive immunity is? (03marks)

A type of immunity that occurs when a person is given antibodies rather than making them through his or her own immune system. For example, passive immunity occurs when a baby receives a mother's antibodies through the placenta or breast milk.

b) How does the human body defend itself from disease causing germs? (09 marks)

- **use physical barriers like your skin to prevent entry of germs**
- produce pathogen-destroying chemicals, like lysozyme, found on parts of your body without skin, including your tears and mucus membranes

- produce antibodies to destroy germs in the body
- white blood cells in blood destroy germs
- clot prevent entry of germs from damaged skin

***END***