

REVISING U.C.E BIOLOGY

Paper 1 (553/1 (Theory))
Paper 2 (553/2 (Practical))

Agnes Nambuya
*Senior Teacher Biology and Chemistry,
Jinja Secondary School.*

Isaac Omar
Makerere University

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Books by the same Author:
Companion Biology for O' level.

PREFACE

Revising UCE Biology has ultimately seen the light of the day, in an endeavour to enable all Secondary School Students pass Biology better. The second edition of this book will, certainly, be a fundamental lubricant in oiling the wheels of our endless efforts as we struggle to purposefully prepare for UNEB Examinations.

This academic output carefully tackles past paper questions (P553/1) from 1985 - 2007 and provides appropriate answer guides. A set of questions for about 24 years have been properly tackled with clear answers suitable for students all the way from senior one to senior four.

The book starts with questions for 2007, ending with those of 1987 with answers coming immediately after the questions. Students are advised to read the questions and to try to attempt them without looking at the answers. This will enable them to think and discover a lot for themselves. This is a basic requirement in modern learning.

Often times, candidates ought to be aware that in most cases Examination Questions based on Standard UNEB syllabus are related and that serious look at past papers and their answers will, undoubtedly, enable them to

appreciate the fundamental objective of this book. This will foster and enhance their capacity to answer questions as they come in an examination with high degree of confidence and accuracy.

Special attention has been put on the simplicity and clarity Biological concepts with excellent diagrams that are normally required by examiners in order for a student to get a distinction. The book ends with tips on how to perform better in biology.

In the first place it would be a mockery of our own best intentions if I do not thank Hon. Namirembe Bitamazire, Minister of Education for launching this book.

May God Bless You

A. Nambuya

I. Omar

The Launch of the book....



It is great that Ugandan teachers like Agnes Nambuya have come to author update works. It is a new trend that will make the teaching profession forget the error of old notes “yellow Notes”.....Said by .Hon. Geraldine Namirembe Bitamazire, Minister of Education & Sports during the launch of Revising UCE Biology on March 13, 2009

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53/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2007

**Uganda Certificate of Education
BIOLOGY (THEORY)**

Paper 1
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the space provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section. Write the letter representing the most correct answer to each question in the box provided.

1. Which type of fruit is shown in the cross section of figure 1?

- A. Berry
- B. Drupe
- C. Caryopsis
- D. Achene

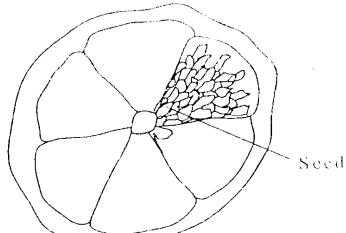


Fig. 1

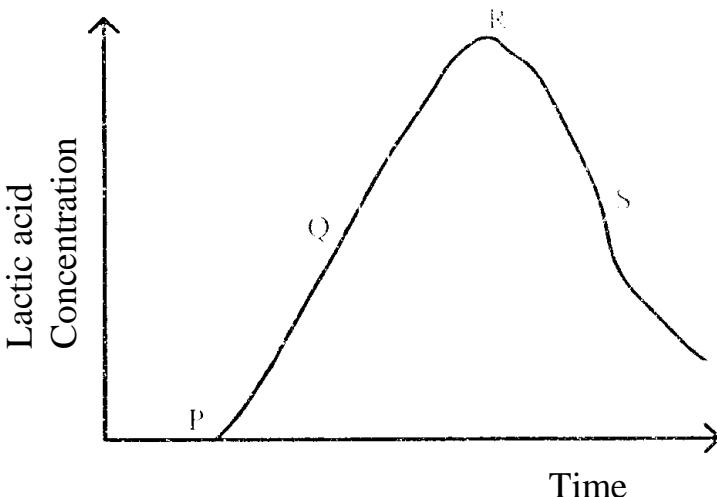
3. Which one of the following pairs of insects undergoes incomplete metamorphosis?

- A. Housefly and mosquito
- B. Butterfly and cockroach.
- C. Honey bee and moth
- D. Cockroach and grasshopper.

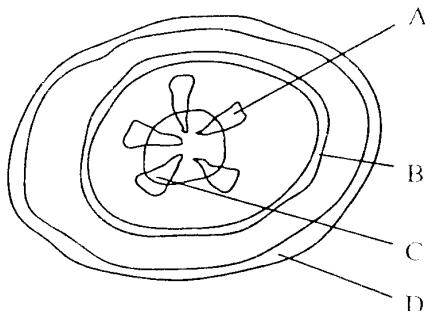
4. Which one of the following occurs in a flower after fertilization?

- A. Petals, stigma and style persist.
- B. Ovary, petals and sepals dry and fall off.
- C. Ovary develops into seed coat.
- D. Ovules develop into seeds.

5. Figure 2 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?



- A. P-Q B. **Q-R** C. R-S D. P-R
6. Which one of the following is not a reproductive and storage organ of a plant?
 A. Yam tuber B. Ginger rhizome
 C. Cassava tuber D. Irish potato tuber.
7. Which one of the following secretions does not play a digestive role in the alimentary canal?
 A. Pepsin B. Rennin C. Trypsin D. Lipase
8. Which of the following are not social insects?
 A. Ants B. Bees C. Termites D. Butterflies
9. 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.
10. Figure 3 is a transverse section through a dicotyledonous stem.



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- Which one of the parts labeled is used to transport food substances?
11. Which one of the following is the correct order in the level of organization of an organism?
- Cells → organs → tissues → systems
 - Tissues → organs → systems → cells
 - Cells → tissues → organs → systems
 - Organs → tissues → systems → cells
12. Which one of the following modes of reproduction is sexual?
- Spore formation
 - Budding
 - Fragmentation
 - Conjugation
13. Which one of the following blood vessels has the highest level of nutrients?
- Mesenteric artery.
 - Hepatic portal vein.
 - Renal artery.
 - Hepatic vein.
14. Which one of the following farming practices does not promote soil fertility?
- Strip cropping
 - Crop rotation
 - Monoculture
 - Mulching.
15. The following are characteristics of animals:
- Jointed appendages
 - Possession of exoskeleton
 - Three body parts
 - Three pairs of limbs.
- Which set of characteristics is possessed by all arthropods?
- (i) and (ii)
 - (ii) and (iii)
 - (iii) and (iv)
 - (ii)and(iv)
16. A health worker advised people to do the following:
- Wash hands before eating.
Cover all food.
Burn or bury rubbish. Use toilets.
- Which one of the following disease out breaks was the health worker mainly preventing?
- Tapeworm infection.
 - Cholera.
 - Trachoma.
 - Tuberculosis.

17. Which one of the following organisms has the largest surface area to volume ratio?

- A. Dog B. Frog C Cockroach D. Amoeba.

18. 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.

19. Which one of the following parts of the ear, regulates air pressure?

- A. Ear drum B. Oval window C. Round window D. Eustachian tube.

20. Which one of the following structures of a dicotyledonous seed is correctly matched with its function?

Structure	Function
A. Micropyle	protection
B. Radicle	develops into shoot
C. Testa	allows in air
D. cotyledons	store food.

21. The leaf in Figure 4 is modified for



Fig. 4

- A. absorption of nutrients. B. reproduction.
 C. photosynthesis. D. water storage.

22. Which of the following parts of a flower are essential for fertilization?

- A. Filament, style and petal. B. Petal, receptacle and sepals.
 C. Ovary, anther and stigma. D. Filament, sepal and receptacle.

23. Which one of the following enzymes acts in the duodenum and ileum?

- A. Lipase B. Maltase C. Peptidase D. Sucrase

24. Which one of the following is a nastic response?

- A. Bending of a plant shoot towards light.

- B. Folding of plant leaflets when touched.
C. Growing of plant roots towards water.
D. Bending of plant root towards gravity.

25. Under activity of the thyroid gland in a child may result into
A. overweight and sluggishness.
B. thinness and over-activity.
C. stunted growth and mental retardation.
D. increased metabolic rate and restlessness.

26. Which one of the following organs excretes urea?
A. Bladder B. Skin C. Liver D. Lungs.

27. Which one of the following is **not** an adaptation of a leaf for absorption of carbondioxide?
A. Its exposure in the air.
B. Presence of airspaces in the mesophyll layer.
C. Its being thin.
D. Presence of chloroplasts.

28. The hormone which causes ovulation is called
A. follicle B. stimulating hormone
C. progesterone. D. luteinising hormone oestrogen.

29. Which one of the following would not contribute to the accuracy of the capture-recapture 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.

30. Which one of the following stores carbon dioxide for a long term, in the carbon cycle?
A. Living animals. B. Dead plants. C. Fossils. D. Living plants.

SECTION B (40 MARKS)

Answer all questions in this section. Answers must be written in the spaces provided.

- 31.** Table I 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.

Table 1

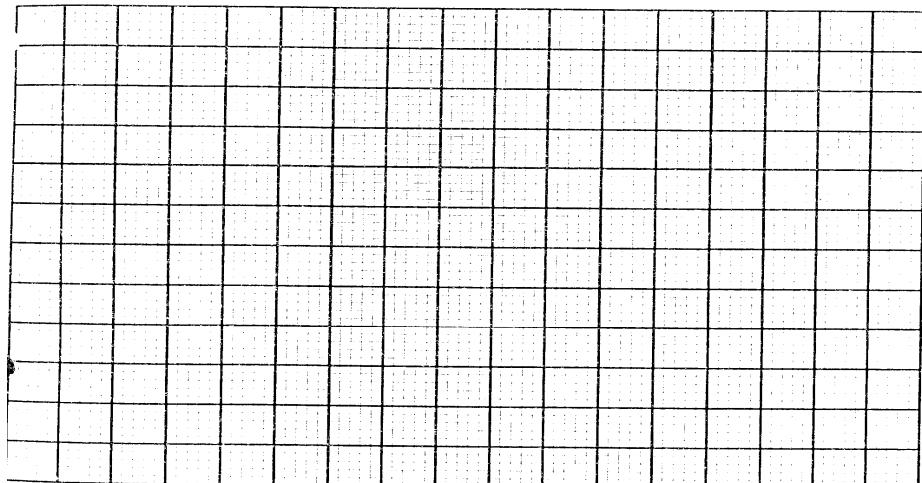
Mammal	T Surface area (m)	Volume (m ³)
--------	------------------------	--------------------------

A	1.2	0.92
B	0.6	0.18

Table 2

Environmental Temperature (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. (02 marks)
- (ii) State the structural difference between mammal A and B. (02 marks)
- (b) Using the space provided, plot on the same graph the metabolic rate of the two animals against environmental temperature. (07)



- (c) From your graph, determine the metabolic rate of each mammal at environmental temperature of 25°C.
- (d) i) How does environmental temperature affect the metabolic rate of the mammals? (02 marks)

- 7
- (ii) Explain why variation of temperature affects the metabolic rate of the mammals as stated in (c) (i). (02 marks)
- (e) From the information provided explain why at any environmental temperature, the metabolic rate of mammal B is higher than that of mammal A. (03 marks)
32. Withdraw of a hand from a hot object and bending of a plant shoot towards light are examples of sensitivity of living organisms.
- (a) What is the importance of sensitivity to living organisms? (03 marks)
- (b) State **three** ways in which the two actions described above differ.(3 mks)
- (c) Suggest the cause of the following defects in humans.
- (i) Production of large amounts of dilute urine. (01 mark)
- (ii) Overweight and sluggishness in an adult individual. (01 mark)
- (d) How does auxin concentration affect the growth of plant roots?
(02 marks)
33. (a) State how flowering plants obtain nitrogen from the soil.(02 marks)
- (b) How is nitrogen utilized by plants? (02 marks)
- (c) Outline the possible sources from which plants obtain nitrates.(4 marks)
- (d) Explain why water-logged soils are usually deficient in nitrates.(2 mks)

ANSWERS FOR BIOLOGY UCE 553/1 2007

SECTION A

1A	11C	21B
2B	12D	22C
3D	13B	23A
4D	14C	24B
5C	15A	25C
6C	16B	26B
7B	17D	27D
8D	18D	28C
9B	19D	29B
10A	20D	30C

SECTION B

31. (a) (i) The surface area: volume ratio of each animal

$$\text{Mammal A} = \frac{1.2}{0.92} = 1.3$$

$$\text{Mammal B} = \frac{0.6}{0.18} = 3.3$$

The volume ratio is:

$$1.3:1$$

$$3.3:1$$

- (ii) The structural difference between mammal A and B is as follows:

- Mammal A is big
- Mammal B is small
- Mammal A is bigger than mammal B

- (b) Little = $\frac{1}{2}$

$$L.A = \frac{1}{2} @ = 01$$

$$P = \frac{1}{2} @ \text{ for correctly plotted point scale (slated)} \quad \frac{1}{2} @ \text{ for } x2y = 01$$

$$\text{Curve} = \frac{1}{2} @ = 01$$

$$\text{Total} = 9\frac{1}{2}$$

- (c) Mammal A is 5.2 – 5.3;

Mammal B is 6.2 – 6.3;

- (d) (i) Environmental temperature affects the metabolic rate of mammals in that when environmental temperature increases, the metabolic rates of the two mammals reduce, and when the environmental temperature decreases, the metabolic rates of the two mammals increase;

- (ii) The variation of temperature affects the metabolic rate in the following ways: As the environmental temperature increases, the metabolic rate reduces in order to produce less heat, to avoid over heating / reduce body temperature / maintain body temperature.

- 32.(a) Enables the organisms to be aware of the surrounding conditions.
Respond appropriately to them for the betterment of the organism

- (b) **Withdraw of hand**

- Message is electrical -
- Message is faster
- Effect is short lived

- Bending of plant shoots**

- Message is chemical /hormonal
- Message is slower
- Effect is long lived / gradual

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- Messages conducted - Messages conducted through
through nerves cell scup.
 - (c) (i) Deficiency of Anti- diuretic Hormone (A.D.H).
(ii) Deficiency of Thyroxin Hormone
 - (d) When in low concentration root growth is stimulated, when in high concentration root growth is retarded.
33. (a) By Diffusion
By Active transport
- (b) In the formation of plant proteins, for growth formation of chlorophyll.
- (c) From fertilizers that are added to the soil.
 - When lightening occurs
 - Nitrogen fixing bacteria / Rhizoburn in plant root nodule / Azotobacters in the soil
 - Nitrifying bacterial / Nitrosomonas / Nitrobacter in the soil
 - From insects by **carnurous** plants
- (d) Lack of oxygen for the survival of Nitrifying bacterial, which convert nitrites to Nitrates / Lack of oxygen in water logged soil encourage survival of denitrifying bacteria, which convert nitrates to atmospheric nitrogen / nitrates are highly soluble and easily leached,

SECTION C

34. (a) Growth response of plants, to unidirectional / directional stimulus,
(b) **Type of Tropism** **Importance**
Positive phototropism Shoots obtain light (for photosynthesis)
- Positive geotropism Roots obtain rates / dissolved salts, anchorage of plant in the soil.
- Negative geo plants flow upwards to obtain air,

Positive Hydrotropis	exposing flows for positive. Roots obtain H ₂ O
Haptotropis	Plants obtain support
Positive chemotropis	Plants obtain essential chemical
Negative Acrotropis	Pollen grain grow away from air.

35.

Causes

- (a) Poisonous chemicals like mercury / lead discharged into water, bodies / industrial wastes / explosions / atomic bombs.
 Hot water from industries fertilizers / toxic chemicals used in agriculture.
 - Untreated sewage
 - Oil from tankers / shops spilled into H₂O
 - Soil eroded by running water

(b)

Effects

- Toxic chemicals kill organisms
- Hot water expels dissolved oxygen causing suffocation of aquatic organism
- Nitrogenous wastes and untreated sewage leads to eutrophication, leading to competition for oxygen by aerobic organisms
- Oil floating on H₂O causing diseases of dissolved air in H₂O / kills sea birds / kills vegetation.
- Eroded soil make H₂O dirty and silty hence unfit for human consumption / reduce penetration of light / reduces visibility of aquatic organisms.

(c)

Control

- Recycling industrial wastes / proper disposal of Human wastes
- Use of biological and cultural methods instead of chemicals methods in agriculture.
- Use of biodegradable chemicals in agriculture
- Treatment of sewage
- Soil conservation methods should be practiced / accept examples
- Sensitize / educate the population and the dangers of H₂O pollution
- Strict laws by Government.

36.

(a) Preservation of genetic materials

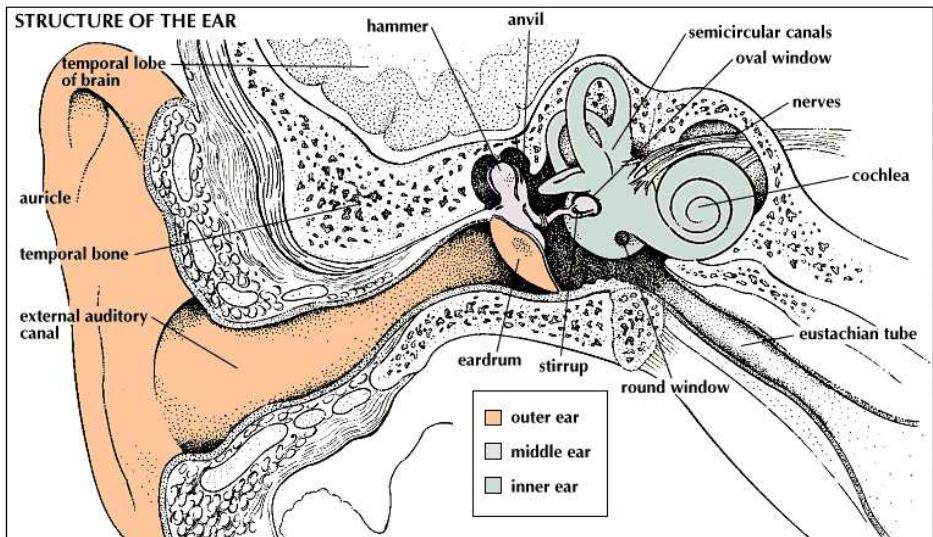
- Availability of different biodiversity for research.
- Maintaining of materials in ecosystem.

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- Plant biodiversity utilizes Carbon dioxide thus reducing pollution / reduce global warming.
 - Plants release Oxygen from photosynthesis for respiration.
 - Forests act as catchment areas for water.
 - Forests are habitat for some animals
 - Preservation of medicinal plants and animals
 - Aesthetic / beauty for tourism/fort of exchange
 - Source of raw materials for human use.

- (b)
- Wild fires, destroy vegetation, diseases / epidemics / pests, leading to death of aridity / drought, - death.
 - Poaching / illegal harvesting of wildlife, leads to extinction of wildlife.
 - Settlement / urbanization / encroachment / deforestation, clearing of vegetation for new settlement,
 - Floods / earth quakes / volcanic eruption – destroy vegetation living organisms
 - Spreading / dumping of pollutant / pesticide / herbicides / fertilizers.
 - political instability
 - lack of veterinary services

 - Pinna / outer earlobes,
 - Auditory canal,
 - Vibration,
 - Eardrum, ear ossicles, ear ossicles amplifying the vibrations, oval window, fluid filled canals / coches,
 - Sensory hair cells,
 - Impulses,
 - Auditory nerves,
 - Brain
 - Interpretation as sound,

Question could also be marked using the diagram of human ear as seen in the diagram below.



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2006

SECTION A : (30 MARKS)

Attempt all questions in this section. Write the letter representing the most correct answer to each question in the box provided.

1. Muscles are attached to bones by
 - A. cartilages.
 - B. tendons
 - C. muscle fibres.
 - D. ligaments.
2. Which one of the following blood vessels contains blood with the highest amount of oxygen ?
 - A. Venacava.
 - B. Hepatic vein.
 - C. Pulmonary vein.
 - D. Hepatic portal vein.
3. A distinguishing feature on the thoracic vertebra is a
 - A. long neural spine.
 - B. big Centrum.
 - C. small neural canal.
 - D. pair of large transverse processes.
4. 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.
5. An insect's respiratory system consists of
 - A. trachea, tracheoles and bronchioles.

- B. spiracles, trachea and tracheoles.
C . spiracles , trachea and bronchioles.
D. trachea, bronchioles and tracheoles.
6. Which one of the following cell structures is possessed by both animal and plant cells ?
A. Chloroplast. B. Cell wall. C. Flagellum. D. Cell membrane.
7. 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.
8. 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.
9. 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 sweating, hairs standing.
D. Increased blood flow to the skin surface, hairs lying flat.
10. 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.
11. Which of the following are end products from digestion of cane sugar?
A. Sucrose and maltose. B. Glucose and fructose.
C. Maltose and galactose. D. Fructose and galactose.
12. Which one of the following is a characteristic of the class insecta ?
A. Cutineous outer skeleton. B. Jointed limbs.
C. Two pairs of wings. D. Three body parts.
13. A pure breeding red-flowered plant was crossed with a pure breeding white flowered plant and all the resulting F₁ generation had pink flowers. What percentage of the F₂ plants would have red flowers if the F₁ plants were self pollinated ?
A. 100 % B. 50 % C. 33 % D. 25 %
14. In grasses, the anthers hang out below the flower and the stigma is held out above the anthers. The importance of this arrangement is to
A. improve the chances of pollination.
B. encourage cross pollination.

- C. minimise waste of pollen grains.
 D. encourage self pollination.
- 15.** Which one of the following is correct about nutrition in a
 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.
- 16.** Which one of the following tissues brings about an increase in width of a stem in a flowering plant ?
 A. Xylem. B. Phloem. C. Cambium. D. Cortex.
- 17.** Figure 1 represents a set up of experiments to show the effect of unilateral lighting on plant shoots.

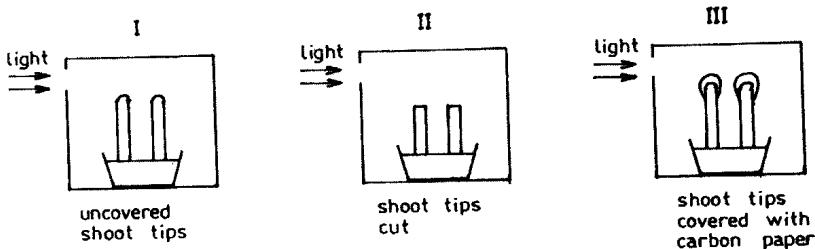
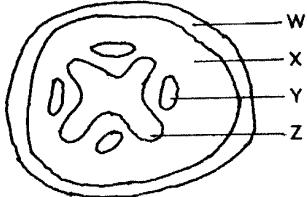


Fig. 1

- In which experiment(s) would the shoots grow straight ?
 A. I and II. B. I and III. C. II and III. D. III only.
- 18.** 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.
- 19.** Which of the following diseases are all transmitted by mosquitoes ?
 A. Elephantiasis , river blindness and yellow fever.
 B. Malaria, elephantiasis and river blindness.
 C . Yellow fever, river blindness and malaria.
 D. Yellow fever, malaria and elephantiasis.
- 20.** Which one of the following organisms can reproduce both sexually and asexually ?
 A. Amoeba. B . Spirogyra. C. Bacteria. D. Yeast.
- 21.** 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.
22. Which one of the following characteristics of an organism is most important in constructing a dichotomous key ?
 A. Body structure. B. Body colour. C. Body size. D. Age of organism.
23. When 80 cm^3 of water was added to 100 cm^3 of soil, the volume of the mixture was 140 cm . What was the percentage of air in the soil sample ?
 A. 20 % B. 40 % C. 60 % D. 80 %
24. Cutting of fallopian tubes in a woman prevents conception because
 A. ovaries stop producing eggs.
 B. implantation does not occur.
 C. sperms do no reach the egg.
 D. sperms are destroyed.
25. Which one of the following sets of characteristics of leaves enables them to absorb maximum light ?
 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.
26. Figure 2 is a transverse section of a dicotyledonous root.

**Fig. 2**

- Which one of the parts labelled, is responsible for the conduction of mineral salts and water ?
 A. W. B. X. C. Y. D. Z.
27. 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.
28. 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.
29. Which one of the following sets consists of hormones produced by mammalian reproductive organs ?

- A. Follicle stimulating hormone and testosterone.
B. Progesterone and testosterone.
C. Oestrogen and luteinising hormones.
D. Follicle stimulating hormone and oestrogen.
30. 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 photosynthesise.

16

SECTION B : (40 MARKS)

Answer all questions in this section. Answers must be written in the spaces provided.

31. 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 potometers 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 figure 3.

Use the information to answer the questions that follow.

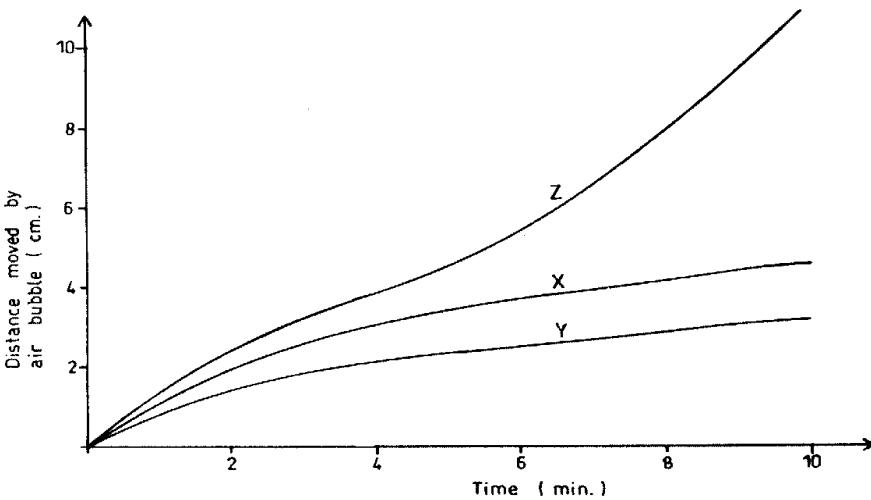


Fig. 3

- (a) Describe the pattern of movement of the air bubble in each of the three potometers during the time of the experiment.
- (i) X (02 marks) (ii) Y (02 marks) (iii) Z (04 marks)
- (b) Explain the pattern of movement of the air bubble in each potometer.
- (i) X (02 marks) (ii) Y(02 marks) (iii) Z (05 marks)
- (c) Why were similar shoots and potometers used and all the three potometers placed under a shade ? (01 mark)
- (d) The movement of the air bubble in the potometer is a measure of water uptake rather than water loss. Why is this so ? (02 marks)

32. Figure 4 represents the carbon cycle.

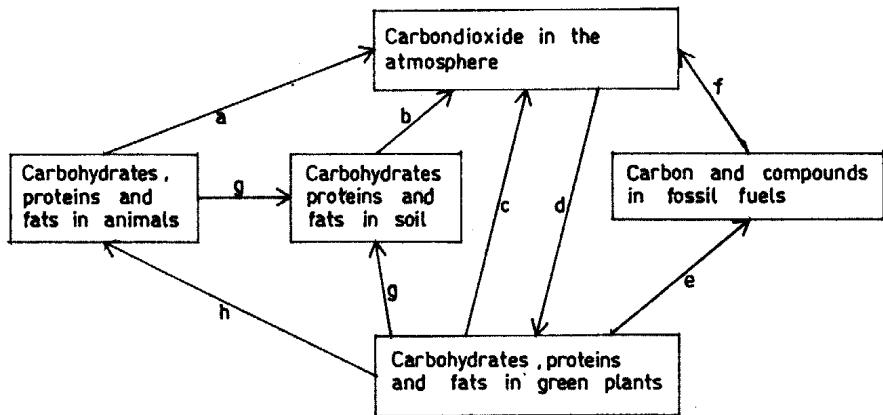


Fig. 4

- Name the processes labeled a, c, f and g. (02 marks)
 - State **one** physical factor that promotes process b. (01 mark)
 - Give **two** uses of process d to animals. (02 marks)
 - Describe **one** way in which process e may be harmful. (02 marks)
 - (i) Suggest **one** human activity that tends to lower the level of carbon dioxide in the atmosphere. (01 mark)
 - Explain how the activity suggested in (e)(i) lowers the level of carbon dioxide in the atmosphere. (02 marks)
33. Figure 5 represents a section through a mammalian eye.

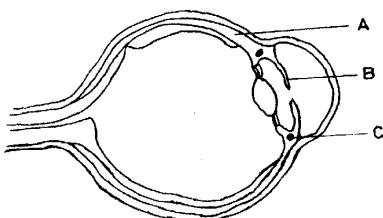


Fig. 5

- Give **two** functions of structure A to the eye. (02 marks)
- (i) What stimulus does structure B respond to ? (01 mark)
- How does structure B respond to the stimulus stated in (b)(i) ? (3 marks)
- How is part C involved in the change of focus of the eye from a distant object to a near object ? (04 marks)

SECTION C : (30 MARKS)

Answer any two questions.

34. (a) What is the importance of bile in digestion? ? (02 marks)
(b) How does the body
(i) regulate the level of glucose in the blood ? (07 marks)
(ii) deal with amino acids (06 marks)
35. (a) Explain how flowers are adapted to wind pollination. (10marks)
(b) What are the benefits of sexual reproduction in plants ? (5 mrks)
36. (a) (i) What is meant by **mitosis** ? (02 marks)
(ii) What is the importance of mitosis to living things ? (08 marks)
(b) Give differences between **mitosis** and **meiosis**. (05 marks)
37. (a) How are birds adapted to flight ? (05 marks)
(b) With the aid of diagrams, describe how wings are moved up and down during flight in a bird. (10 marks)

END

ANSWERS FOR BIOLOGY PAPER 2 2006

Section A

1.	B	11	B	21	B
2	C	12	D	22	A
3	A	13	D	23	B
4	C	14	B	24	C
5	B	15	A	25	A
6	D	16	C	26	D
7	D	17	D	27	C
8	B	18	C	28	C
9	A	19	D	29	B
10	B	20	B	30	C

SECTION B

- 31.(a) (i) X- there s a fast increase in the movement of the air bubble for the first 3-4 minutes; then a moderate increase for the remaining minutes.
(ii) Y – there is a fast increase in the movement of the air bubble for the first 3-4 minutes; then a gradual or slow increase for the remaining minutes.
(iii) Z – the movement of air bubble is fast for the first 3-4 minutes; 4-6 minutes is fastest; then very fast for the remaining minutes.
- b) (i) X – moderate because upper epidermis is with few stomata covered; so preventing some transpiration.

- (ii) Y- slow or gradual because lower epidermis is with highest number of stomata covered, so preventing a lot of transpiration.
- (iii) Z – fastest because all stomata are uncovered, allowing much transpiration. After 5 minutes, more transpiration occurs in sunny conditions due to increased temperature or light intensity.
- c) So that any difference in movement of the air bubble is due to the treatment of the leaves with petroleum jelly or due to the difference in the number of stomata exposed.
- d. Not all the water taken up is lost or transpired, some of it is used for photosynthesis or metabolic processes.
32. (a) The processes name are:
- a. Respiration (in animals)
 - c. Respiration (in plants)
 - f. Combustion or burning or oxidation
 - g. Death or decay or putrefaction
- b. Temperature or moisture or oxygen
- c. -Produces food for animals through photosynthesis
 -Release oxygen for respiration for animals
 - Reduces the amount of carbondioxide in the air.
- d. It locks up or removes nutrients from circulating for a long time.
- e. (i) -Plant trees (afforestation)
 -Industrial extraction
- (ii) Plants use carbondioxide during photosynthesis
 Human beings extract carbondioxide from the atmosphere for preservation of drinks
- 33.(a) A (choroid)
- It gives nourishment to the eye.
 - Its dark pigment minimizes internal reflections.
- (b) (i) Light (intensity)
- (ii) When light intensity is high muscles of B relax or circular muscles contract or radial muscles relax, size of pupil reduces, admitting less light.

When light intensity is low, muscles of B contract or circular muscles relax or radial muscles contract; size of pupil increases and more light is allowed in the eye.

- c) C contracts, reducing tension on the lens and the lens becomes thicker or convex with shorter focal length.

SECTION C

34. (a) Functions of bile

- Bile emulsifies fats
- Provides suitable Ph for action of pancreatic enzymes or bile increases ph or bile neutralizes acids.

- b) (i) When glucose level in the blood is high, the pancreas secretes insulin which causes the liver to convert excess glucose into glycogen or fats for storage.

When the level of glucose low, the pancreas secretes glycogen or adrenal gland or adrenal gland secrets adrenalin which causes the breakdown of glycogen into glucose.

(ii) Amino acids are used to make new cells or tissues or protoplasm or protein compounds or new other amino acids. Excess amino acids cannot be stored in the body so they are deaminated or amino groups is removed and converted into urea which is excreted out. The residue is converted into carbohydrates which are oxidized for energy or converted into glycogen or fats for storage.

35. (a) (i) How flowers are adapted to wind pollination

- Abundant pollen production – to increase the chances of reaching the Stigma
- Small or light pollen grains- which can be blown easily by wind.
- Smooth pollen grains or pollen loosely attached to anther- which cannot stick together so that they are easily blown away.
- Large anthers – to produce large quantities of pollen.
- Long filaments- which hang outside the flower so that they sway and shake out the pollen in the lightest breeze.
- Spreading or wide or large featherly stigma – for catching or trapping pollen as it floats in the air.

- Flowers usually on long (pedical) above the leaves – for increasing the flowers' exposure to air currents.
- Anthers are versatile or hinged or loosely attached to filament. They are easily shaken by wind.

b. **Benefits of sexual reproduction in plants**

- Results into variations
 - Results into variations which increase resistance to diseases or increase adaption to various environments.
 - Seeds are widely dispersed reducing competition for nutrients and reducing chances of getting infectious diseases from parents so growing healthier and better.
 - Varieties can be improved by crossing individuals with required qualities.
 - Seeds produced during sexual reproduction are able to survive under harsh conditions through seed dormancy.
36. (a) (i) Mitosis is a process of cell division to form two identical daughter cells or two cells with same number of chromosomes with a mother cell.

(ii) **Importance of mitosis to living things**

- Increase in number of cells hence growth or production of new body cells and repair.
- Maintains equal number of chromosomes in the same species.
- Basis for asexual reproduction or cloning.
- Quick colonization or establish a colony of individuals which are similar to the parent or increase in population.
- Maintenance of parental characteristics.

b. **Differences between Mitosis and Meiosis**

Mitosis	Meiosis
Occurs in somatic cells	Occurs only in testis and ovary cells or germinal cells.
Chromosome number remains the same.	Chromosome number is halved.
Daughter cells are identical to parent cell.	Daughter cells are genetically different from parent cells.
Two daughter cells produced	Four daughter cells produced
CO never occurs or chiamsata never	CO may occur or charismata form.

forms.	
Occurs in one stage at every phase or takes a short time.	Occurs in two stages at every phase or takes a long time.
Homologous chromosomes do not associate or bivalents never form.	Homologous chromosomes associate or bivalents form.

37.(a) How birds are adapted to flight

- The fore limbs are wings with a very wide surface area provided by the feathers.
- They have large pectoral muscles for depressing or raising the wings.
- They have a deep keel from the breast bone (sternum) for attachment of the pectoral muscles.
- They have a coracoid bone for transmitting the lift of the wings to the whole body.
- They have a rigid skeleton giving a firm framework where only few bones move in the body.
- The skeleton has hollow bones which reduces the weight of the bird.
- Their bodies are relatively small and light.
- They have an efficient vascular and respiratory system where the lungs have extensive air sacs which store air when the bird is in flight.

b) How wings are moved up and down during flight.

Down stroke of the wing:

- The pectoralis major which is attached to the lower side of the humerus contracts.
- The pectoralis minor which is attached to the upper side of the humerus relaxes.
- The wing is pulled downwards.
- There will be air resistance on the wing giving the wing an upthrust.
- The upthrust lift will be transmitted from the wing through the coracoid bone to the whole body. So the whole body will be lifted.

Upstroke of the wing:

- The feathers open to allow air to pass through.
- The pectoralis minor contracts and the pectoralis major relaxes.
- The wing is pulled upwards.
- The joint between the humerus and the radius-ulna is bent to reduce air resistance on the wing.

- Steering in the right direction is achieved by the bird applying unequal strokes for the wings.
- Tilting of the wings and the tail acts as brakes for the bird.

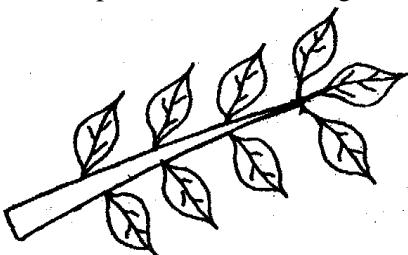
553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2005
(Theory) Paper Oct/Nov. 2005

2½ hours

SECTION A: (30 MARKS)

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

- 25
1. Which one of the following organisms improves aeration and drainage of soil?
A. Fungi B. Snails C. Bacteria D. Termites
 2. Which one of the following groups contains the largest number of organisms?
A. Order B. Species C. Class D. Phylum
 3. People living at high altitudes have more red blood cells than those at lower altitudes in order to
A. Breathe more quickly C. Pump more blood
B. Keep the body warm D. Absorb enough oxygen
 4. Which one of the following best describes the effect of one 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
 5. The group of organs performing excretory functions is
A. Kidneys, Lungs and skin C. Skin, kidneys and pancreas
B. Liver, Kidneys and pancreas D. Lungs, spleen and gall bladder.
 6. A cuticle may be regarded as a disadvantage to insects mainly because
A. It does not allow rapid locomotion C. Does not prevent water loss
B. It limits the size of insects D. Does not allow gaseous exchange
 7. The best description of the leaf in fig. 1 is



- A. Pinnate and parallel veined C. Pinnate and net-veined
 B. Palmate and net veined D. Bipinnate and parallel veined
8. Which one of the following structures of the ear equalizes pressure on both sides of the eardrum?
 A. Oral window C. Semi-circular canal
 B. Eustachian tube D. Round window
9. Which one of the following shows the correct path followed by the sperms when ejaculated?
 A. Seminiferous tubules → epididymis → sperm ducts → urethra
 B. Epididymis → seminiferous tubules → urethra → sperm ducts
 C. Sperm ducts → seminiferous tubules → epididymis → urethra
 D. Seminiferous tubules → urethra → sperm ducts → epididymis
10. 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 thyroxin hormone
 D. Deficiency in adrenaline hormone
11. Which of the following monosaccharide make up sucrose?
 A. Galactose and fructose C. Fructose and glucose
 B. Galactose and glucose D. Two glucose molecules
12. Which of the following parts of a microscope are adjusted in order to bring the specimen into focus?
 A. Eyepiece and coarse adjustment C. Eyepiece and fine adjustment
 B. Coarse and fine adjustments D. Mirror and fine adjustment
13. P,Q,R and S are characteristics of insects
 P - Undergo complete metamorphosis
 Q - Possess wings
 R - have three pairs of legs
 S - divided into three body parts.
 Which of then are common to all insects?
 A. P and Q C. Q and S
 B. R and S D. P and R
14. Which of the following is not a characteristic of a respiratory surface?
 A. Thin walls C. Densely supplied with capillaries
 B. Moist surface D. Smooth surface
15. Green plants give out less carbon dioxide during day than at night because during the day
 A. The rate of photosynthesis is low
 B. Transpiration interferes with escape of carbon dioxide

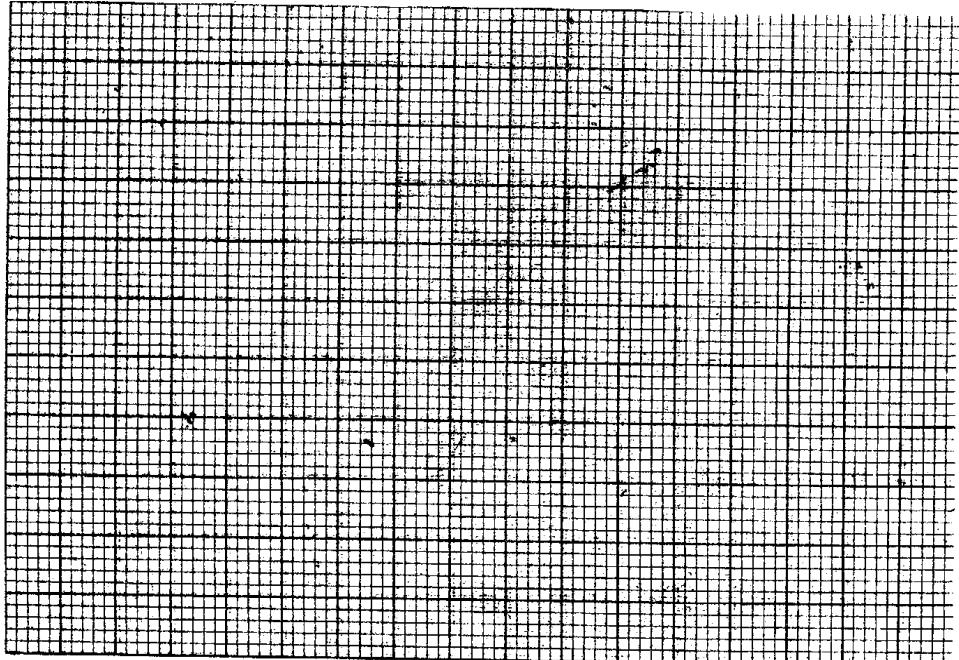
SECTION B: (40 MARKS)

Answer all questions in this section. Answers must be written in the spaces provided.

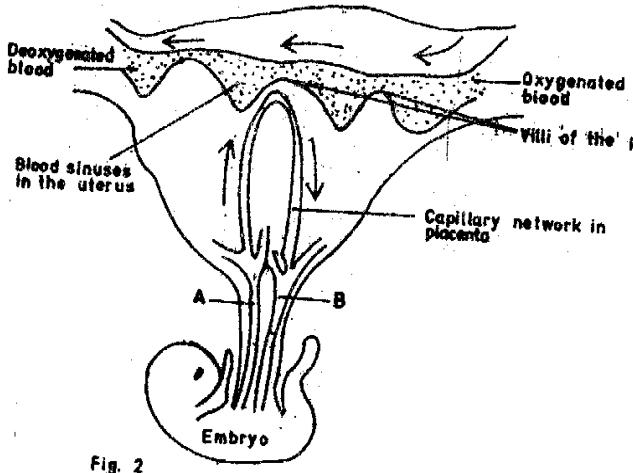
31. Six identical potato cylinders measuring 2.0 cm in length were each placed in a different concentration of sugar solution. After two hours, the potato cylinders were removed from the solutions and re-measured. The table below shows the results.

Concentrations of sugar solutions mol⁻¹	Length of potato cylinders after 2 hours (cm).	Difference in length of potato cylinders after 2 hrs(cm)
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 two hours (i.e. length after 2 hours subtract initial length). (03 marks)
- (b) In the space provided plot a graph of the difference in length after 2 hours against concentration of sugar solutions. (05 marks)



- (c) (i) What was the effect of the concentration of the sugar solutions on the length of the potato cylinders? (04 marks)
(ii) Explain why the concentration of the sugar solutions affected the length of the potato cylinders as stated in (c) (i). (03 marks)
- (d) (i) From your graph, determine the concentration of the sugar solution that would give no difference in length of a potato cylinder. (01 mark)
(ii) Explain what happens in a potato cylinder when no change in length occurs .
- (e) Suggest one other observation other than change in size, the would be made on the potato cylinders. (02 marks)
32. Fig. 2 Shows the relationship between blood supply of the embryo, placenta and uterus.



31

- (a) State the functions of the:
- Placenta to the embryo (*04 marks*)
 - Villi on the placenta (*02 marks*)
- (b) Give two reasons why the mother's blood does not mix with that of the embryo. (*02 marks*)
- (c) Give two differences in the composition between the blood in vessels A and B. (*02 marks*)
33. (a) What is meant by genotype? (*01 marks*)
 (b) A man of blood group A married a woman homozygous for blood group B and they produced a son of blood group B.
 - Work out the genotypes of the father and of the son. (*04 marks*)
 - The son married a wife of blood group O showing your working, give the percentages of the possible phenotypes of their offspring. (*03 marks*)
(c) Blood groups in humans show discontinuous variation. Explain what you understand by this statement. (*02 marks*)

SECTION C: (30 MARKS)

Answer any two questions

- 34.(a) What are the constituents of fertile soil? (*03 marks*)
 (b) In what ways may human activities:
 - Improve soil? (*06 marks*)

- 32
- (ii) Degrade soil? (06 marks)
- 35.(a) Describe the structure of the different types of bird's feathers, stating the function of each type. (06 marks)
- (b) What factors contribute to the bird's ability to fly? (09 marks)
36. (a) Draw and label a transverse section of a stem of a herbaceous dicotyledonous plant.
- (b) State the functions of five of the parts that can be identified in the section (05 marks)
- (c) Describe how carbon dioxide is removed from the mammalian body tissues into the atmosphere. (13 marks)
37. (a) What is meant by excretion? (02 marks)
- (b) Describe how carbon dioxide is removed from the mammalian body Tissues into (he atmosphere. (13 marks)

ANSWERS FOR 2005 UCE BIOLOGY

1.	D.	11.	C	21.	C
2.	D	12.	B	22.	B
3.	D	13.	B	23.	B
4.	C	14.	D	24.	C
5.	A	15.	D	25.	C
6.	B	16.	A	26.	C
7.	C	17.	B	27.	A
8.	B	18.	B	28.	A
9.	A	19.	C	29.	D
10.	C	20.	C	30.	A

SECTION B:

31 (a)

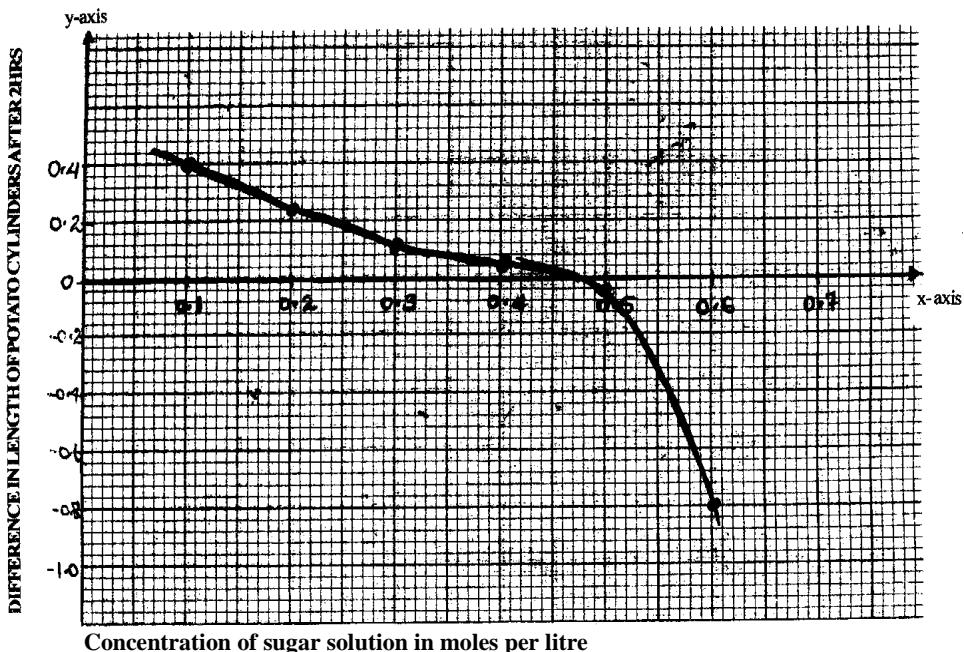
Concentrations of sugar solutions mol 1 ⁻¹	Length of potato cylinders after 2 hours (cm).	Difference in length of potato cylinders after 2 hrs (cm)
0.1	2.40	0.40
0.2	2.25	0.25
0.3	2.15	0.15
0.4	2.05	0.05
0.5	1.98	-0.02

0.6

1.02

-0.98

A graph showing difference in length v concentration of sugar solution in moles



Scale: x-axis 1cm: 0.05 mol L⁻¹
y-axis 1cm: 0.2 cm

- (c) (i) Low concentration of sugar solution (less than 0.4-0.5) leads to an increase in the length of the potato cylinders and increased concentration of sugar solution (more than 0.4-0.5) leads to a decrease in length of a potato cylinder.
- (ii) In the less concentrated sugar solutions i.e. (0.1 - 0.4), water enters by osmosis into the potato cylinders, the vacuoles expand, leading to increase in length. In the more concentrated sugar solutions (more than 0.4-0.5), water leaves the vacuoles of the potato cylinders by osmosis, the vacuoles shrink causing the potato cylinders to shorten.
- (d) (i) The concentration of the solution in the vacuoles is equal to the concentration of the solution outside the cylinder leading to the amount of water entering and leaving the cylinders being equal.

(e) The potato cylinder becomes (hard) or stiff

32. (a) (i) **Functions of the placenta to the embryo**

- Transports antibodies from the mother's blood to the foetus
- Permits blood to operate at different pressures
- Transports waste products from the foetus to the mother's blood
- It acts as a barrier to maternal hormones and other chemicals in the mother's blood which would have an effect on foetal development.
- It is an organ of exchange of respiratory gases and nutrients between the mother and the foetus
- Produces a hormone progesterone responsible for maintenance of pregnancy.

(ii) Villi provide a large surface area for exchange of nutrients and oxygen from the surrounding uterine blood to the foetus.

(b) This is due to the presence of the barrier between the mother's blood and that of the foetus which prevent the mother's blood pressure from bursting the vessels of the embryo.

-Blood would agglutinate if the mother's blood group was different from that of the foetus.

-It prevents poisonous substances from the mother from entering the embryo.

(c) A

- Rich in urea
- Has high concentration of Carbon dioxide and low concentration of oxygen
- Less antibodies

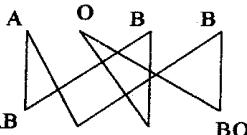
B

- No Urea
- has a high concentration of oxygen and a low concentration of carbon dioxide
- More antibodies.

- 33 (a) This is the genetic composition of an organism.

Parents	Man	X	Woman
Phenotype	Blood Group A	X	Blood Group B
Genotype	AO	X	BB

Meiosis



Fertilization

F1 offspring
genotype

The genotype of the father is AO

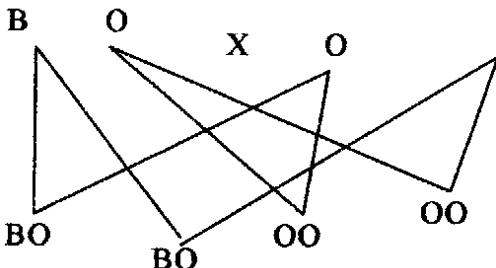
The genotype of the boy is either BO

Parents Man X Woman

Phenotype Blood Group A X Blood Group B

Genotype BO X OO

Meiosis



50% have blood group B 50% have blood group O

- c) This is a variation in characteristics in a population which shows no intermediates for example blood groups in humans (A, B, AB and O).

SECTION C: ANSWERS

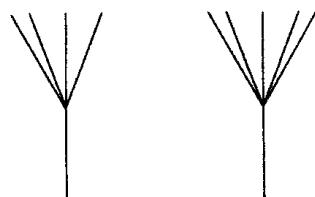
34. a) The constituents of a fertile soil are;

- Water
- organic matter
- Mineral salts
- inorganic matter air
- Living organisms

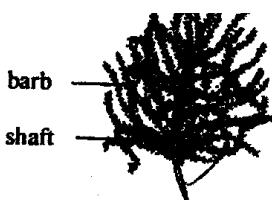
- 36
- b) (i) **Human activities improve soil in the following ways**
- Mulching adds humus on the soil which improves soil fertility and improves water retention capacity
 - Planting of crops like legumes add nitrogen into the soil
 - Cultivation helps to improve soil aeration by breaking the soil particles apart
 - Addition of fertilizers helps to improve soil fertility
 - Digging of drainage channels helps to improve both the structure of clay soil and its aeration.
 - Mulching of the soil also increases the water infiltration capacity,

- (ii) **Human activities degrade the soil in the following ways;**
- Over cultivating the land removes soil cover and exposes the soil to agents of erosion.
 - Both mining and deep cultivation degrades the soil structure.
 - Application of fertilizers can lead to death of soil organism
 - Bush burning exposes the top soil to agents of erosion and also kills soil organisms.
 - Over grazing exposes the soil to agents of erosion
 - Addition of fertilizers that are acidic like Ammonium Sulphate decreases the soil PH-
 - Ploughing down the stream exposes the soil to agents of erosion.
 - Disposal of non biodegradable wastes can prevent water infiltration into the soil.

35.



Have short shafts and barbs that are not interlocking have a short quill.
They function for insulation and covering the body.



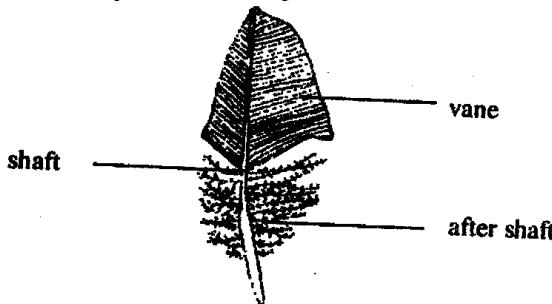
(a) (i) **Filoplume feathers:-**
These are small fine hair like structures that cover the whole body of a bird they function for sensory, insulation and covering the body.

(ii) **Down/contour feathers:-**
These are small fine hair like structures that cover the whole body of a bird they function for sensory, insulation and covering the body.

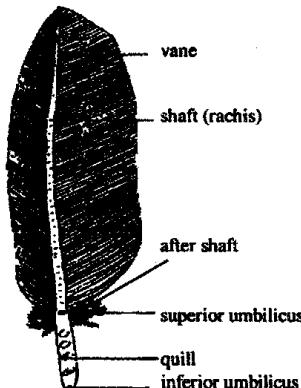
(iii) **covert/contour feathers:-** These are arranged in that they are inclined

37

backwards to ease flight they have a short vane, large after shaft and a short quill. They also give colour to the birds. In addition they act as water proof



(iv) **Quill (flight) feather**:- Has long and broad vane. The barbs divide into barbules. The upper barbules contain hooks, while the lower contain ridges. Has small after shaft. These are used for flight and keeping the body dry.

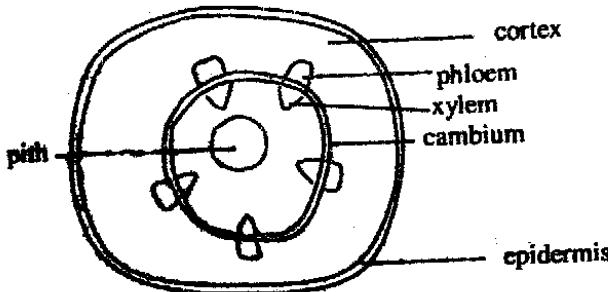


(b) Factors that contribute to bird's flight ability;

- The bones of the vertebral column are fused hence reducing the length of the bird.
- The body is streamlined to reduce the effect of air resistance
- The wings and tail bear flight feathers used for flight
- The bones contain large airspaces making them light enough for flight
- The fore limbs have been modified into wings for flight
- The breaking system is very efficient to cope up with oxygen demand for respiration as enormous energy is required during flight.
- Have no ear lobes to abstract the flow of air. This reduces resistance
- Reduction in the size of reproductive organs. In female there is only one ovary which even beaks down during non breeding seasons.

- Presence of a transparent eructating membrane covering the eyes and protects them
- Moderately high blood temperature and insulation of feathers stop the cooling effect of air during flight. They have a deep keel of sturnum for muscle attachment.

36. (a) The structure of herbaceous dicotyledonous plant



(b) Functions of the parts

- **Xylem:** Transports water and mineral salts. Supports the plant.
- **Cambium:** Responsible for secondary growth
- **Phloem:** Transports manufactured food from the leaves to the rest of the parts
- **The cortex:** This has thin walled cells which are not closely packed forming air spaces thus allows free circulation of air to inner cells
- **The Epidermis:** This forms a protective layer against decication and free entry of pathogens. Reduces excessive water loss

(c) Stem modifications to various functions

- Climbing stems develop tendrils e.g. in passion fruits
- Some stems develop hooks that hold the plant onto another e.g. Bougainvillea
- Some are specialized in storing food and water due to being swollen. E.g. stem tuber like Irish potatoes
- Some stems are modified for reproduction for example Sugarcane, Cassava and Irish potato. In this case they contain buds.
- Some stems appear green and bear chlorophyll for photosynthesis especially in young plants.
- They bear lenticels responsible for gaseous exchange

- 39
- Stems that develop hooks serve defensive purposes. Some have air spaces for floating.
37. (a) Excretion is the removal of harmful waste products of metabolism from the body.
- (b) Carbon dioxide from the tissues diffuses into the capillaries which unite into veins that return blood to the heart through the venacava.

From the heart blood is pumped to the lungs through the pulmonary artery which divides into capillaries.

From capillaries of the lungs carbon dioxide diffuses into the alveoli.

Diaphragm muscles relax, the diaphragm becomes dome shaped and intercostal muscles contract and ribs are lowered.

Both reduce the volume of the chest cavity and increase its pressure above that of the atmosphere so air from the alveoli is forced into the atmosphere.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2004

BIOLOGY (THEORY) Oct./Nov. 2004

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. 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 fathers
2. In which one of the following associations do both organisms benefit?
 - A. Malarial parasite and human
 - B. Tape worm and human
 - C. A fungal parasite and plant
 - D. Nitrogen fixing bacteria and leguminous plant.
3. Which one of the following methods would be the best for estimating the population density of rats in a bush?
 - A. Direct counting
 - C. Line transect
 - B. Quadrant method
 - D. Capture-recapture method
4. Addition of humus to a sandy soil would
 - A. Decrease the capillarity of the soil
 - B. Increase the aeration of the soil
 - C. Decrease mineral content of the soil
 - D. Improve the water retention capacity of the soil
5. At which of the following levels of classification can organisms interbreed and produce fertile offspring?
 - A. Class
 - B. Species
 - C. Phylum
 - D. Kingdom
6. By which one of the following process does carbon dioxide leave the blood capillaries into the alveoli?

7. A. Osmosis B. Active transport C. Diffusion D. Capillarity
 Which one of the following parts of the mammalian ear is concerned with balance?
 A. Cochlea C. Eustachian tube
 B. Semi-circular canal D. Oval window
8. The main reason why birds sit on their eggs during the incubation period is to ensure that
 A. Hatching occurs quickly
 B. Rain does not destroy eggs
 C. Eggs are kept at a constant temperature
 D. All eggs develop chicks at the same time
9. 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 → mosses
 C. Shrubs → herbs → trees → mosses
 D. Mosses → herbs → trees → shrubs
10. Which one of the following is likely to cause pollution in water bodies?
 A. Over fishing C. Use of fertilizers
 B. Boat racing D. Use of farmyard manure
11. 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
12. 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 offspring occurs
 D. Maintenance of parental characteristics in offspring
13. 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
14. Which one of the following pairs of organs is important in the digestion of fats?
 A. Stomach and liver C. Liver and pancreas
 B. Pancreas and stomach D. Stomach and mouth
15. 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.
16. Fig 1 shows how the body temperatures of animals A and B vary with environmental temperature:

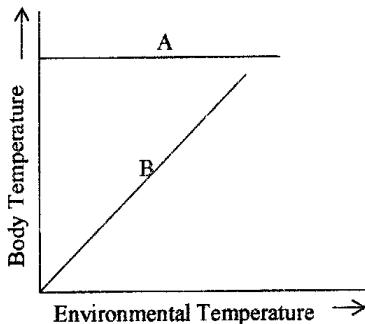


Fig. 1

17. Which one of the following is demonstrated in the figure?
 A. Body temperature of A is dependent on environmental temperature
 B. Body temperature of B is dependent on environmental temperature
 C. A has a higher temperature than B
 D. B loses more heat than A.
18. Which one of the following is a likely effect of a decrease in the number of platelets in the blood?
 A. A, B and O blood groups C. Hemophilia
 B. Sickle cells D. Height
19. Which one of the following is a likely effect of a decrease in the number of platelets in the blood?
 A. The blood may not be able to carry enough oxygen
 B. There may be prolonged bleeding in case of an injury
 C. The body may not be able to fight disease
 D. The body may not be able to distribute heat efficiently

19. Which one of the following characteristics may be used to determine whether leaves are compound?
A. Nature of margin C. Type of venation
B. Number of leaflets D. Presence of leaflets

20. 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 C. ii, iv, I, and iii
B. ii, iii, iv and I D. ii, I, iii, and iv

21. Which one of the following stimulates the reabsorption of water in the kidneys?
A. Adrenaline C. Thyroxin
B. Antidiuretic hormone D. Insulin

22. The best explanation for panting of an athlete immediately after a race is to
A. allow fast blood flow to the lungs
B. restore the used up energy
C. take in more oxygen
D. allow fast blood flow from the muscles.

23. During pregnancy in humans, the substances that pass from the mother to the embryo are
A. Oxygen, nitrogenous wastes and glucose
B. Glucose, amino acids and oxygen
C. Carbon dioxide, mineral salts and nitrogenous wastes
D. Carbon dioxide, amino acids and mineral salts

24. 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

25. 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 C. 25% tall, 75% short
B. 100% tall D. 75% tall, 25% short.

26. 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
A. magnesium and iron C. calcium and potassium
B. potassium and manganese D. zinc and calcium

27. Which of the following conditions increase the rate of transpiration?
- High temperatures, windy conditions and high humidity
 - Low temperatures, windy conditions and high humidity
 - High temperatures, low humidity and windy conditions
 - Low temperatures, low humidity and still air.
28. Which of the following parts of a microscope magnify the object?
- Eye piece and mirror
 - Eye piece an objective lens
 - Objective lens and mirror
 - Eye piece and fine adjustment
30. Which one of the following is along terra adaptation of mammals to low temperature environment?
- Raising of hair
 - Increase in metabolic rate
 - Deposition of fats under the skin
 - Reduction of blood flow to the skin

SECTION B: (40 MARKS)

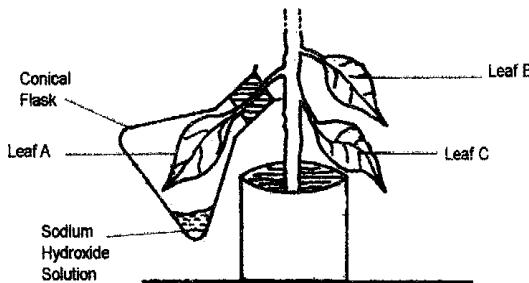
Answer all questions in this section. Answers must be written in the spaces provided

31. The table below shows the percentage composition of inhaled and 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.

	Water vapor	Nitrogen	Carbon dioxide	oxygen
Inhaled air at rest	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%

- State the differences in composition between inhaled and exhaled air at rest. (03 marks)
- Give a reason for each difference stated in (a) (06 marks)
- State the changes that occur in the composition of exhaled air in a human being who is previously at rest, then takes an exercise. (3 marks)
- Give a reason why each stated in (c) occurs. (03 marks)
- During exercise, the breathing rate increases. From the information provided, suggest why this happens. (03 marks)
- Why is the percentage of nitrogen constant in inhaled and exhaled air? (02 marks)

32. To investigate the effect of carbon dioxide on photosynthesis, a green plant was destarched by leaving it in darkness for 24 hours. After destarching, leaf A was put in a conical flask as shown in figure 2 while leaf B was immediately tested for starch. The set up was then left in light for 12 hours after which leaves A and C were tested for starch



- (a) Why was sodium hydroxide used in the experiment? (01 mark)
- (b) State two reasons why the plant was placed in darkness for 24 hours it became destarched. (02 marks)
- (c) State the purpose of including each of leaves B and C in the experiment. (02 marks)
- (i) Leaf B
- (ii) Leaf C
- (d) What was observed when each of leaves A, B and C were tested for starch? (03 marks)
- (i) Leaf.....
- (ii) Leaf B.....
- (iii) Leaf.....
- (e) Give reasons why each of the following is carried out while testing a leaf for starch,
- (i) Put a leaf in boiling water (02 marks)
- (ii) Put a leaf in hot ethane! (02 marks)
- 33.(a) What do you understand by a recessive gene? (02 marks)
- (b) A man who is a carrier for albinism married a normal woman. Using suitable symbols, work out the proportions of the possible genotypes and phenotypes of their children. (06 marks)
- (c) Give two benefits of studying human genetics (02 marks)

SECTION C: (30 MARKS)

Answer any two questions

- 34.(a) Explain the value of earthworms in maintaining the soil in a condition suitable for crop growth. (07 marks)
- (b) How does clay affect the fertility of soil? (08 marks)
35. (a) What are the functions of a skeleton in mammals? (04 marks)
 (b) With the aid of a labeled diagram, describe how movement is caused in a named hinge joint in a mammal. (11 marks)
36. (a) What factors are necessary for germination in seeds? (1½ marks)
 (b) Using labeled diagrams, describe experiments to show the necessity of each factor for germination. (13½ marks)
37. In humans, the blood circulatory and lymphatic systems transport body fluids.
 (a) Outline the functions of the lymphatic system. (04 marks)
 (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) Lungs (03 marks)
 (ii) Liver (05 marks)
 (iv) Kidneys (03 marks)

ANSWERS FOR BIOLOGY PAPER 1 2004**SECTION A**

- | | | |
|-------|-------|-------|
| 1. C | 11. B | 21. B |
| 2. D | 12. D | 22. C |
| 3. D | 13. A | 23. B |
| 4. D | 14. C | 24. B |
| 5. B | 15. C | 25. A |
| 6. C | 16. B | 26. A |
| 7. B | 17. D | 27 C |
| 8. C | 18. B | 28. C |
| 9. A | 19. D | 29. D |
| 10. C | 20. C | 30. C |

SECTION B: ANSWERS

- 31.(a) Carbon dioxide concentration in inhaled air is lower(0.03),water vapor is variable and oxygen is more(20.96).
 Water vapor in exhaled air at rest is 0.8% carbon dioxide is higher 4.1% and oxygen is lower (16.2%).
- (b) Inhaled air has variable water vapor because this depends on the humidity in the atmosphere which varies while humidity in the lungs is constant.

Inhaled air has 0.03% carbon dioxide which is atmospheric concentration while exhaled has 4.1% carbon dioxide because it is given up during tissue respiration. Inhaled air has oxygen concentration of 20.96% while exhaled air has less oxygen concentration because it is absorbed and used up during respiration.

- (c) More water vapor is produced, more carbon dioxide is produced and less oxygen is released.
 - (d) The concentration of carbon dioxide in exhaled air during exercise is slightly higher than at rest because during exercise tissue respiration is very high producing more carbon dioxide than at rest.
- Similarly due to higher respiration during exercise, more oxygen is used up than during rest thus a decrease in the concentration of oxygen in exhaled air during exercise and more water vapor is produced during tissue respiration.
- (e) During exercise, more energy is needed and more oxygen is required to increase the rate of respiration to meet the energy demand. This brings about an increase in the breathing rate.
 - (f) The percentage of Nitrogen is constant in both exhaled and inhaled air because Nitrogen is neither produced nor used up in the body

32. (a) A recessive gene is the gene whose effect does not show up in the phenotype of the individual in presence of a dominant gene.

(b) Let the gene for normal be H.

Let the gene for albinism be h.

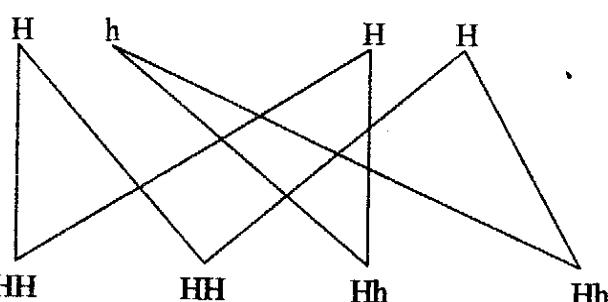
Parents:	Man	X	Woman
Phenotype:	Carrier	X	Normal

Genotype:

Hh

HH

Meiosis



Phenotype

- HH normal

- Hh normal child but carrier

- Thus phenotypically all the offsprings in the F1 are normal,
- (e) (i) It helps us in choosing partners with good characters.
(ii) Helps us to avoid abnormalities that would otherwise arise in the off springs like hemophilia and albinism
(iii) Used in the legal profession to determine the paternity of the child.
33. (a) Sodium Hydroxide solution absorbs carbon dioxide gas from the flask
(b) The starch that was originally contained in the leaves was used up by the plant for maintenance of growth.
(c) Because there was no light, starch could not be manufactured
Leaf B shows that leaves are completely detached. Leaf C is the control experiment.
(d) (i) Leaf A showed pale yellow/brown color,
(ii) Leaf B showed pale yellow/brown color.
(iii) Leaf C showed blue/black color.
(e) (i) The leaf was put in boiling water to kill the protoplasm and burst the starch grains,
(ii) The leaf is put in hot ethanol to remove \ absorb chlorophyll..

SECTION C ANSWERS

34. Turning over soil brings fresh soil to the surface, keeps the soil loose and improves aeration.
- Burrowing of organisms improves drainage and aeration of the soil.
 - The excreta from organisms add nutrients to the soil. '
 - Death and decay of organisms add humus to the soil.
 - Feeding on dead plant materials leads to production of humus and improves soil structure
- (b) Clay consists of small soil particles which are compacted together making root penetration difficult.

It has small air spaces, little air is trapped making it difficult for micro organisms to live in the soil. This leads to little or no decomposed materials (humus). Small air spaces also lead to poor drainage and water logging.

In dry conditions small air spaces lead to improved water retention and high capillarity for plant roots to absorb water and improves the mineral content of the soil.

- 35 (a) **Functions of the skeleton in humans**

1. The skeleton protects the delicate organs of the body like heart, lungs and the spinal cord,

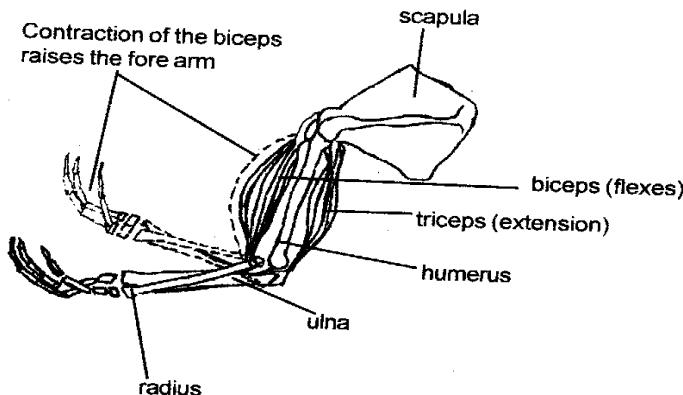
- 49
2. The skeleton supports the body especially the vertebral column, pectoral and pelvic girdles etc.
 3. The skeleton also provides shape to the body
 4. It also helps in the production of red and white blood cells (by marrow in leg bones and ribs)
 5. Stores minerals e.g. calcium and phosphorus.
 6. It helps in the transmission of sound e.g. in the ears.

(b) At the Hinge Joint of the elbow

The action of muscles to bring about contraction and straightening of the arm. The Human arm bends and straightens by action of antagonistic muscles (i.e. biceps and triceps).

During the bending of the forearm, the biceps muscle contract and triceps relax thus raising the forearm.

Contraction of the triceps and the relaxation of the biceps leads to straightening of the arm.



36.(a) The factors necessary for germination are

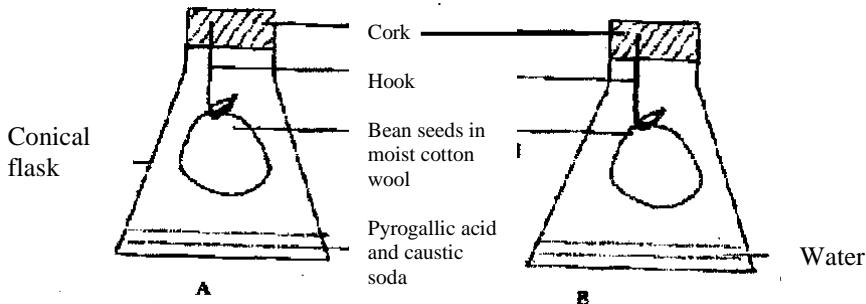
- Oxygen
- Suitable temperature
- Water

(c) An experiment to find out whether oxygen is necessary for germination.

Apparatus and materials: Conical flasks, hooks, cotton wool, bean seeds, pyrogallic acid, caustic soda, water and cork.

Procedure

Wrap some seeds in moist cotton wool. Pour about 5cm^3 pyrogallic acid plus some caustic soda in a conical flask. Suspend the seeds in the flask using a hook that is firmly corked. Label it A repeat the above procedure using water in the place of pyrogallic acid and label it B. leave the set ups to stand for 3 - 4 days and make observations.



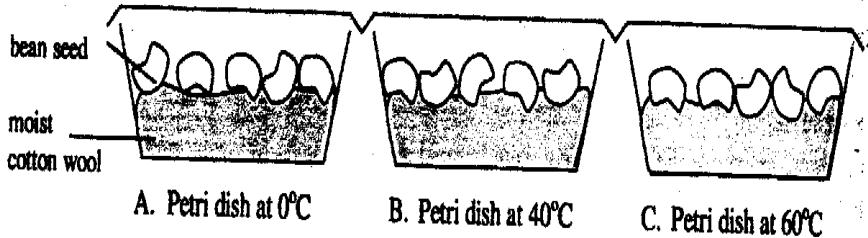
Observations: Seeds in flask B germinated while those in flask A did not.

Conclusion: Oxygen is necessary for germination.

Explanation: In flask A, the pyrogallic acid and caustic soda absorbed the oxygen that is why the seeds could not germinate. In flask B, all the conditions for germination were present hence the seeds germinated normally.

An experiment to show that water is necessary for seed germination.

Material & apparatus Bean seeds, three Petri dishes, cotton wool, water, lids.



Observation: Only seeds in Petri dish at 40°C germinated.

Conclusion: Optimum temperature for germination of bean seeds is at 40°C while too high or too low temperature inhibits germination

Explanation: Temperature of about 40°C is optimum for enzymatic activities for most enzymes. Much deviation in temperature inhibits enzymatic activities either by denaturing (too high temperature) or inactivating (When temperature is too low) the enzymes. Hence germination only occurs when temperature is optimum for enzymatic activities.

37. (a) Functions of the lymphatic system

- It drains tissue fluid from the body
- Fatty acids and glycerol are absorbed through the lymphatic- vessels before they reach the general circulation.
- Phagocytes at lymph nodes help to fight against the invading bacteria and other infectious organisms,

(b) (i) In the lungs oxygen is gained, carbon dioxide lost and water vapor lost due to gaseous exchange.

(ii) In the liver, urea is gained resulting from deamination of excess amino acids, glucose is gained resulting from conversion of glycogen to glucose or glucose is lost due to conversion of glucose to glycogen for storage.

Fats are lost for storage or being converted to glucose. Excess amino acids are lost due to deamination, vitamins are lost due to storage while hormones are lost due to destruction.

(iii) In the kidneys urea is lost. Excess water and excess salts are lost through ultrafiltration.

Carbon dioxide is gained and oxygen lost due to respiration.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2003

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

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SECTION A (30 MARKS)

1. The following are conditions necessary for germination except
 - A. Oxygen
 - B. Moisture
 - C. Moderate temperature
 - D. Carbon dioxide.
2. The main value of panting in a dog is that
 - A. excess water is removed from the body
 - B. latent heat of vaporization of water cools the body.
 - C. Excess mineral salts are removed from the body
 - D. The dog relaxes from exhaustion.
3. Which one of the following is true about a person of blood group O?
 - A. Receives blood from people of all other blood groups.
 - B. Donates blood to people of all other blood groups
 - C. Receives blood from only people of blood groups AB and O.
 - D. Donates blood to only people of blood group AB.
4. The main value of sweating in man is that during the process.
 - A. excess water is lost.
 - B. Excess salts are got rid of
 - C. The body is cooled
 - D. Excess nitrogenous waste is got rid of.
5. Sexual reproduction in spirogyra is described as
 - A. fragmentation
 - B. conjugation
 - C. binary fission
 - D. budding.
6. Lack of a nucleus in a red blood cell is advantageous in that it
 - A. enables the cell to pass through thin epithelium
 - B. helps the cell to fight diseases-causing organisms.
 - C. Allows the cell to carry a lot of oxygen.
 - D. Enables the cell to carry much dissolved food.
7. Which of the following parts of a flower is not essential for reproduction?
 - A. Corolla
 - B. Stigma
 - C. Style
 - D. Anther.
8. 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.
9. The role of rennin in children during digestion is
 A. breaking down milk protein into peptides
 B. mixing the milk protein with digestive enzyme
 C. activating pepsin to digest the milk protein
 D. coagulating milk protein.
10. Which one of the following is a reaction to over - cooling by a mammalian body?
 A. Dilation of blood vessels. C. Decrease in metabolic rate
 B. Sweating D. Shivering
11. A good mammalian respiratory surface should be
 A. dry with large surface area C. dry with many blood vessels
 B. moist with reduce surface area D. moist with many blood vessels.
12. Which of the following parts of a plant cell provides shape and rigidity?
 A. Protoplasm C. Cell wall
 B. Nucleus D. Cell membrane
13. Which one of the following is not a function of the liver?
 A. Regulation of blood sugar C. Formation of bile
 B. Production of insulin D. Storage of iron
14. Which of the following biological processes describes a fungus growing on the leaves of a living potato plant?
 A. Predation C. Competition
 B. Parasitism D. Saprophytism
15. 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 C. codominant with that for red
 B. recessive to that for red D. mutated to show roan
16. What would be the ratio of the phenotypes if a roan bull and roan cow from the offspring referred to in question 15 were mated?
 A. 1 red: 2 roan: 1 white. C. 1 red: 1 roan: 2 white
 B. 2 red: 1 roan 1 white D. 1 red: 1 white
17. 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
18. While analyzing a soil sample, the following results were obtained: Sand = 200cm^3 Water = 300cm^3
 Water and sand after stirring = 450 What was the percentage of air in the sand?
 A. 10% B. 20% C. 25% D. 30%
19. Which of the following features of an amphibian are suited for aquatic life?

20. A. Possession of wings C. Moist skin without scales
B. Muscular hind limbs D. Webbed toes.
Which part of Irish potato plant is used in its vegetative reproduction?
A. Stem C. Leaf
B. Root D. Flower

21. To which two parts of the alimentary canal is starch digested?
A. Small intestines and mouth C. Duodenum and stomach
B. Mouth and duodenum D. Mouth and stomach

22. Lack of two parts of the alimentary canal is starch digested?
A. Anaemia C. Goiter
B. Scurvy D. Rickets

23. Which of the following farming practices would control soil erosion?
A. Application of artificial fertilizers C. Terracing
B. Addition of compost manure D. Mixed farming.

24. Which one of the following maintains a transpiration stream in flowering plants?
A. Capillarity C. Diffusion
B. Osmosis D. Active transport

25. Which one of following layers of the human skin helps the body to retain water?
A. Granular layer C. Subcutaneous layer
B. Malpighian layer D. Conified layer

26. 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 stimulation hormone.
D. Causing ovulation.

27. 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.

28. 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).

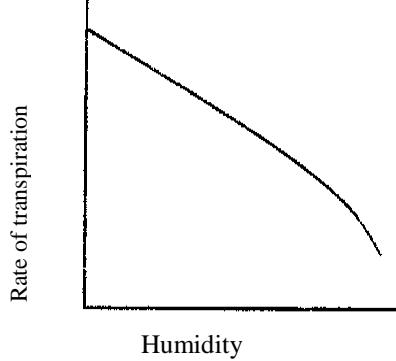
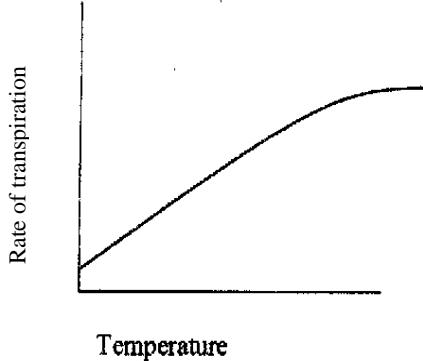
29. Which one of the following parts of a tooth contains living tissue?
A. Cement B. Pulp cavity C. Enamel D. Dentine

30. Which one of the following occurs during exhalation in a mammal?
A. The diaphragm relaxes
B. The inter-costal muscles contract

- C. The volume of the chest cavity increases
D. The ribs move upwards and outwards.

SECTION B (40 Marks)

- 31 (a) What is 'transpiration'? (02 marks)
(b) Figures 1 (a) and (b) show how temperature and humidity affect the rate of transpiration.

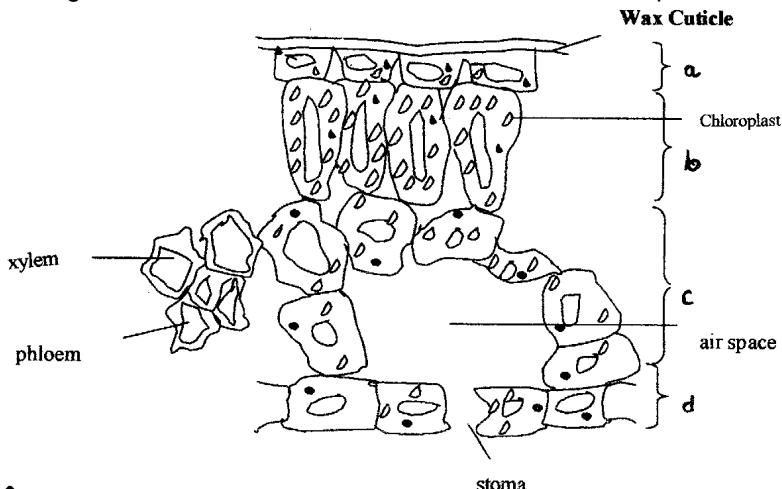


- (i) From fig 1 (a), describe how the rate of transpiration changes with temperature.....(01 mark)
(ii) From fig. 1 (b), describe how the rate of transpiration changes with humidity.....(1 mark)
(c) Explain why:
(i) Temperature affects the rate of transpiration as shown in figure 1 (a). (02 mks)
(ii) Humidity affects the rate of transpiration as shown in figure 1(b) (02 marks)

32. How does each of the following characteristics of a respiratory surface aid diffusion of gases at the surface?
(a) Thin epithelium (02 marks)

- (c) Dense network of capillaries (03 marks)
 (d) Large surface area (02 marks)

33. Figure 2 shows an internal structure of a leaf Chloroplast



- (a) Label the layers a, b, c and d and on the diagram. (03 marks)
 (b) Give three differences between layers b and c. (02 marks)
- (c) Using evidence from the diagram, describe how the structure of a leaf is suited for photosynthesis(03 marks)
 (d) What is the importance of wax on layer (a)? (02 marks)
34. (a) What is long-sightedness. (01 mark)
 (b) State two causes of long-sightedness. (i) marks
 (c) In the space below, draw light rays from an object into the eye to show long-sightedness. (03 marks)
 (d) What is the effect of the following movements of the different parts of the eye?
 (i) contraction of the iris (01 mark)
 (ii) relaxation of the ciliary muscle (01 mark) (iii) shortening and thickening of the lens. (01 mark)

SECTION C (30 Marks)

Answer any two questions.

35. (a) Distinguish between dominance and codominance in genetics. (02 marks)
 (b) When tall pea plants were crossed with short pea plants, all the plants in F₁ generation were tall. Both tall and short plants were produced in the F₂ generation. Why were all plants tall in the F₁ generation (02 marks)

Using suitable symbols, show the crosses to produce the F1 and F2 generation

(c) In rose plants, when a red flowered plant is crossed with a white flowered plant, all plants produced bear pink flowers. Using suitable symbols show the result of crossing a pink flowered plant and a white flowered plant (03 marks)

36. (a) What do you understand by environmental degradation? (01 mark)
(b) Describe how man's activities lead to the degradation of soil. (14 marks)
37. (a) List the substance transported by the blood circulatory system. (04 marks)
(b) Give the importance of transporting each one of the substances named in
(a) above. (11 marks)
38. (a) What is excretion?
(b) With the aid of a labeled diagram describe the functioning of the kidney in excretion. (13 marks)

2003 BIOLOGY ANSWERS

SECTION A

1. D	11.	D	21.	B
2. B	12.	C	22.	C
3. B	13.	B	23.	C
4. C	14.	B	24.	A
5. B	15.	C	25.	D
6. C	16.	A	26.	D
7. A	17.	C	27.	D
8. B	18.	C	28.	C
9. D	19.	D	29.	B
10 D	20.	A	30.	A

SECTION B

- 31.(a) This is the loss of water in form of water vapour by the plant to the atmosphere.
(b) (i) The rate of transpiration increases with temperature
(ii) The rate of transpiration decreases with increase in humidity.
(c) (i) Increase in temperature increases the rate at which water changes into vapor hence increasing the rate of transpiration.

- 58
- (ii) As the atmosphere becomes saturated with water vapor the diffusion gradient is lowered and less water can be lost.
- (d) Transpiration helps in transportation of water up the plant
- It helps in cooling of the plant.
 - Helps in the transpiration stream.

32.(a) Thin Epithelium

This helps easy diffusion of gases across the respiratory surface.

(b) Dense network of Capillaries

The blood capillaries continuously bring blood to the respiratory surface as well as taking it away, this maintains a high diffusion gradient to respiratory gases.

(c) Moist surface

This help to dissolve the gases before they diffuse across the respiratory surface,

(b) Large surface area.

Increase the volume /quantity of gas diffusing at any one given moment.

33. (a) a-Upper Epidermis

b-Palisade layer

c- Spongy mesophyl layer

d- Lower epidermis

(b) Three differences between layers b and c.

Layer b	Layer c
Cells are columnar and elongated in shape	Cell s are irregular in shape
No air space	Have air spaces
There is high concentration of chloroplasts	Low concentration of chloroplasts

(c) How the structure of a leaf is suited for photosynthesis

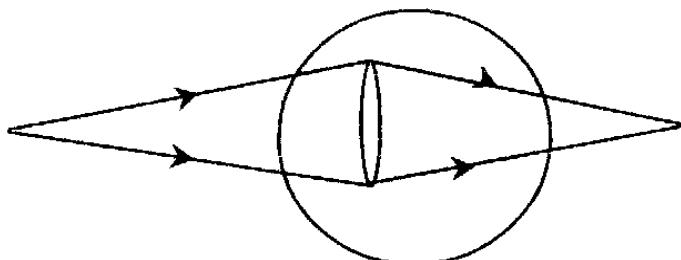
- Presence of the xylem and Phloem ensures transportation of water and manufactured food
- The upper epidermis is one cell thick and this allows easy penetration of sunlight Presence of air spaces and stomata for easy gaseous exchange.
- Presence of chloroplasts helps in sunlight trapping.

(d) The wax layer prevents water loss and hence prevent desiccation.

34. (a) Longsighted is a condition whereby an individual can only clearly see far objects but not near ones

- (b) i) when the eyeball is shorter than the retina.
 (ii) Death of the cells at the centre of the lens when they become insufficiently supplied with oxygen.

c) Light rays from an object into the eye



- d) i) It increases the size of the pupil,
 (ii) The lens is made more convex.
 (iii) This shortens the focal length of the lens.

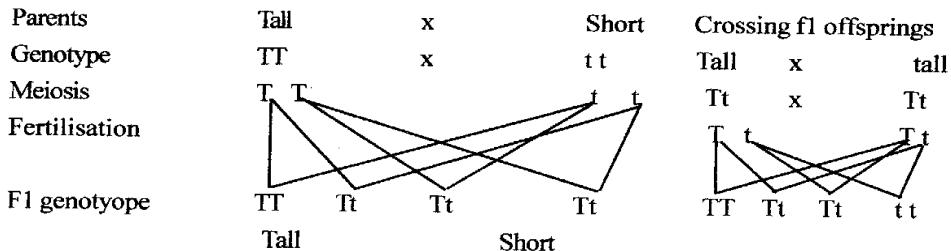
SECTION C

35. Dominance is a condition whereby a gene expresses itself over the other while co-dominance is a condition whereby neither of the genes is dominant nor recessive to the other but when organisms of two traits are crossed together, phenotype of the offspring shows a mixture of two traits on the parents.

- (b) (i) All the plants in F₁ generation were tall because the gene for tallness was dominant over the one for shortness,

(ii) Let the gene for tallness be T

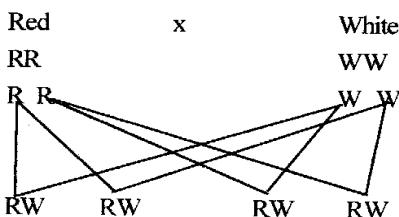
Let the gene for shortness be t



- (c) Let the gene for Red flower be R
Let the gene for white flower be W

3\4 Tall 1\4 short.

Parents Phenotype



36. (a) Environmental degradation is the decline in the value of both the renewable and non renewable resources. Examples of renewable resources are forests. Non renewable are minerals.

(b) **Human activities that interfere with soil environment**

- Mining / Quarrying: - This destroys the soil structure
- Dumping of domestic wastes which include un decomposable materials like polythen lead to poor soil aeration.
- Use of pesticides, insecticides and herbicides also produce chemicals which affect the soil ecosystem.
- Bush burning produce a lot of heat in soil and may affect soil organisms.
- Dumping of domestic rubbish, when decomposed produce methane and other gases which give out bad smell.
- Deforestation may lead to soil erosion since trees help to reduce water speed.
- Over cultivation leads to soil exhaustion.
- Overgrazing leads to loss of soil cover leading to soil erosion.

37. **Substances transported by blood circulatory system**

- | | |
|--------------------|------------------|
| -Oxygen | -Digested food |
| -Carbon dioxide | -Urea |
| -Mineral salts | -Hormones |
| -Heat | -Plasma proteins |
| -White blood cells | |

- (b) S Oxygen is transported from the lungs to respiring cells all over the body.

- It also helps in transpiration of digested food from intestines to other parts (Cells) for growth and energy production.
- Carbon dioxide has to be transported from respiratory cells to the lungs for excretion.

- Mineral salts are also transported from the alimentary canal to the sites where they are needed.
- Heat is transported from the muscles and the liver to all parts of the body which helps to maintain a constant body temperature.
- Platelets and plasma proteins are also transported to injured parts to assist in blood clotting.
- The white blood cells and antibodies are also transported to the site of infection and helps to fight against the pathogens.
- The hormones that are transported from the ductless glands to where they are required to bring about response.

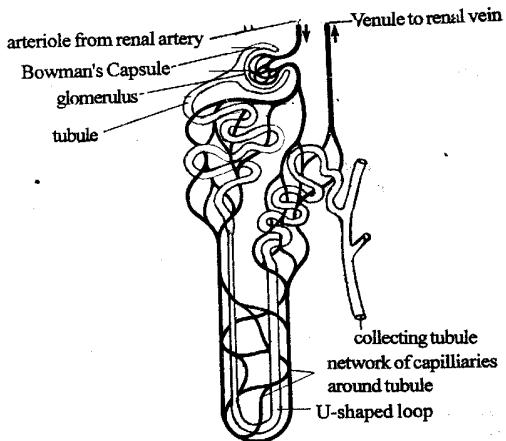
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38. (a) Excretion is the removal of waste products from the body,

(b) **The fundamental unit of the kidney in the nephrons**

- The kidney consists of many small units called nephrons. Blood carrying waste products enters the kidney through the renal artery.
- In the cortex region of the kidney, the renal artery divides repeatedly forming a knot of vessels called the glomerulus.
- The arterioles entering the glomerulus are wider than those leaving this creates a very high pressure of the blood in the glomerulus due to the reduction in the volume of the blood vessels.
- Within the glomerulus, ultra-filtration occurs which causes water, salts, urea, uric acid to diffuse into the Bowman's capsule but blood cells and proteins remain in the capillaries due to possession of large molecules.
- The filtrate is conveyed down the proximal convoluted tubule where glucose, some water and salts, Vitamins, hormone etc. are selectively re-absorbed.
- Urine composed of excess salts, excess water, urea excess heat now passes from the collecting ducts to pelvis to urete and to the bladder and out through the urethra.

This can be illustrated in the diagram below



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2002

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A

1. Which of the following are characteristics of surfaces for gaseous exchange?
A. Large surface area, thinness and moistness
B. Thinness, moistness and presence of fine blood vessels
C. Large surface area thinness and presence of arteries and veins
D. Thinness, moistness and presence of arteries and veins

2. Stunted plant growth, creamy yellow leaves and poor fruit development is caused by deficiency of
A. Nitrogen and potassium C. Potassium and iron
B. Nitrogen and phosphorous D. Nitrogen and iron

3. Which one of the following dental formulae is that of a sheep?
A. $I^0/2 \quad C^0/0 \quad Pm^3/3 \quad M^3/3$ C. $I^3/3 \quad C^0/0 \quad Pm^3/3 \quad M^2/2$
B. $I^2/2 \quad Pm^2/2 \quad M^3/3$ D. $I^2/2 \quad C^1/1 \quad Pm^2/2 \quad M^3/3$

4. Enzymes differ from catalysts because enzymes
A. are required in small amounts C. are protein in nature
B. respond to temperature changes D. speed up reactions

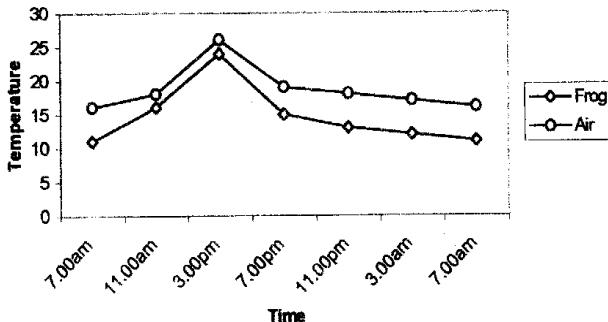
5. When preparing to test for starch in a leaf, the leaf is boiled in alcohol in order to
A. burst chloroplasts C. quicken the reaction of starch with iodine
B. remove coloured materials in the leaf D. soften the leaf

6. In which of the following animals does expired air take a different route from that of inspired air?
A. Birds C. Bony fish
B. Reptiles D. Mammals

7. Which one of the following does not aid flight in birds?
A. Pectoral muscles C. Down feathers
B. Hollow bones D. Quill feathers

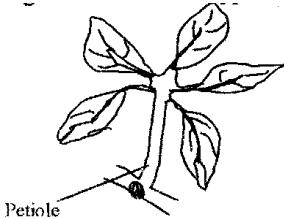
8. Which one of the following sets of organisms belong to the same groups?
A. Butterfly beetle and starfish
B. Crab, tape worm and liver fluke

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- C. Scorpion, mite and spider
 D. Jelly fish, slug and sea urchin
9. 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.
10. Bacteria that often live in their hosts where both partners cannot survive without the other are called
 A. Parasites B. symbionts C. saprophytes
11. 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.
12. Which of the following are the end products of lactose?
 A. Glucose and sucrose C. Glucose and fructose
 B. Glucose and galactose D. Fructose and galactose
13. The graph below shows how the body temperature of a frog varies with that of air over a 24 hour period.



14. Which one of the following is correct about the temperature control in a frog?
 A. The frogs keeps its temperature constant irrespective of time of the day.
 B. The frogs body temperature increases as the air temperature increases.
 C. The frogs temperature is highest at 12.00 noon.
 D. The difference in the body temperature of the frog and the surrounding is constant throughout
14. A man of blood group A marries a woman of blood group B and produce a child of blood group AB. Which one of the following statements is true about his family
 A. The mother could donate blood to the father but not to the child.

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- B. The child could donate blood to the father and the mother.
C. The child could receive blood from the father and the mother.
D. No blood transfusions between members of the family are possible.
15. In which region of the mammalian vertebral column do the vertebrae have long neural spines and short transverse processes?
A. Sacrum C. Thoracic
B. Lumbar D. Neck
16. What happens when the ciliary muscles of a mammalian eye contract?
The lens becomes
A. Thicker and eyes see far objects
B. Thinner and eyes see near objects
C. Thicker and eyes see near objects
D. Thinner and eyes see far objects
17. 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, hemophilia, height.
D. Fingerprints, intelligence, albinism.
18. The following area 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 be highest?
A. P C. R
B. Q D. S
19. Which one of the following methods can be used to estimate the population of butterflies in a flower garden?
A. Direct count C. Line transect
B. Quadrat D. Capture - release - recapture
20. Where in the mammalian skin is the melanin pigment found?
A. Malpighian layer C. Conified layer
B. Granular layer D. Subcutaneous layer
21. Which one of the following organisms reproduce by budding?
A. Yeast C. Spirogyra
B. Amoeba D. Mucor
22. What would happen to a plant tissue placed in a strong sugar solution? It
A. becomes longer and soft C. becomes shorter and soft
B. maintains the original length and texture D. becomes shorter and hard
23. Figure 1 shows a leaf type.



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24. Which types of leaf is shown in the figure above?
- Compound bipinnate
 - Compound trifoliate
 - Compound pinnate
 - Compound palmate
24. Which one of the following is not a function of blood?
- Regulation of sugar level in the body
 - Healing of damaged parts of the body
 - Regulation of body temperature
 - Transportation of wastes
25. Figure 2 is a cross section of part of a plant.
-
- A circular cross-section of a plant tissue. Inside the circle, there are several small, irregularly shaped structures labeled "Vascular bundles". A line points from the text "Vascular bundles" to one of these structures.
- Fig. 2**
- From which one of the following was the section obtained?
- Root of dicotyledonous plant.
 - Stem of monocotyledonous plant
 - Root of monocotyledonous plant.
 - Stem of dicotyledonous plant.
26. What effect does light have on the distribution of auxins at the tip of a plant shoot?
- Causes equal distribution of auxins at the shoot tip.
 - Has no effect on the distribution of auxins at the shoot tip.
 - Concentrates more auxins on the dark side of the shoot tip.
 - Causes auxins to concentrate more on the illuminated side of the shoot tip.
27. Which one of the following is a modified root?
- | | |
|-----------------------|------------|
| A. Irish potato tuber | C. Rhizome |
| B. Cassava tuber | D. Corn |
28. Which one of the following organs is responsible for removing excess amino acids from blood?
- | | |
|----------------|----------|
| A. Gallbladder | C. Liver |
|----------------|----------|

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- B. Kidney D. Spleen
29. Which one of the following is the most common air pollutant?
A. Dust C. Herbicides
B. Fungicides D. Smoke
30. In which part of the kidney nephron does reabsorption of glucose occur?
A. Proximal convoluted tubule C. Descending loop of Henle.
B. Distal convoluted tubule. D. Ascending loop of Henle

SECTION B

Answer **all questions in this section. Answers must be written in the spaces provided**

31. (a) What is an artery? (1 Mark)
b) State three structural differences between an artery and a vein. (3 marks)
c) State how arteries and veins suited for their respective functions.
(i) Arteries (3 marks)
ii) Veins (3 marks)
32. Figure 3 shows the effect of unidirectional light on the growth of plant shoots. Study the figure and answer the questions that follow.

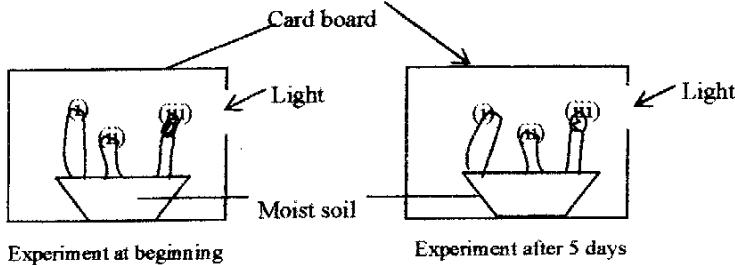


Fig. 3

- (i) Intact coleoptile,
(ii) Coleoptile with cut tip,
(iii) Coleoptile with tip covered with aluminium foil.

33. a) Explain why each coleoptile appears as shown after 5 days.(7mrks)
b) What is the importance of the response shown in the diagram, to plants?(3 marks)

33. a) (i) Which chromosomes are responsible for determining sex in humans?
(ii) Using appropriate symbols show how sex is determined in humans.(4 marks)

b) Red-green colour blindness is a defect caused by a recessive gene carried on the X chromosome. What would be the phenotype of the offspring when a normal woman marries a colour blind man? Show

34. (a) State four ways in which a leaf is suited for photosynthesis.
b) State two ways in which food transported to growing regions is utilized by the plant. (2 marks)

SECTION C

Answer any two questions

35. Using named examples, describe the methods of fruit and seed dispersal. (15 marks)
a) Give three characteristics of enzymes. (5 marks)
b) Describe an experiment to show that enzyme activity is affected by temperature. (12 marks)
36. a) Give effects of four air pollutants on living things (4 marks)
b) Describe how human activities interfere with soil environment in Uganda
37. 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.

ANSWERS FOR REVISION QUESTIONS 2002

SECTION A

1.B	11.C	21.A
2.B	12. B	22. C
3. No answer	13. B	23. D
4.C	14. C	24. A
5.B	15. C	25. A
6.C	16. C	26. C
7. C	17.D	27.B
8. C	18. B	28.C
9B	19. D	29. A
10. B	20. A	30. A

SECTION B

31. (a) An artery is a blood vessel that carries blood away from the heart.

Artery

Has thicker muscles

Has a narrow Lumen

Has no valves except

Vein

- Has thin muscles

- Has a wide Lumen

- Has valves along its length leaving the heart

at the base of major arteries

(i) **Arteries**

Arteries have thicker muscles to withstand the high blood pressure of the blood.

It should be noted that arteries carry blood from the heart and therefore with high pressure thus they must be with thicker muscles to contain this pressure,

At the base of major arteries leaving the heart, there are valves and these prevent the tendency of back flow of blood to the heart,

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(ii) **Veins**

The veins have valves along their lengths to stop the back flow of blood.

(a) It should be noted that the blood carried in veins is under low pressure and to maintain its flow, valves are crucial structural adaptation.

(b) The veins also have wider lumen to ensure smooth flow of blood.

32. (i) Coleoptile (i) has the tip which is the source of auxins (growth hormones in plants) and due to light illumination from one side has the effect of concentrating the auxins on the dark side of the coleoptiles. High concentration of auxins in shoots encourage quick growth and thus bends towards light source,

(ii) The coleoptile (ii) didn't show any change in growth, this was due to the fact that the tip which is the source of auxins was cut on.

Cm) In coleoptile (iii) the tip was covered and this ensured equal distribution of auxins of which resulted into uniform growth of the coleoptiles.

a) This helps plants to respond to a unidirectional light or helps the plants to grow towards a direction where maximum light is available

(i) It should be noted that all growth responses in plants are controlled by growth hormones,

(ii) High concentration of auxins in plant shoots encourages growth while it discourages growth in roots.

33. (i) X and Y chromosomes

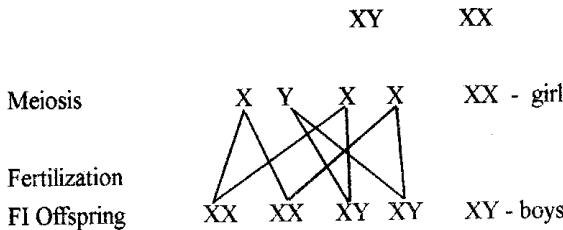
(ii) Females and homogametic (xx) Males are heterogametic (xy) Man X woman XY XX which is the source of auxins was cut on.

(iii) In coleoptile (iii) the tip was covered and this ensured equal distribution of auxins of which resulted into uniform growth of the coleoptiles.

a) This helps plants to respond to a unidirectional light or helps the plants to grow towards a direction where maximum light is available

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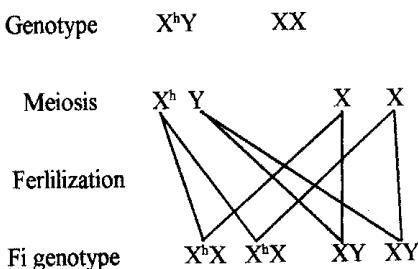


(b) Red green colour blindness is a defect caused by a recessive gene carried on the X-chromosome. What would be the phenotype of the offspring when a normal woman marries a colour blind man.

Show your working.

Answer: Let the recessive gene for colour blindness be h

Parents: Colour blind man X normal woman



X^hX - Normal girl but carrier

XY - Normal boy

Therefore, phenotypically, all the offsprings in F1 are normal.

34. (a) -They have a dense network of veins which transport the product of photosynthesis away and continuously bring the water to the photosynthetic site.

-They have stomata for gaseous exchange which ensure continuous supply of carbondioxide to the leaves.

-They have large surface area for maximum sunlight absorption.

-They also have thin epithelium for easy penetration of sunlight energy,

- (b) i) It provides energy for cell division
i) Used for growth and expansion of cells

SECTION C

35. Seed and fruit dispersal is the way how seeds and fruits are moved from place to another, methods of fruit dispersal include the following

(a) **Wind dispersal**

- (i) Parachute fruits and seeds. Here the seeds and fruits have spreading tufts and hairs formed from modified calyx which increase their surface area so much that air resistance to their movement is so great As a result they can be carried to great distances by air currents. Examples include, fruits of triadax and seeds of Asclepias and cotton.
(ii) Winged fruits here fruits which have papery extension from the ovary or testa making winglike structures. The increased surface area offers extra air resistance thus delaying Its fall and includes fruits of combretum and seeds of cedar and tecoma .
(iii) Censer mechanism.

Here the ovary becomes a dry fruit and splits into partially separated carpels and when wind shakes the fruits, the seeds fall out and become scattered example tobacco (*Nicotiana*), *Aristolochia*.

b) **Animal dispersal**

- (i) Under this, we have; hooked fruits, which are majorly dispersed by mammals. The hooks catch in fur of the passing animals or in the clothing of people. Examples are dismodium, *Bidens* (Black jerk) and *Acanthospermum*

(ii) **Succulent fruits**

These are mostly dispersed by man, bats and birds. The birds often carry the fruits away before the seeds are dropped e.g red pepper.

The neem fruits are eaten by bats which bite off the end of the fruit, suck out edible part and split out seed at a distance.

Some seeds like those of mistletoe are freshy and sticky and therefore stick to the birds beaks and can be discarded to another area.

(c) Explosive Mechanism

In this case, the pods of flowers in the bean family have two lines of weaknesses and when dry, they split open along these lines. When the carpel splits in half down two lines of weaknesses the two halves curl back suddenly and flick out the seeds examples include beans, soya beans, and Crotalaria

(d) Dispersal by water

In this case the outer fibrous layer of the pericarp traps air and makes the fruit buoyant which enables it to be dispersed without sinking, examples include coconut,

36. a) (i) Enzymes are proteins in nature
 (ii) They are destroyed by high temperature
 (iii) They work best in a small range of temperature

Others are;

- They work best in a limited range of PH.
- They catalyze both forward and backward reactions
- They are inactivated by very low temperature.
- They are specific in action.

(b) An experiment show that enzyme activity is affected by temperature

Materials used

- Test tubes
- Thermometer
- White tile
- 2% starch solution
- Source of heat
- Iodine solution
- Water - Water bath

Procedure: Three test tubes are prepared each containing 1 cm³ of 2%

Starch solution

- The mouth is rinsed using water and saliva is collected into a small beaker.
- Three water baths are prepared (O, P, Q) each at different temperature (0-37° C, P- 60°C, 0-90 °C).

- Maintain a constant temperature using thermometer for each water bath.
- A white tile is prepared and points O ,P and Q are marked on it
- To each test-tube 1 cm³ of warmed saliva is added and each test-tube is placed in a different water bath, (O, P & Q).
- The initial time is then recorded
- Stir the contents in each test-tube.
- Use a glass rod to draw a drop of mixture from O and add onto it iodine solution on a tile. Repeat for P and Q and note the changes.

Results: Starch disappears faster in test tubes Q, P and O respectively, showing yellow - brown color of iodine unchanged.

Conclusion: Enzyme action increases with temperature.

37.) To the reader, pollution should be understood as the addition of dangerous substances to the environment at a rate faster than the environment can accommodate.

(a) Smoke has the following effects.

- When breathed in, smoke blackens the alveoli causing damage to their epithelial lining hence causing Bronchitis.
- It remains suspended in air and can therefore reduce light intensity at the ground level.
- Deposits of smoke (soot) may coat on plant leaves hence reducing the rate of photosynthesis as it prevents light penetration

Sulphur oxide: This is produced when fossils containing sulphur are burnt. It has the following effects.

Causes irritation of the respiratory system.

It also causes damage to the epithelial lining of the alveoli.

It reduces the growth of some plants like berry where as others like lichens may be killed.

Carbondioxide - This has an effect of increasing atmospheric carbondioxide and prevents sun's heat from escaping from the earth and causes rise in temperature.

Carbon monoxide - This may lead to death as all haemoglobin combines with it leaving none for oxygen.

- In small amounts it causes dizziness and headache

b) Human activities that can interfere with soil environment.

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- Mining/quarrying - This destroys the soil structure
 - Dumping of domestic wastes which include undecomposable material like polythen lead to poor soil aeration.
 - Use of pesticides, insecticides and herbicides also produce toxic substances which affect the soil; ecosystem.
 - Bush burning produce a lot of heat in the soil and may affect soil organism.
 - Dumping of domestic rubbish, when decomposed produce methane and other gases and give out bad smell.
 - Also worms and other pathogens thrive in such conditions hence leading to diseases like cholera.
 - Deforestation may lead soil erosion since trees act to reduce the water speed.
 - Application of fertilizers. These may become excess in the soil and thus affect soil micro-organisms.

38) An experiment to test for the presence of non reducing sugars.

Apparatus: -Test tubes, Source of heat, NaOH, -HCl, Benedict's solutions

Procedure: To 2cm^3 of food sample, add 1cm^3 of HCl and heat to boil. Cool under tap water and add 2cm^3 of NaOH. Then add about 2cm^3 of Benedict's solution and heat to boiling.

Observation: The colour changes from blue to green to yellow and finally to red precipitate.

Conclusion: Non reducing sugars (complex sugars) present.

Note: HCl helps in the hydrolysis of the complex sugars to reducing sugars.

- Na OH is used to Neutralise the acid.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2001

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A

1. Which one of the following would occur if a potato strip was placed in distilled water?
A. Increase in length C Decrease in length
B. Strip would soften D Remain unchanged.

2. 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 lower side of the seedling.
C. Causes auxins to accumulate on the upperside of the seedling.
D. Causes auxins to accumulate uniformly on all sides.

3. The following are some features of lower plants
(i) reproduce by spores,
(ii) lack vascular tissues.
(ii) grow in damp places.
(iii) have simple stem and leaves.
Which of the features belong to both mosses and ferns?
A. (i)and(iv) C. (ii) and (iii)
B. (i) and (iii) D. (iii) and (iv)

4. Which part of a flowering plant is represented by figure 1 below?

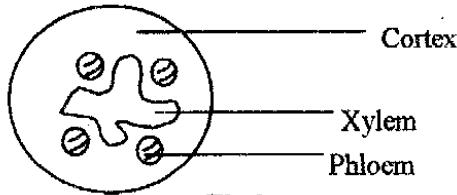


Fig. 1

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

5. The following are products of tissue respiration in living organisms
(i) Energy
(ii) carbon dioxide
(iii) water
(v) ethanol
(vi) lactic acid
Which of them are common to both aerobic and anaerobic respiration in plants?
A. (i) and (ii) C. (i), (ii) and (iii)
B. (ii) and (iii) D. (ii), (iv) and (v)

6. A student wanted to determine the percentage of air in a soil sample. The following measurements were obtained.
Volume of dry soil = 250cm^3 Volume of water added
 160cm^3 Volume of mixture of soil + water = 380cm^3
What was the percentage of air in the soil sample?
A. 7.9 B. 12 C. 25 D. 34

7. Which one of the following groups of animals uses gills, skin, buccal cavity and lungs for gaseous exchange at some stage in their life cycle?
A. Fish B. Amphibians C. Reptiles D Mammals.

8. A student noted the following characteristics on a vertebra
(i) long neural spine
(ii) wide neural canal
(iii) short transverse process
The vertebra was
A. Cervical. B. Atlas. C. Thoracic D. Lumbar.

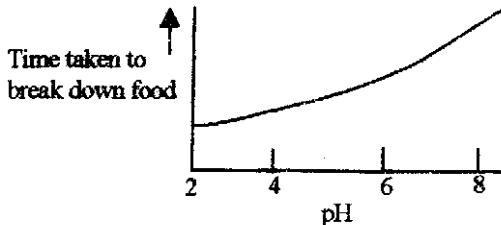
9. Which one of the following may result from lack of progesterone hormone in a woman?
A. Implantation may not occur. C. Menstruation may not occur
B. Miscarriage may occur. D. Ovulation may not occur.

10. Which one of the following fruits is an example of a drupe?
A. Avocado. C. Tomato
B. Passion. D. Orange.

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

Test	Observation
(i) Heated Y with Benedict's Solution	Solution remained blue

(i) 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	C. Sucrose.
B. Maltose	D. Glucose
12. Which one of the following is true of both photosynthesis and respiration?	
A. Involve enzymes.	C. Are exothermic
B. Need light energy	D. Occur in all living organisms
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 reactions is likely to occur when a donor of blood group A give 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.	
15. 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.	C. Mutation.
B. Incomplete dominance.	D. Recessive genes.
16. Which one of the following may not be used for classifying insects?	
A. Mouth parts	C. Structure of legs.
B. Feeding habits.	D. Types of eyes.
17. Which one of the following is a possible sequence of plant of plant succession on an undeveloped piece of land?	
A. fungi → ferns → shrubs → trees.	
B. fungi → Mosses → shrubs → trees.	
C. mosses → trees → fungi → ferns	
D. mosses → herbs → shrubs → trees.	
18. The graph below shows the effect of varying pH on the time taken for an enzyme to break down food.	

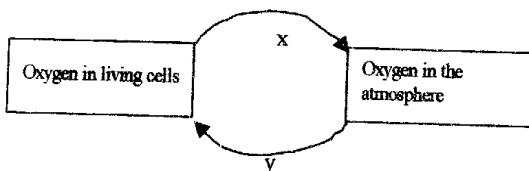


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Which one of the following enzymes below could have given that response?

- A. Pepsin.
 - B. Lipase.
 - C. Salivary amylase
 - D. Trypsin.
19. Which one of the following fins provides a major propulsion force in a fish?
- A. Caudal.
 - B. Pectoral.
 - C. Dorsal.
 - D. Pelvic.
20. Which one of the following characteristics of respiratory surfaces in true of humans but not of insects?
- A. Highly vasodilated
 - B. Have large surface area.
 - C. Moist.
 - D. Thin walled.
21. The rapid elongation of the hypocotyls 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.
22. Which one of the following blood vessels contains the lowest concentration of urea?
- A. Hepatic portal vein.
 - B. Renal artery
 - C. Hepatic vein
 - D. Renal vein
23. Which one of the following is the correct response to increased carbon dioxide in human blood? The rate of
- A. Breathing is slowed.
 - B. Heartbeat is slowed down.
 - C. Heartbeat is increased.
 - D. The pulse is slowed down.
24. The tapeworm *Taenia solium* has a primary and a secondary host. Which of the following are the primary and secondary hosts in that order?
- A. Pig and man.
 - B. Cow and man.
 - C. Man and cow.
 - D. Man and pig
25. Which one of the following statements is not correct about photosynthesis?
- A. Water is required.
 - C. Sugar is a product.

26. B. Oxygen is a by-product. D. Energy is released.
Figure 2 below shows the cycling of oxygen between the atmosphere and living cells.

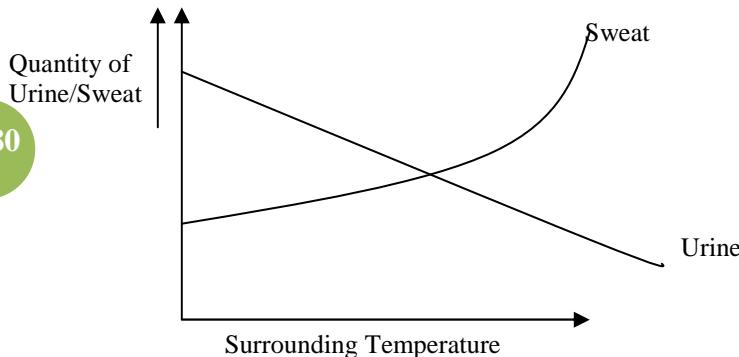


79. Which process is represented by letter X?
A. Excretion. C. Decay.
B. Respiration. D. Photosynthesis.
27. Which one of the following is the correct reason for the thickness of the walls of atria and ventricles?
A. Atria are thicker because they have to generate higher pressure.
B. Atria are thicker 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.
28. Which one of the following controls the rate of heart beat in a mammal?
A. Cerebrum. C. Medulla oblongata.
B. Pituitary. D. Cerebellum.
29. 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.
30. Which of the following is characteristic of a soil with low capillarity?
A. Poor water retention. C. Poor aeration.
B. Poor drainage. D. Small particles.

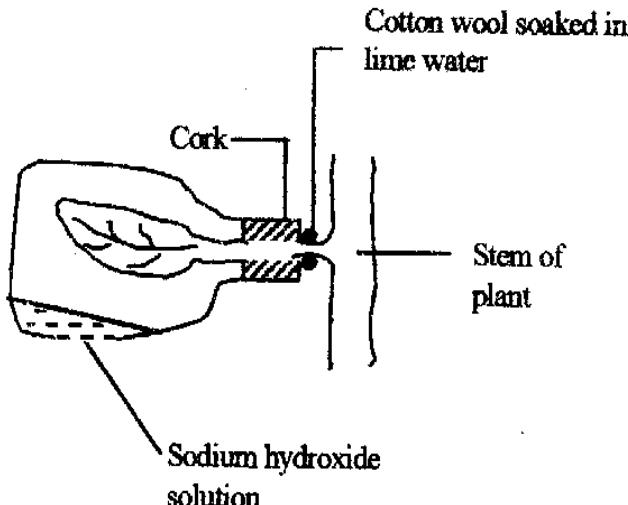
SECTION B

Answer all questions in this section. Answer must be written in the spaces provided.

31. 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? (2 marks)
- b) Explain your answers in (a) (i) and (ii) above.
(i) Explanation for (a) (i)
(ii) Explanation for (a) (ii) (4 marks)
(c) State three conditions under which humans pass out concentrated urine.
(d) Apart from sweating, state three other body responses by mammals to overheating.
32. Figure 3 below is an experimental set up to investigate the conditions for photosynthesis. The plant is in light but had previously been kept in the dark overnight.



- a) Which condition is being investigated?
- (b) Why
- (i) Was it necessary to keep the plant in the dark overnight?
 - (c) What is the purpose of sodium hydroxide in the flask?
 - (d) (i) How would you test starch in the leaf after some time
33. The information below is on feeding relationships in an ecosystem.
Lizards feed on praying mantis, butterflies and herbivorous bugs. Praying 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 praying mantis, herbivorous bug, lizards and grass.
 - (b) How would the population of the organisms in (a) (i) above be affected if the praying 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 ecosystem?
34. Figure 4 below shows a section through the human eye. A B-C

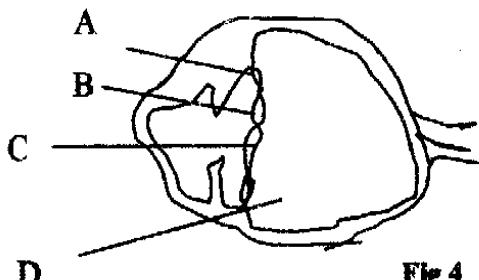


Fig 4

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- D Fig 4 (a) Name the parts labeled A,B,C and D.
 (b) What function is performed jointly by the parts A,B,C and D? .
 (c) Other than the joint function, state two other functions of the part labeled D.
 A) Give the state of parts A, B and C when the eye is viewing,
 (i) near objects. (6 marks)
 (ii) distant objects
 (e) State two eye defects and how they are corrected.
 (i) Defect
 corrective measure.....
 (ii) Defect.....
 corrective measure.....

SECTION C

Answer any two questions

35. (a) State the dangers of a parasitic mode of life.
 (b) Describe how a tapeworm is adapted to its mode of life.
36. (a) Describe the digestion of proteins in a mammal.
 (b) Explain how the ileum is suited for its functions.
37. (a) With the aid of well labeled diagrams explain the difference between hypogaeal germination.
38. (a) Explain why a skeleton is necessary in a mammalian body.
 (b) With the aid of diagrams describe how a human arm can bend and straighten.

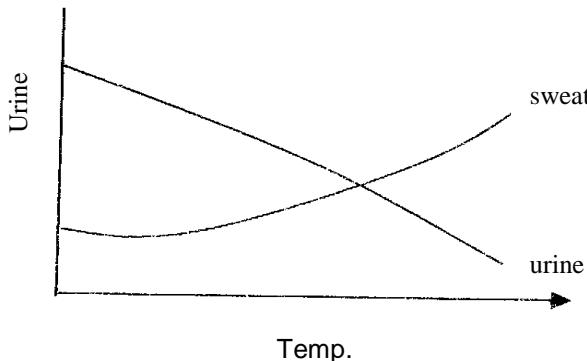
ANSWERS TO REVISION QUESTIONS

SECTION A

- | | | |
|-------|-------|-------|
| 1. A | 11. C | 21. B |
| 2. D | 12. A | 22. A |
| 3. C | 13. C | 23. C |
| 4. D | 14. C | 24. A |
| 5. C | 15. B | 25. D |
| 6. B | 16. B | 26. D |
| 7. B | 17. D | 27. C |
| 8. C | 18. D | 28. B |
| 9. A | 19. A | 29. C |
| 10. A | 20. A | |

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SECTION B

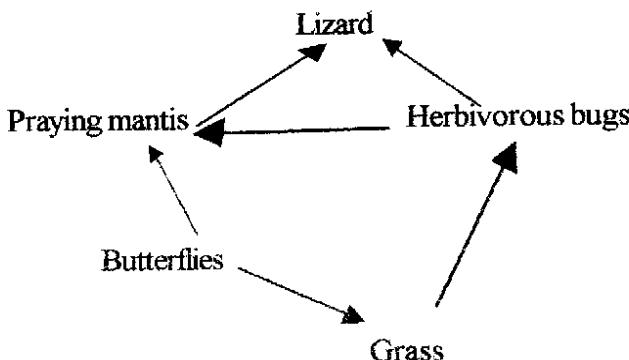


31. (a) (i) Urine production
Urine production decreases as temperature increases
(ii) Sweat production
Sweat production increases as temperatures increases.
b) Explain your answer in (a) (i) of a(ii) above
- (a) (i) As temperatures increases most of the water passes out through the skin as sweat and thus less water remains to pass via the kidney .
(ii) When temperature increases, the skin pores open wide and thus a lot of water passes through the skin.
(c) (i) During hot conditions when most of the water passes out as sweat.

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- (i) When blood concentration is very high therefore a lot of water is reabsorbed from the kidney tubules.
 (ii) There may be kidney failure.
- d. (i) Dilation of blood vessels
 (ii) Falling of hair on the skin.
32. (a) It is Carbon dioxide.
 (b) (i) To destarch the plant.
 (ii) To allow the leaf to photosynthesize.
 (c) To absorb Carbon dioxide gas from the flask
 (d) How do you test for starch in the leaf after sometime?

Detach a leaf from the plant: Boil it in water to kill the protoplasm. Boil it in alcohol to remove chlorophyll pass it in warm water to soften it and then pour a few drops of Iodine solution on to the leaf if the leaf contained starch, it will show blue-black color with iodine and if no starch, the purple color of iodine is retained.

33. (i) Using a suitable method show the feeding relationship between (i)
 All the organisms Lizard



- (ii) Grass → herbivorous bug → Praying Mantis → Lizard
- b) How would the population of the organisms in (a) (i) above be affected if the praying Mantis were removed from the Ecosystem?

- Ans. The population of lizards may reduce because the praying Mantis were a potential food for the lizard. Whereas the population for herbivorous bugs and butterflies will increase because they will no longer be fed upon by the praying Mantis.

The grass population will reduce due to an increase in the number of herbivorous bugs and butterflies that feed on grass

Discussion

The representation in (a) (i) is a food web which represents continued eating and being eaten between the organisms. While that in a (ii) is a food chain which represent a linear feeding pattern

Ans. these are decomposers.

Ans. they help in the recycling of nutrients in the ecosystem.

34. a) A - Ciliairy muscle
B - Suspensory ligament
C - Lens
D - vitreous humour
- b) They help to focus light on to the retina.
- c) i) help to refract light and produce an image on the retina.
ii) Its out ward pressure on the sclerotic muscle maintains the shape of the eye

Note: the aqueous and vitreous humours are solutions of salts, sugars and proteins in water.

d) (i) near objects
A. contracted state. B - in a state of tension C -thicker

(ii) far object

- A. - relaxed state. B-relaxed state. C - thinner
- e) i) defect - myopia (short sight)
correction - use concave lens
defect - long sight
correction - use of convex lens discussion

During the accommodation of near and far objects, the focal length of the lens in the eye can be altered by making it thicker or thinner and thus object from near to the limits of visibility can be brought to focus. The system of the eye to alter the focal length is called accommodation.

When the eye is at rest the lens is thin and has a long focal length and is adapted for seeing distant at objects.

For nearby objects to be focused, the ciliary muscles running the ciliary body, contract and reduces diameter of the ciliary body the radial muscles of the lens

contract and circular muscle relax the pupil gets larger, the lens becomes thicker and more refractive. For distant object to be focused, the ciliary muscles relax, circular muscles of the iris contract, radial muscles relax, the pupil gets smaller, the lens becomes thinner and less refractive and distant objects are focused.

SECTION C.

37. a) Dangers of Parasitic Mode of life

- Failure of the parasite to find the right host
- Failure of the parasite to penetrate the host
- The dangers of being dislodged in the host
- Dangers of being destroyed by the host
- Dangers of the host dying

37) How a tape worm is adapted to its mode of life.

- It lays a great number of eggs to ensure high survival of the young ones.
- They have hooks for attachment to the host's intestines and in this way, they cannot be swept away by food.
- They produce mucus which keeps them free from the corrosive action of the host's digestive juices.
- They have reduced sense organs like eyes; nervous system etc. and can easily live in dark conditions of the intestines.
- They can depend on anaerobic respiration and thus being able to live in dark conditions of the intestines.
- They also have secondary hosts which help them complete their life cycle.
- Their eggs can be viable for quite along period of time and can survive harsh conditions especially from one host to another.

36.a) Digestion of proteins in a mammal.

- The physical digestion of proteins starts in the mouth by chewing action of the teeth. Food is broken to smaller particles.
- The chemical digestion of proteins starts in the stomach by the action of the enzyme pepsin which converts proteins to peptides.
- The enzyme rennin coagulates milk by converting the soluble caseinogen into insoluble casein which is then acted upon by the enzyme pepsin and converted to peptides.

Note Pepsin Enzyme works in acidic PH which is provided by HCl produced by special oxyntic cells in the stomach walls

- (ii) Pepsin is contained in Gastric Juice which is secreted by Gastric glands in the stomach walls.

In the duodenum, the pancreatic juice secreted from the pancreas contains several enzymes, pancreatic lipase, pancreatic amylase and trypsin.

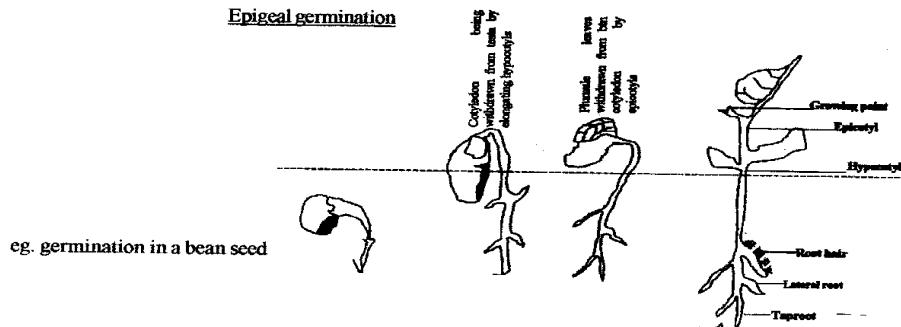
Trypsin is the protein digesting enzyme which converts proteins to peptides, the Amino acids on reacting the ileum get absorbed.

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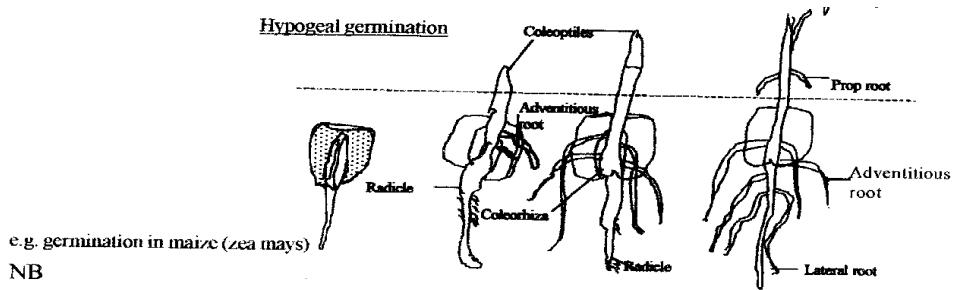
- NB: i) Trypsin is secreted in its inactive form trypsinogen and activated by the intestinal juice (succus entericus).
ii) It should also be noted that generally protein digesting enzymes are secreted in their inactive forms to prevent the digestion of the cells from where they are produced since these cells are also proteins in nature. The optimum PH for Trypsin is 7-8

- 3.7. With the aid of well labelled diagrams explain the differences between hypogea and Epigeal germination.
(a) Germination is the process by which a seed develops into a seedling. Epigeal germination is where cotyledons come above the ground whereas hypogea germination is where cotyledons remain under the ground after germination.

Epigeal germination.



In Epigeal germination, the hypocotyl grows faster than the Epicotyl thus push the cotyledons above the ground.



And in hypogaeal germination, the Epicotyl grows faster than the hypocotyl and the cotyledons remain under the ground.

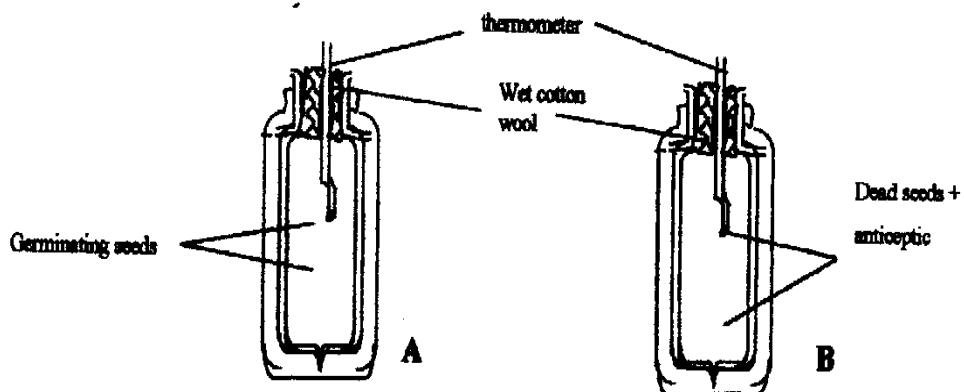
37. (a) Describe Experiment you would carry out to show that heat is liberated by germinating seeds

Materials used/apparatus

-2 flasks	- cotton wools	Antiseptic
-2 thermometers	- water	
- seeds	- source of heat	

Procedure

- fill one flask with germinating seeds and another or with killed seeds by boiling. An antiseptic should be added to stop fungal, bacterial growth that may respire to produce heat.
- fit the two flasks with thermometers and cover them with wet cotton wool.
- leave the experiment for a few days.



Results: After a few days the thermometer in flask A showed a rise in temperature while that in B showed no change. Germinating seeds give out heat since only temperature rise was registered in the flask with germinating seeds.

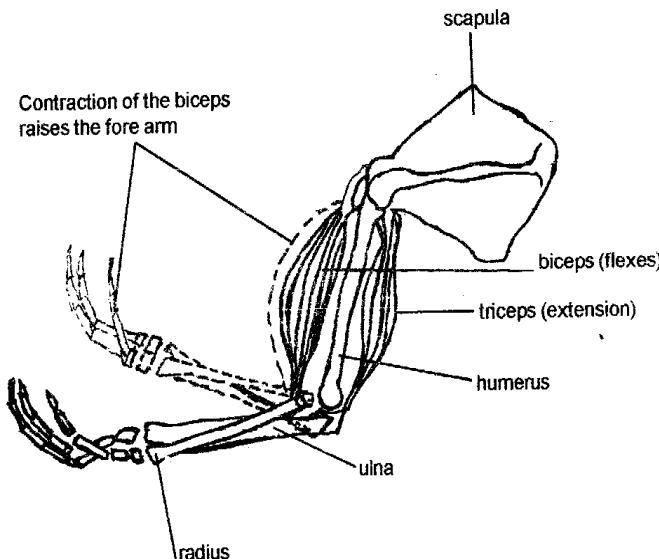
38. (a) **Explain why a skeleton is necessary in human body.**

The skeleton provides support to the body and enables the animal to resist compressional forces, many organs are supported by their attachment to the skeleton.

The skeleton also acts as levers to facilitate locomotion muscles for locomotion are attached to movable parts of the skeleton across joints.

The skeleton provides protection to the delicate internal organs for example in humans, the skull protects the brain the ribs protect the lungs and the heart.

38 (b)



The human arm bends and straightens by action of antagonistic muscles (ie biceps and triceps) during the bending of the forearm, the biceps muscle contract and triceps relax thus raising the forearm. Contraction of the triceps and relaxation of the biceps leads to straightening of the arm.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 2006

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A

1. The following are characteristics of blood vessels:
(i) Presence of valves,
(ii) Presence of values,
(iii) Thick walls,
(iv) Wide lumen,
(v) Elastic walls.
Which of the characteristics belong to veins?
A. (i)and(ii) C. (ii) and (iii)
B. (i) and (iii) D. (iii) and (iv).

2. Mucor undergoes a sexual reproduction to produce
A. Spores. C. zygospores.
B. Zoospores. D. Sporangia.

3. The fins which keep a fish stable in water are the
A. Anal and dorsal fins. C. Caudal and pelvic fins.
B. Dorsal and pelvic fins. D. Pelvic and pectoral fins.

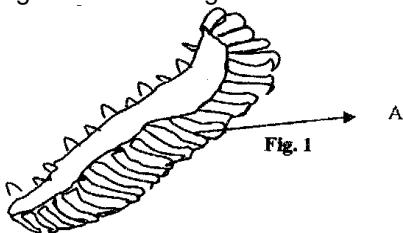
4. Which one of the following is correct about dividing cells at the tip of plant shows? They
A. Have large vacuoles. C. Have soft cell walls.
B. Are specialized. D. Have rigid cell walls.

5. Which one of the following would contain the highest concentration of proteins?
A. Blood plasma. C. Urine.
B. glomerular filtrate. D. Serum.

6. 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

7. What mode of nutrition is used by Rhizopus?
A. Heterotropism C. Parasitism
B. Autotropism D. Saprophytism

8. Which one of the following would be the first to colonise a rocky surface?



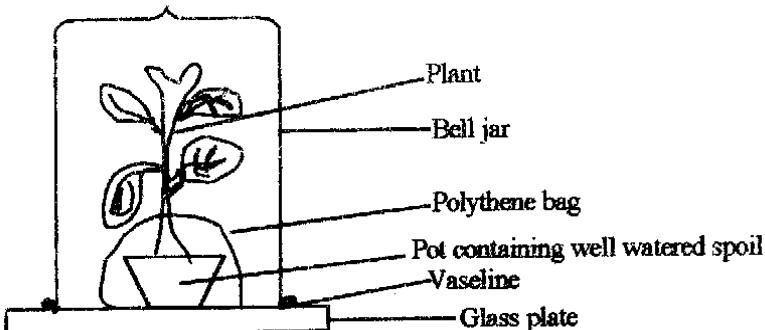
The name and function of part labelled A is

16. A. 0.9cm^3 C. 12.5cm^3
 B. 45cm^3 D. 450cm^3
16. How is lactic acid produced in muscles got rid of? By
 A. Converting it into water C. Converting it into ethanol.
 B. Storing it in the liver D. Oxidation.
17. Blood flows in the pulmonary artery at a lower pressure than in aorta because in the pulmonary circulation
 A. blood travels a shorter distance.
 B. The right ventricle has thinner walls.
 C. The vessel carrying blood is smaller
 D. Fewer organs are supplied.
18. Which one of the following is an example of a reflex action?
 A. Eating C. Riding
 B. Screaming after kicking a stone D. Salivating on smelling food.
19. What happens to insect wings when depressor muscles are relaxed? The wings
 A. Move downwards C. Riding
 B. Move upwards D. Salivating on smelling food.
20. Which one of the following parasites is transmitted by Anopheles mosquito?
 A. Filaria worm C. Rotate freely.
 B. Move upwards D. Move in three directions.
21. The following are body secretions.
 (i) Amylase,
 (ii) Trypsin,
 (iii) Hydrochloric acid,
 (iv) Pepsin,
 (v) Renin
 Which of them are contained in gastric juice?
 A. (i) and (iii). C. (iii) and (v).
 B. (ii) and (iv). D. (i) and (ii).
22. What is the main function of the phloem in green plants'
 A. Transporting water C. Transporting mineral salts
 B. Supporting the plant D. Transporting manufactured food.
23. Which of the following is an example of a modified root?
 A. Irish potato tuber, C. Rhizome
 B. Cassava tuber D. Corm.
24. Which of the following events occur during inhalation in a mammal?
 A. Diaphragm contracts, ribs raised,
 B. Diaphragm relaxes, ribs lowered,
 C. Internal intercostals muscles contract, pressure in chest cavity increases

SECTION B

Answer all questions in this section. Answer *must* be written in the spaces provided.

31. Figure 2 below shows an experiment set up to demonstrate transpiration in plants.



- (a) Explain why:
- (i) Vaseline is smeared between the glass plate and the bell jar.
 - (ii) polythene bag is wrapped around the pot and tied at the base of the plant.
- (b) (i) What will be observed in this experiment?
(ii) How do you test for the identity of the substance observed in (b) (i)
- (c) Describe the set up of the control for this experiment.
- (d) State two factors which affect the results of this experiment. **(2 marks)**

32. (a) What is an enzyme? **(1 mark)**
(b) State three factors which affect enzyme action.....(3 marks)
(c) The optimum pH. For enzyme X is 2.00 and for 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 substance acted on by each enzyme and the product formed in each case. **(3 marks)**

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

34. Figure 3 below shows a cross section of part of a plant.

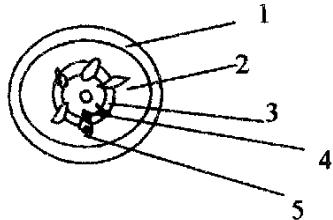


Fig. 3

- (a) Name the parts labeled 1 to 5.
 (b) Giving a reason, state the part of the plant from which the section was taken **(2 marks)**
 (c) (i) State the functions of the parts labeled 3 and 4 **(2 marks)**
 (ii) Give two similarities between the cells in part labeled 3 and those found at the tips of growing shoots. **2 marks**)

34. Figure 4 shows a longitudinal section of a human skin.

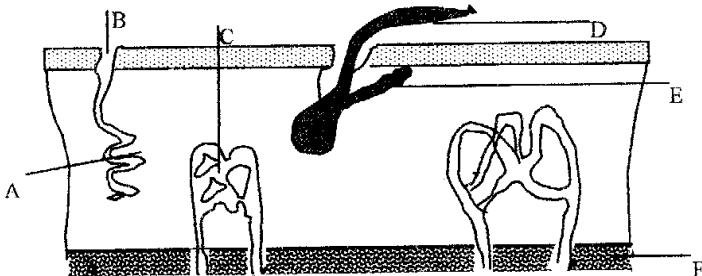


Fig. 4

- (a) (i) Name the parts labeled A to F.
 (ii) State the function of each of the parts labelled A, B, D and F **(7 marks)**
 (c) Using any one observable feature on the diagram, suggest the type of temperature condition the skin is responding to. State the observable feature as a reason for your answer.

Temperature condition.....

Observable feature.....

SECTION C

Answer any two questions.

35. Describe an experiment to show that carbon dioxide is necessary for photosynthesis.
36. (a) What is sexual reproduction? (2 **marks**)
(b) Give the advantages of sexual reproduction in plants. (6 **marks**)
(c) Describe how sexual reproduction occurs in a *Mucor*. (7 **marks**)
37. Describe human activities which may cause environmental pollution
38. (a) What is the importance of water to animals?
(b) Describe how water balance in the mammalian body is maintained.

ANSWERS TO THE QUESTIONS

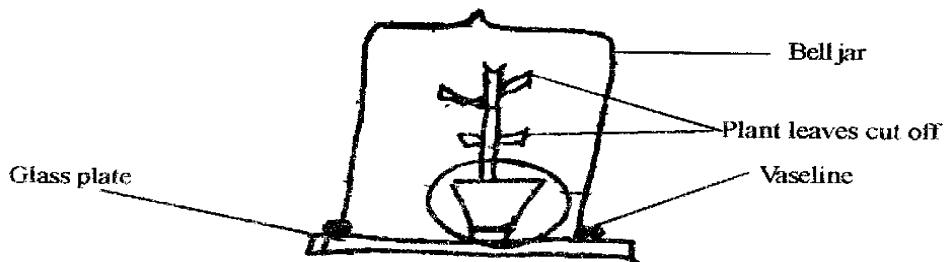
SECTION A.

- | | | | | | |
|------|------|-------|-------|-------|-------|
| 1.B | 6.B | 11. A | 16 .D | 21.C | 26. C |
| 2. A | 7.D | 12.C | 17. A | 22 .D | 27 .C |
| 3. A | 8. A | 13 .B | 18 D | 23 ,B | 28 .B |
| 4.C | 9.D | 14 .C | 19 B | 24. A | 29 .D |
| 5,D | 10.A | 15.D | 20.C | 25 B | 30.D |

SECTION B

31. (i) To enable the bell jar stick tightly on the glass plate.
(ii) Using white anhydrous Copper II Sulphate.
When it turns blue, we conclude that it is water.
c) Describe the set up of the control for this experiment.

A similar experiment is set up but with the leaves chopped off from the plant



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In this experiment, nothing is observed in the bell jar.

d) State two factors which affect the results of this experiment

- Light intensity
- Water availability in the soil.

32. (a) What is an Enzyme?

This is a biological catalyst protein in nature which speed up the rate of metabolic reaction in the body.

b) State three factors which affect Enzyme action

- Temperature
- Substrate concentration
- Enzyme concentration

c) The optimum PH for enzyme X is 2.00 and for the 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 the alimentary canal the enzyme is found
X Pepsin Y Trypsin	Stomach Duodenum

State two enzymes contained in the pancreatic juice, the food substance acted on by each enzyme and the product formed in each case

Enzyme	Food substance acted upon	Product formed
(i) Lipase	Fats	Fatty acids and glycerol
(ii) Amylase	Starch	Maltose
(iii) Trypsin	Peptides	Amino acids

33. a)
1. Epidermis
 - 2 Cortex
 3. Cambium

4. Xylem
5. Phloem
- b) 3. Responsible for secondary growth.
4. Transportation of water and mineral salts
- c) (ii) - They are both capable of division producing new cells. –
They both have soft cell wall
34. (a) A - Sweat gland
B- Sweat pore
C - Capillary loop
D-Hair
E-Erector muscle
F- A dispose tissue
- (b) State the function of each of the parts labelled A, B, D & F.
A - For sweat production
B - outlet through which sweat passes
D - For keeping the body warm
F - Storage of fats thus insulating the body,
- c) Using any one observable features in the diagram, suggest the type of temperature condition the skin is responding to. State the observable features as a reason for your answer.

Temperature: Hot temperature condition

Observable feature :The hair is bent (lowered) which is an adaption to reduce over heating.

SECTION C

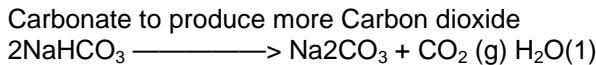
- 35 An experiment to show that carbondioxide is necessary for photosynthesis to take place

Apparatus: Glass jar, Iodine solution, Sodium hydroxide -Sodium hydrogen Carbonate, Potted plant

Procedure

- A potted plant is destarched by putting it in darkness for almost 12 hours
- Enclose two leaves each in a glass jar one containing Sodium hydroxide and one containing Sodium hydrogen Carbonate.
- Expose the plant to sunlight for about six hours

Setup



- Detach the two leaves after 6 hrs and test them for starch.

Observations: The plant leaf B showed blue-black colour with Iodine, while A took up the brown colour of Iodine.

Conclusion: Carbon dioxide is necessary for photosynthesis. Since the leaf that was deprived of Carbon dioxide gave a negative test for starch.

36. (a) Sexual reproduction is a kind of reproduction where new individuals arise from the fusion of male and female gametes.

(b) It brings about variation due to mixing of genetic material during meiosis

The seeds may help the plant to survive unfavourable conditions during the period of dormancy.

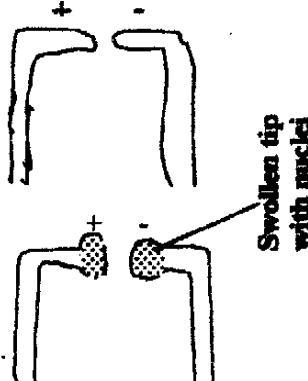
With sexual reproduction, hybrids may be produced which have advantages like being disease resistant, high productivity etc.

In sexual reproduction, plants can colonise new areas (widely) due to variation which may allow adaptation to the new environmental conditions.

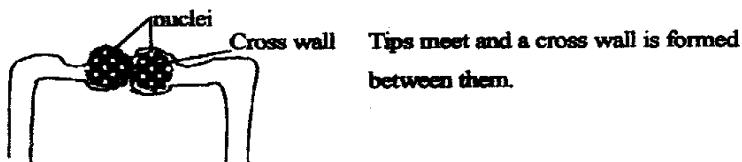
(c) Sexual reproduction in mucor occurs when hyphae from opposite mating strain are chemically attracted to each other.



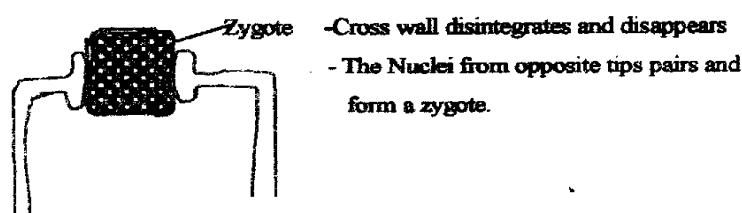
(ii) Short branches of two hyphae tips come to face each other



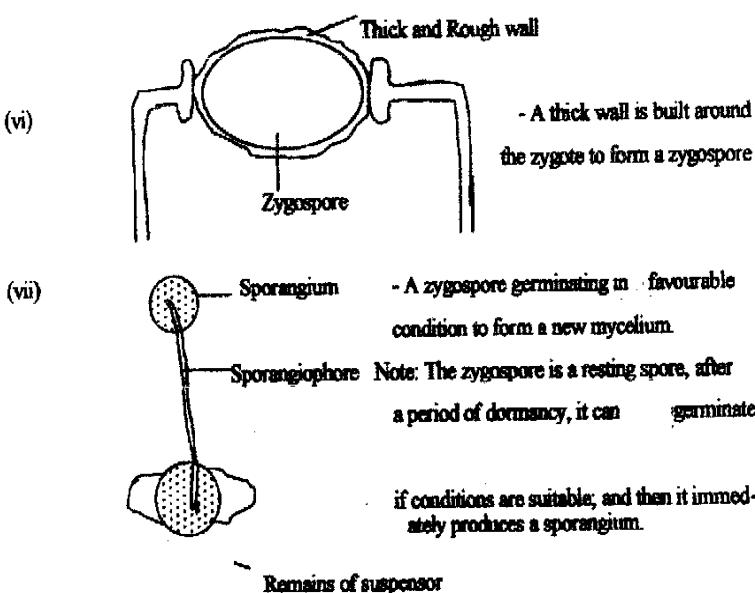
(iii) Hyphae tips swell and nuclei start to form



(iv) Tips meet and a cross wall is formed between them.



-Cross wall disintegrates and disappears
- The Nuclei from opposite tips pairs and form a zygote.



37. Describe human activities, which may cause environmental pollution.

Pollution is the addition of dangerous substance to the environment at a rate, which is faster than environment, can accommodate it.

Note that for something to be called a pollutant, it has to be harmful to life.

The human activities that cause pollution include;

- **Smoking.** This causes air pollution as it contains tinny particles of soot (carbon), suspended in air
- Burning substances (fossils) containing Nitrogen, Carbon & Sulphurdioxide. Sulphur dioxide causes irritation of the respiratory system and may reduce the growth of some plants like wheat.
- **Sewage Deposition**

- 02
- Sewage from homes and industries when deposited into water bodies causes pollution. This may have a problem in that the aerobic saprophytic bacteria use up oxygen which create a Biochemical oxygen demand.
 - Release of toxic chemicals into rivers, lakes and seas around the world is serious cause of water pollution. The toxic substances may include Zinc, Copper, lead, Mercury & Cyanide.
 - Application of fertilizers. The organic fertilizers are majorly applied to farms to increase crop yield. The major constituents of these fertilizers are Nitrates which are highly soluble and readily leached into rivers and lakes thus causes water pollution.
 - Oils in storage tanks at the sea or just by accidental spillage. Here sea birds are at risk because oil coats on their feathers preventing them from flying.
 - Electricity generation at power stations. This cause thermo pollution of the river water. This has an effect of altering the ecological balance by favouring the warm species on the expenses of cold water ones.
 - Damping of wastes and deposits. This causes terrestrial pollution as a result of solid waste materials from commercial activities They become toxic owing to the high concentration of heavy metal ions.
 - Domestic rubbish: This is decomposed by bacteria to produce Methane and other gases which give out bad smell to the environment.
 - Application of pesticides: These are chemicals which kill pests, most of these are stable and cannot easily be broken down into harmless substances and thus cause terrestrial pollution.
 - Making of noise: This is normally lethal but sometimes causes hearing damage. This is often irritating and stressful.

38. (a) For man water may be used for food preparation

- Its used for drinking by animals.
- Water is a universal solvent \and dissolves all other chemicals
- It provides a medium where all chemical reactions occur.
- Evaporation of water (sweat) from the body leads to cooling.
- Water helps in the regulation of blood concentration
- Its important for diffusion of substances which first dissolve in water e.g oxygen in the

b) **Water Balance in a Mammalian body**

- Water can be gained by eating and drinking and its lost through urine, faeces, sweat and exhaled air. Water loss and gain cause changes in the concentration of blood.
- The changes in blood concentration are detected by the hypothalamus in the Brain.
- When blood concentration is high, the hypothalamus stimulate the pituitary gland to secrete anti-diuretic (ADH) hormone which causes the kidney tubules to absorb more water from the glomerular filtrate back into the blood.
- When blood concentration is low ADH secretion is suppressed and less water is absorbed from the glomerular filtrate.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1999

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

04

SECTION A

1. Figure 1 below shows the structure of a part of the lower epidermis of a leaf

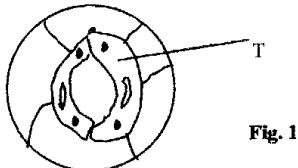


Fig. 1

What is the structure labeled T?

- A. Stoma
 - B. Vacuole
 - C. Chloroplast
 - D. Guard cell
2. 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
3. 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.
4. 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.
5. Which of the following is a function of thyroxine hormone?
- A Promotes development of follicle in the ovary.
 - B Prepares the body for fight-flight action.
 - C Controls body metabolic rate.
 - D Regulates sugar content of the body.
6. Which of the following is an example of a berry?

7. A. Avocado C. Groundnut
B. Passion D. Cotton
The mode of feeding displayed by a mucor is described as

8. A. holozoic C. Parasitic
B. Filter feeding D. saprophytics
What is the function of the Eustachian tube in the human ear?

A. Detection of body posture.
B. Transmission of sound waves to the middle ear
C. Equalizing pressure in the middle ear.
D. Transmission of sound waves to the inner ear.

9. 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 C. AO, OO
B. AA,AO D. AO only.

10. What relationship exists between a groundnut plant and nitrogen fixing bacteria in its root nodules?
A. Parasitism C. Naturalism
B. Saprophytism D. Symbiosis

11. Which type of soil has the following characteristics?
(i) Heavy to cultivate
(ii) Rich in dissolved minerals
(iii) High capillarity
A. Loam C. Sand
B. Clay D. Silt loam

12. In figure 2 below, which part transports water and dissolved minerals?

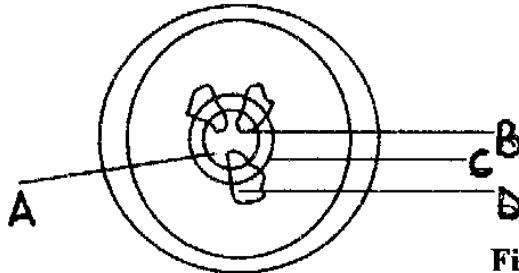
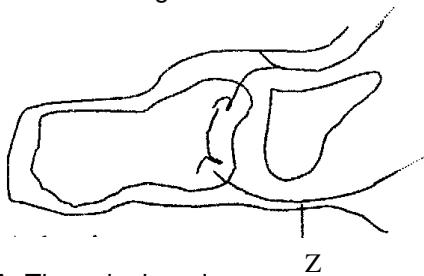


Fig. 2

13. Which of the following features belong to both an arachnida 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.

14. Which one of the following statements best explains why urine does not normally contain glucose?



- A. The spinal cord.
B The brain Z
C. The effector organ
D. The receptor organ

18. Which of the diseases listed below is a result of lack of the Anti-Diuretic Hormone (ADH) in the body?
A. Diabetes thellitus. B. Anaemia C. Goitre. D. Diabetes inspidus

19. The following are body responses to changes in temperature of a mammal:
(i) Shivering (ii) Increased blood supply to the skin.
(iii) Decreased sweat production,
(iv) Relaxation of erector pilli muscle.
Which two of the these are responses to a fell in body temperature?
A. (i)and(ii) C. (iii) and (iv)
B. (ii) and (iii) D. (i) and (iii)

20. Which one of the following pairs of bones form a ball and socket joint?
A. Humerus and ulna. C. Humerus and radius.
B. Femur and pelvis. D. Femur and tibia.

21. Which of the following characteristics show discontinuous variation?

22. A. Body weight C. Size of leaves
B. Blood groups D. Colour of flowers
Which one of the following responses is a directional growth movement?
A. Taxis B. Reflex C. Tropic D. Nastic

23. The blood serum of a universal donor contains
A. Antigens A. C. Neither antigens A nor B
B. Antigens B. D. Both antigens A and B

24. 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.

25. Which one of the following organisms carries out intracellular digestion?
(i) green plants
(ii) herbivores,
(iii) saprophytes
(iv) carnivores
In which order would the organisation die out?
A. (i),(ii),(iii)and(iv) C. (iii), (i), (ii) and (iv)
B. (i), (ii), (iv) and (iii) D. (i), (iii), (ii) and (iv)

26. A plant with poorly developed roots is likely to be growing in a soil that is deficient in
A. sulphur. C. Magnesium.
B. Phosphorus. D. Iron.

27. In fish, the fins which are used in propulsion movements are
A. Caudal C. Pelvic
B. Dorsal D. Ventral

28. Phagocytosis is the process whereby white blood cells
A. ingest bacteria.
B. Cause the bacteria to stick together
C. Dissolve the outer coats of invading bacteria.
D. Neutralize bacteria.

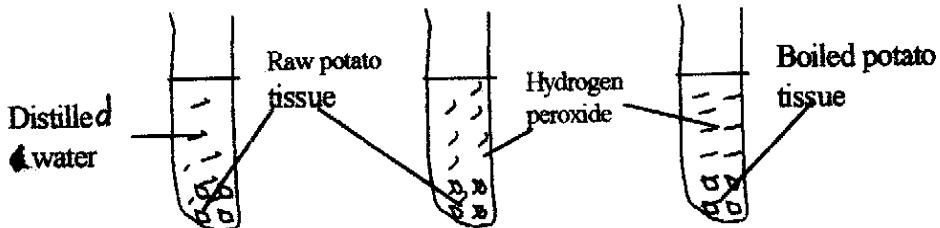
29. The following are factors that affect the rate of transpiration:
(i) High temperature
(ii) High relative humidity
(iii) Low atmospheric pressure
(v) Low light intensity

30. Which two of these would increase transpiration?
A. (i)and(ii) C. (ii)and(iv)
B. (i) and (iii) D. (iii) and (iv)

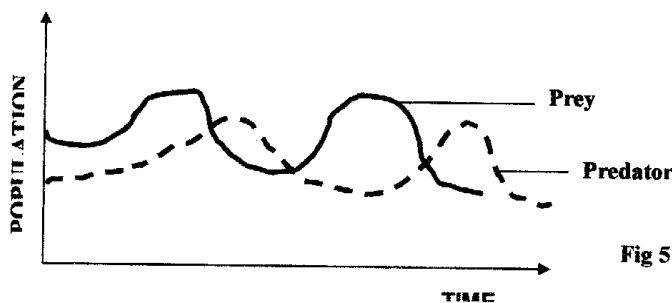
SECTION B

Answer all questions in this section. Answers must be written in the spaces provided.

31. (a) What is an enzyme?
 (b) Study the experimental set up in figure 4 below and answer the question 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.
32. (a) Distinguish between predator and prey?
 (b) Figure 5 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.
33. (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?

34. (a) (i) State the difference between cross-pollination and self-pollination
(ii) Give three structural features of flowers that ensure cross-pollination.

SECTION C

Answer any two questions.

- 09
35. Describe an experiment to show that oxygen is produced during photosynthesis.
36. a) Give three secondary sexual characteristics in a human female.
b) Describe the main events that occur during the menstrual cycle in a mammal.
37. 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?
38. (a) Define:
(i) phototropism
(ii) geotropism
b) Describe an experiment you would carry out to determine the effects of gravity on the root of a dicotyledonous plant.

ANSWERS TO BIOLOGY THEORY 553/1 1999.

SECTION A					
1 D	6 B	11 B	16 D	21 B	26 B
2 B	7 D	12 B	17 C	22 C	27 B
3 D	8 C	13 D	18 D	23 C	28 C
4 B	9 C	14 C	19 D	24 D	29 A
5 C	10 D	15 D	20 B	25 C	30 B

SECTION B.

31 (i) The effect of the enzyme catalase on hydrogen peroxide

In the first test tube, effervescence and bubbles of a gas were observed .while in C there was no observable change.

In test tube (i) ,there was no observable change because catalase enzyme in living tissues does not react with water.

In test -tube (ii) the bubbles of a gas were due to the oxidation of hydrogen peroxide to oxygen and water.

(iv) (i) In test tube (iii) the enzyme catalase was destroyed by boiling

32 (i) Originally, the number of prey is greater than the number of predators, the population of predators increases as that of prey increases.

the prey population reaches the maximum first and falls fast. the prey population increases again and a similar trend is followed .

(ii) Since the prey is the potential food for the predators ,their number should always be greater that of predators,

As the number preys increase, the predators get enough food and therefore increase in number again as predators increase more, they over fed on the prey and the population of prey had to decrease, due to starvation .the predator population also decrease this results into an increase of prey population and the trend continues.

Diseases shortage of food

Disaster like fire out break which May kill some.

(iii) A predator is an organism that hunts, kills and feeds on another organisms, and usually has a special kind of taste while the one being hunted for and fed on is a prey.

- 33 (a) Soil erosion is the washing away of top soil
(b) (i) sheet erosion
 - Rill erosion
 - gully erosion
 - splash erosion.
(c) (i) over cultivation
(ii) overgrazing
(iii) Deforestation
(iv) fire setting which removes soil cover.
(d) (i) Mulching helps to conserve water by stopping excessive evaporation from the soil because it provides a cover.

34. (a) (i) **cross pollination**

pollen grains transferred from anthers to stigma of different flowers

stigma is longer than the anthers.

The pollen grains relatively large,

Rough and sticky

filaments fancy, rigid and anther firmly attached

The flowers produce nectar and sweet -

The stigma is longer than the anther.

- (ii) -
Sticky pollen grains.
Brightly colored petals.

Self pollination

pollen grains transferred from anther to - stigma of the same flower

stigma is shorter than the anthers

pollen grains small and smooth

may have air bladders

anther are flexible and hinged.

The flowers have no nectar and are smell

SECTION C

35. An experiment to show that oxygen is produced during Photosynthesis.

Apparatus: Elodea plant, 2 beaker of water, test tube, funnel

Procedure.

- A short stemmed funnel is in the beaker containing water.

- The test -tube containing water is inverted over the funnel stem
- The funnel is placed above the bottom of the beaker to allow free circulation of water
- The apparatus is placed in sunlight

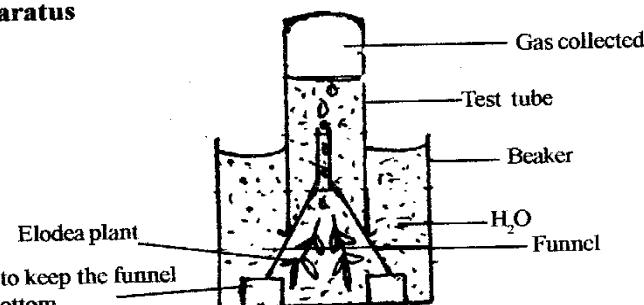
Set up of the apparatus

- Elodea plant Support to keep the funnel
- Gas collected
- Funnel
- off the bottom

12

Observation. Bubbles of a gas soon appear in the stem of the funnelled use and collect in the test -tube, on removing the test -tube and a glowing splint is inserted, the splint bursts into aflame.

set up of the apparatus



Give your own interpretation here.

36. (a) Give three secondary sexual characteristics in a human female.
 (b) *Describe the main event that occur during the menstrual cycle in a mammal.*
- (a)
- development of breasts.
 - menstruation
 - growth of pubic hair
 - enlargement of hip
- (b) It is important to note the menstrual cycle is controlled by hormones.

The pituitary gland produces the follicle stimulating hormone (F.S.H) which will cause the follicle to develop in the ovary.

The ovary in turn produces another hormone oestrogen that cause the repair of the firing of the uterus which was eaten away by menstruation.

The pituitary gland will then produce the lutenising hormone at the start of ovulation This causes ovulation and causes the follicle to turn into corpusluteum.

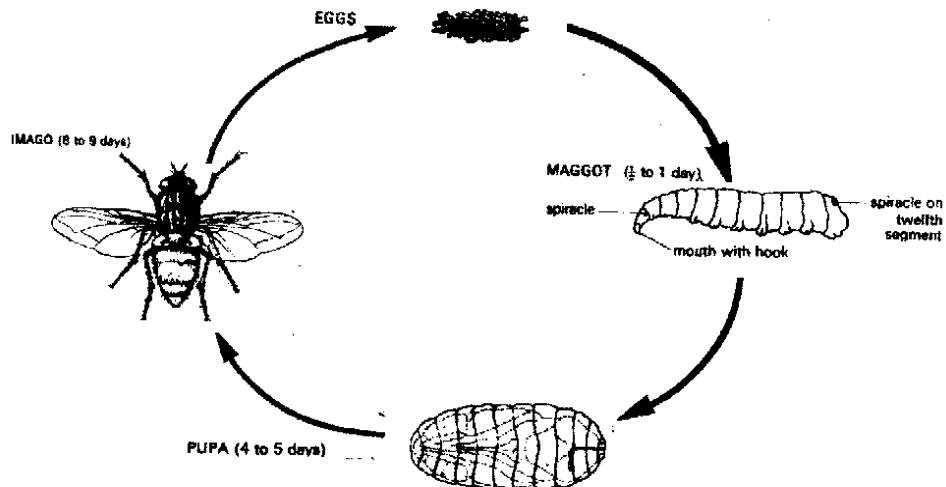
The corpusluteum then produces hormone progesterone which causes Inclining of the uterus to become thicker and get filled with blood vessels. when the egg is not fertilized ,then the production of estrogen and progesterone is stopped and this results in the breaking down of uterine lining thus menstruation occurs

36 (a) The mature female house fly lays many batches of eggs mostly in decaying organic matter they hatch after eight -twenty four hours according to the temperature the larva is a semi-trans parent maggot which later becomes white .

The larva has no legs but on the lower sides of the segments six- twelve are crescent shaped pads bearing short spines which assist its movement spiracles open on the second and last segments only,

The larva grows to above one cm on long in five days, shading Its cuticle twice and then pupate the lost larval skin is not cast but retained as a pupa case (puparium)which latter darkens and hardens forming a cigar -shaped structure. In a period of three days the pupa metamorphoses to the perfect insect

A sack- like structure, the ptilum covering the head is burst by blood pressure and the imago emerges. The wings of the imago expand and harden in the next few hours and after which it flies away.



- (b) The economic importance of a house fly is that it spread diseases
(ii) Houseflies also help in the decomposition of mater when they feed on it.
(c) The spread of house flies in a home can be minimum through.
▪ Covering the food to be stored

- Cleaning of latrines and covering them after use.
- The compost pits should be situated away from the home
- Ensuring proper disposal of wastes like feces i.e. in latrines
- Washing hands before eating
- Cover refuse in dustbins.

37 (a), (a) (i) Phototropism is a growth response of plant shoots to a direction of light

(b) Geotropism is a growth response of plant in to gravity.

(c) **An experiment to determine the effect of gravity on the root of a dicotyledonous plant.**

Apparatus: Petri-dish, Water, seedlings (peas), cotton wool

Procedure

- Germinate about 3 pea seeds. When the seedlings are about 5-6cm long, they are placed in petri dish.
- The selected seedlings should have straight radicles
- Three seedlings should be fixed such that in one, the radicle is facing downwards,-the second horizontal and the 3rd vertically upwards.
- These seedlings are covered with cotton wool or blotting paper in a petridish.
- The set up should then be placed in a dark cupboard for two days.
- Seedlings at the beginning of the experiment End of Experiment

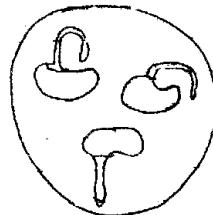
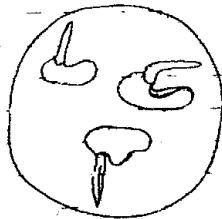
Observation

The radicals that were pointing horizontally and vertically upwards were found to bend downwards whereas the one that was pointing downwards remained growing downwards.

Conclusion: This shows that roots of dicotyledonous plants are positively Geotropic.

Seedlings at the beginning of the experiment

End of Experiment



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1998

2 hours 30 minutes

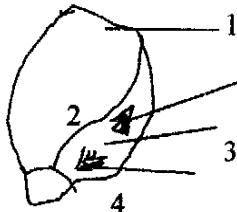
INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A

1. What would happen to an enzyme if the temperature of its medium was increased to above 50°C? The enzyme would be
 - A. Killed
 - B. Activated
 - C. Denatured
 - D. Inactivated
2. In which of the following does active transport not occur?
 - A. Killed
 - B. Phloem sieve tubes
 - C. Xylem vessels
 - D. Ileum villi
3. Which one of the following is an adaptation of reptiles for terrestrial environment ?
 - A. Limbs
 - B. Lungs
 - C. Scales
 - D. Elongated body
4. Figure 1 below shows a longitudinal section through a maize grain



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
5. 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
 6. 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

7. 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 C. A
B. AB D. B

8. A rabbit is able to utilize cellulose because it
A. Has symbiotic bacteria in the stomach
B. Has symbiotic bacteria in the cecum
C. Has a very long alimentary canal
D. Secretes the enzyme cellulose.

9. Which one of the following factors is not important in as far as nutrition of the common mould is concerned.
A. It produces large quantities of spores.
B. It can respire anaerobically.
C. It has a highly branched mycelium.
D. It secretes enzymes.

10. In the human heart, the mixing of oxygenated and de-oxygenated blood is prevented by the
A. Septum, C. Tricuspid valve,
B. Bicuspid valve D. Semilunar valve.

11. Removal of the thyroid gland in a young child may lead to
A. stunted growth and mental retardation
B. failure to develop secondary sexual characteristic.
C. Development of diabetes.
D. Increased metabolic rate and restlessness.

12. The following are physiological processes that occur in the body of a mammal:
(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) C. (i), (ii) and (iii)
B. (ii), (iii) and (iv) D. (ii) and (iii) only.

13. Which one of the following is a respiratory organ in an insect?
A. Malpighian tubule C. Trachea
B. Spiracle D. Zygote

14. Which one of the following is a diploid cell?
A. Pollen grain B. Ovum
C. Spermatoon D. Alveolus

15. What gas is likely to be evolved from a submerged aquatic plant placed in bright sunlight
A. Carbon dioxide C. Hydrogen

16. B. Oxygen D. Nitrogen
Which of the following is a characteristics of cervical vertebra?
A. Broad neutral spine. C. Presence of vertebral canals. B.
Long transverse processes. D. Presence of facets.

17. Which one of the following has the least energy content in a food chain?
A. Producer C. Tertiary consumer
B. Secondary consumer D. Primary consumer

18. A certain one of the following has the least energy content in a food chain? Leaves reduced to spikes Stomata shrunken in pits Leaves covered with thick cuticle.
Which one of the following would be the likely habitat for the plant?
A. Open grass land C. Wetland
B. Arid land D. Tropical rainforest

19. Yellowing of leaves in growing maize plants indicates a deficiency of
A. Calcium C. Nitrogen
B. Sulphur D. Magnesium.

20. What are the products of digestion of lactose sugar?
A. Glucose only C. Fructose and galactose
B. Glucose and galactose D. Fructose and glucose

21. Which one of the following is a characteristic of insects only?
A. Exoskeleton C. Two pairs of wings
B. Jointed legs D. Three body divisions

22. Which of the following vegetative plants would appear earliest in a rocky habitat?
A. Moss C. Algae
B. Lichens D. Ferns

23. Which one of the organisms below has a growth curve represented by the graph in figure 2?

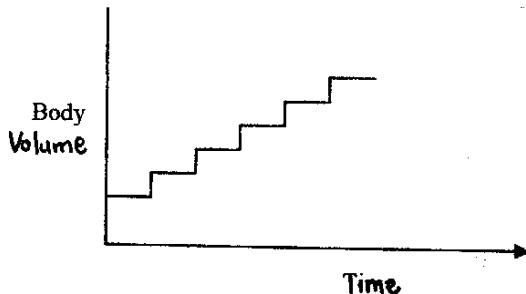
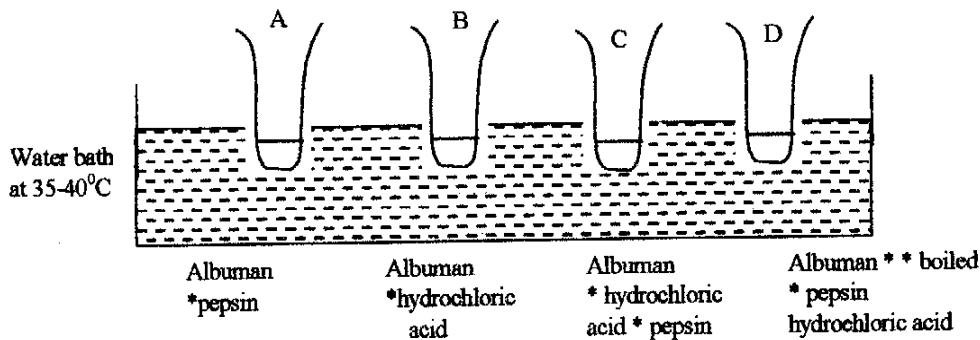


Fig. 2

24. Which one of the following is a modified root?

A. A bacterium C. A human being
B. An insect D. A bony fish.



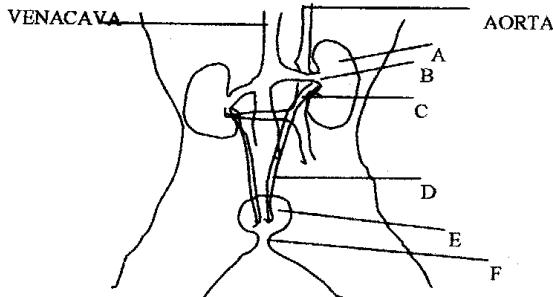
30. In which tube will the contents clear after some time? 30. Which one of the following substances does not contain nitrogen?

A. Glycerol	C. Amylase
B. Ammonium chloride	D. Urea

SECTION B

Answer all questions in this section. Answers must be written in the spaces provided.

31. Figure 4 below shows a mammalian urinary system.



- (a) Name the parts labeled A - F.

A..... D.....
B..... E.....
C..... F.....

- (b) Briefly explain why the concentration of urea in B is less than C.

- (c) What is the function of E?

- (d) A sample of urine was found to contain sugar.

- (i) Suggest the type of likely to be contained in the urine sample.

- (ii) What hormone is likely to be deficient in the person from whom the urine sample was taken?

- (iii) Name the disease that the person is likely to be suffering from.

- (e) Another individual was found to be passing out a lot of urine but without sugar and complaining of thirst most of the time,

- (i) Suggest a hormone that is deficient in this individual.

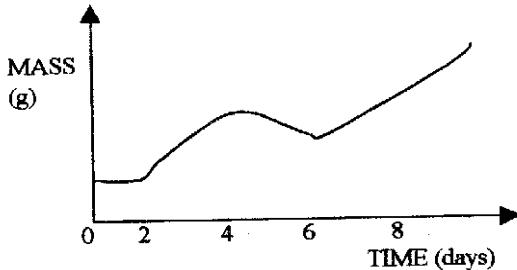
- (ii) Name the organ which produces the hormone referred to in (e) (i) above.

32. (a) Give five differences between respiration and photosynthesis.

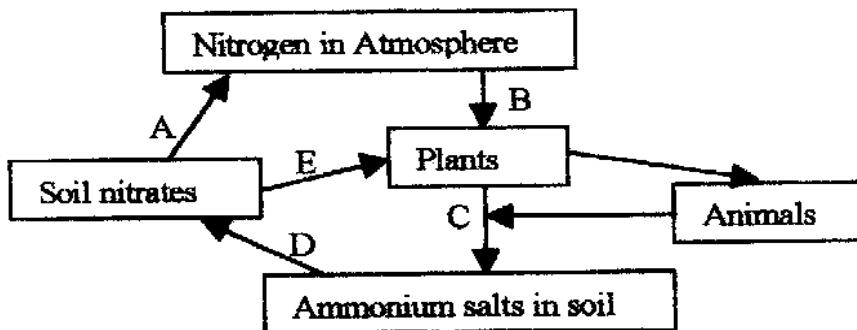
- (b) Give three ways in which respiration is important to living organisms.

- (c) Name two commercial uses of anaerobic respiration.

- 20
33. (a) What is germination?
(b) State the external factors that affect germination
(c) Figure 5 below shows a growth curve of a bean seedling.



- (i) Why does the mass of the seedling increase between day 0 and day 4?
(ii) What has caused a drop in the mass between day 4 and day 6?
(iii) Give reasons for the steady increase in mass after day 6. 34. Figure 6 below shows the nitrogen cycle.



ANSWERS TO BIOLOGY PAPER 1 1998

SECTION A

- | | | | | | |
|------|------|-------|-------|-------|-------|
| 1. C | 6. C | 11. A | 16. C | 21. D | 26. D |
| 2. C | 7. A | 12. C | 17. C | 22. B | 27. B |
| 3. B | 8. B | 13. C | 18. B | 23. B | 28. B |
| 4. A | 9. A | 14. D | 19. D | 24. A | 29. C |

5 D 10. A

15. B

20. B

25. D

30. A

SECTION B

31. Figure 4 below shows mammalian urinary system.

- 21
- A - Left kidney
 - B - Renal vein
 - C - Renal artery
 - D - Ureter
 - E - Bladder
 - F - Urethra

- (b) This is because most of the urea will have been removed along with urine.
- (c) E is used as a temporary store of urine
- (d)
 - (i) Glucose
 - (ii) Insulin
 - (iii) Diabetes Mellitus
- (b)
 - (i) (ADH) Vasopressin
 - (ii) Pituitary gland

32 (a) Respiration photosynthesis

- | | |
|--------------------------------------|--|
| - Occurs in both plants and animals | - Occurs in plants only |
| - Energy is given out | - Energy is used |
| - Carbon dioxide and water given out | - Carbon dioxide and water used |
| - Uses up Oxygen | - Oxygen is given off as a bi-product. |

(b) It provides energy for both chemical and mechanical activities in the body.

It also facilitates the process of gaseous exchange since oxygen is continuously used up which creates a diffusion gradient.

Respiration also helps in the utilization of some absorbed food materials of which excess cannot be stored in the body like the amino acids.

(c) It helps in manufacture of crude Waragi locally.

It also helps in the brewing industry in the manufacture of beer.

33 (a) Germination is the development of a seed into a seedling

- 22
- (b) The factors are water and warmth.
(c) (i) The mass of the seedling increases due to growth using the food stored in the food reserves,
 (ii) During day 4 and 6, the mass of the seedling decreases because the food in the food reserves is being used up.
 (i) The steady increase in mass after day 6 is because the seedling has developed leaves which carryout photosynthesis thus steady increase in growth.
- 34 (a) A Denitrification
 B Fixation
 C Decay
 D Nitration
 E Absorption
(b) (i) It helps plants to obtain Nitrogen from the atmosphere.
 (ii) Detritivores.
 (iii) It helps in the recycling of nutrients in the cycle.

SECTION C

35. **Inspiration:** Muscles of the floor of the mouth cavity contract lowering it resulting in increase in volume of the mouth cavity which leads to a decrease in pressure of this region, the mouth opens and water flows in. muscles of each operculum cause them to bulge outwards, this reduces the pressure in the gill region so that water flows from the mouth cavity to the gills.

This is caused by a big volume in the gill region, low pressure in the same region and relaxation of muscles of the mouth cavity making the floor to raise reducing the volume and increasing the pressure in the mouth cavity with closings of the mouth.

This forces water to move from the mouth cavity where the pressure is high.

Expiration : Operculum muscles then squeeze the opercula walls inwards so that the internal pressure becomes higher than external pressure. This leaves the flexible edge of operculum open letting water to flow out of the gill region.

As water moves along on the gills gaseous exchange takes place. Oxygen from water into blood in the gills and carbon dioxide from blood to the water.

Adaptations of gills for gaseous exchange.

The gills have a thin epithelium (1 cell thick) which increases the efficiency

They are lined with a layer moisture where oxygen dissolves before diffusing across the thin walls.

They have a dense lining of blood capillaries for transportation of diffused oxygen away thus maintaining a diffusion gradient.

They have increased surface area which is ensured by the thin gill filaments where gaseous exchange occurs.

36. (a) Self pollination is the transfer of pollen grains from the anthers to the stigma of the same flower

(b) Self pollination may be naturally prevented in the following ways.

Protogeny: This is a condition where the pistil ripens faster than the stamen.

Protandry: This is a condition where the stamen ripens faster than the pistil

Pistil is higher than the stamens

Self sterility: This refers to a condition where pollen grains produced by one flower cannot fertilize the ovule of the same flower.

(c) Have brightly coloured petals

- * Have scent
- * Have sticky pollen grains
- * The stigma is longer than the anthers.
- * They have nectar
- * They also possess pollen guides.

37. (a) Parasitism - This is the type of feeding relationship where one organism (parasite) lives on or inside the host for food. In this case the parasite gabs and the host is harmed. Examples: liver flukes and sheep, -cattle and ticks, - tape worms and pigs.

(b) Commensalism - this is the type of feeding relationship between two organisms where one neither gains nor loses and the other gains (commensal). Examples: - Porcelain crabs and hermit crabs

-Cattle and Egret

- Barnacles and whales or sea turtles.

- Romora which attaches by its dorsal sucker to some other fish for transport.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1997
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

- Which of the following processes need energy?
A. Osmosis C. Plasmolysis
B. Diffusion D. Active transport
 - What is the normal blood sugar level in an adult person?
A. $140\text{mg}/100\text{cm}^3$ C, $90\text{ mg}/100\text{ cm}^3$
B. $100\text{mg}/100\text{cm}^3$ D. $80\text{ mg}/100\text{ cm}^3$
 - The diagram in figure 1 is of a transverse section of a plant part.

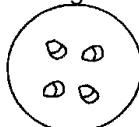


Fig. 1

From which one of the following was the section taken? A

4. A. Monocotyledonous stem C. Dicotyledonous root.
B. Monocotyledonous root. D. Dicotyledonous stem.
Which one of the following represents a reflex arc?
A. Receptor - motor neurone - central nervous system - sensory neurone-effector.
B. Receptor - sensory neurone - effector- central nervous system- motor neurone
C. Receptor - central nervous system- motor neurone — sensory neurone -effector.
D. Receptor — sensory neurone - central nervous system- motor neurone — effector.

5. The following are characteristics of insects:

(i) They undergo complete metamorphosis.

- (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 them 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)

6. Which one of the following combinations of words about amoeba are related?
A. Pseudopodia, reproduction C. Contractile vacuole, water
B. Nucleus, movement. D. Ectoplasm, digestion.

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

Mass of crucible = 15 g

Mass of crucible plus soil = 30 g

Mass of crucible plus soil after drying = 25g

What is the percentage of water?

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

8. Which of the following reasons supports natural feeding of baby on mother's milk? Mother's milk is:

- (i) easy to digest.
 - (ii) Made up mainly of carbohydrates.
 - (iii) Contains correct antibodies.
 - (iv) Fosters relationship between mother and baby
- | | |
|-------------------|-------------------------|
| A. (i)and(ii) | C. (ii), (iii) and (iv) |
| B. (ii) and (iii) | D. (i), (iii) and (iv) |

9. The milk teeth in human consist of

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

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

- | | |
|------------|--------------------|
| A. Amylase | C. Insulin |
| B. Urea | D. Sodium chloride |

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

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

12. 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 herbivores.
- C. Equal to the total number of producers.
- D. Constant year after year.

13. Which one of the following hormones is not secreted from the pituitary gland?

- | | |
|--------------------------|---------------------------------|
| A. Gonadotrophic hormone | C. Progesterone hormone |
| B. Luteinizing hormone | D. Follicle stimulating hormone |

14. Why is it necessary to keep both open when you are 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.

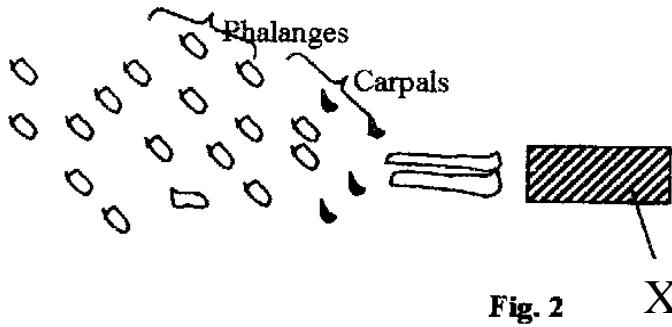
15. Which one of the following food substances are not changed by the gut enzymes?

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

16. The structure in insects that serve as respiratory surfaces for gaseous exchange are
A. Trachea C. Trachioles
B. Bronchioles D. Spiracles

17. A man's urine gave a positive test with Benedict's solution. What is the best deduction about this man?
A. He had been eating a lot of sugar.
B. There was too much insulin in his blood.
C. There was too much glycogen in his blood
D. He was suffering from diabetes.

18. Figure 2 below is a diagram showing a plan of the pentadactyl limb.



What part is represented by letter X?

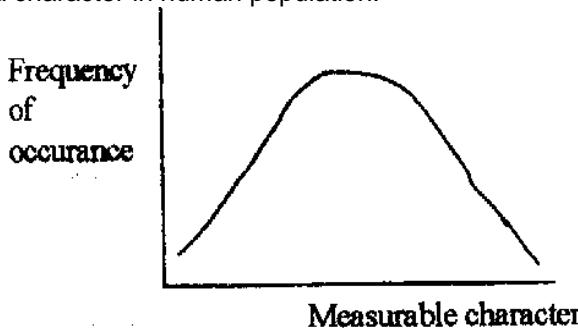
- A. Femur C. Radius
B. Humerus D. Ulna

19. What do the rhizobium bacteria gain in their association with leguminous plant?
A. Air C. Shelter
B. Heat D. Nitrates

20. Which of the following is the best advantage of crop rotation?
A. It helps reduce soil erosion.
B. The growth of weeds is brought under control.
C. It prevents exhaustion of particular mineral salts from the soil.
D. It helps improve soil conditions.

21. Which one of the following events does not occur following the contraction of the ventricles in mammalian heart?
A. Blood flows from ventricles into arteries.
B. The blood pressure increases in the aorta.
C. Atrio-ventricular valves open.
D. Arterial valves open.

22. Which of the following mineral elements are for bone formation?
A. Iodine, sodium and calcium.



- 28
30. Which one of the following organisms is not a heterotroph?
- A. Pallisade cell
 - B. Guard cells
 - C. Epidermal cells
 - D. Spongy mesophyll cells
- A. Mushroom
 - B. Alga
 - C. Tick
 - D. Grass hoper

SECTION B

31. (a) What do you understand by the following terms?

- (i) Habit.....
(ii) Ecosystem.....

(b) There are four possible trophic levels that can exist in a food chain. State them below.

(c) Give an example of a food chain consisting of four levels of organisms found in a grassland.

(d) Construct a diagram of a food chain which may exist in a fresh water lake in Uganda, comprising of the following organisms: Tadpole, Green alga, Heron, Saprophytic bacteria, small fish and mosquito larvae.

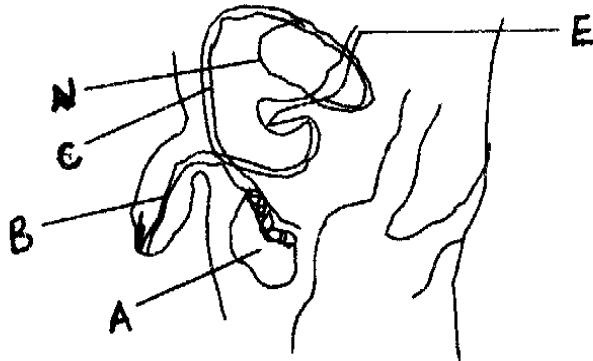
32. In an experiment, a long winged male drosophilla was crossed with a short winged female drosophilla. All the offspring on the F₁ generation were long winged. When two members of the F₁ generation consisted of 62 long winged flies and 21 short winged flies

(a) Suggest an explanation why all the F₁ generation flies were long winged.

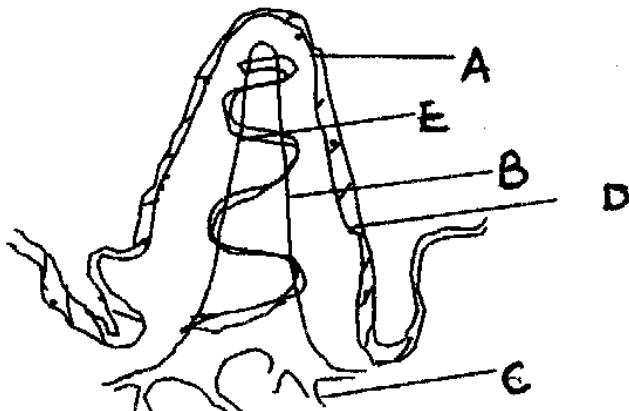
- (b) (i) What type of flies would develop from a mating between short winged flies in the second generation?
(ii) Give a reason for your answer.

(c) Mating between a short winged fly in F₂ generation with a long winged fly in F₁ generation produced 90 flies. How many of them were long winged? Show your working.

33. The diagram in figure 4 shows part of the body of a man.

**Fig. 4**

- (a) Name the parts labeled A to E
- (b) (i) Name the hormone made in the male which brings about the secondary sexual characteristics.
(ii) On the diagram, write H where the hormone is made.
(iii) Name two secondary sexual characteristics in the human male.
- (c) What is the function of part D?
(d) From which organ would fluid in the tube E come from?
34. The diagram in figure 5 shows the structure of a villus.



- (b) Label parts marked A, B C, and D

A.....

B.....

C.....

- 31
- D..
- (f) What food substances enter (i) A?...
- (g) State two factors which make a villus an effective absorbing structure.
- (i)...
- (ii)...
- (h) How does the absorbed food in B reach the general circulation?
- (i) State two nutrients which are absorbed in the gut before reaching the villus.

SECTION C

Answer any two questions.

35. (a) What is soil erosion?
(b) State the various types of soil erosion.
(c) Explain how man's activities may lead to soil erosion.
36. (a) Describe how plants lose water through their leaves.
(b) Describe two features of plants and two features of animals which help them reduce water loss in dry conditions.
37. (a) What is meant by the word metamorphosis?
(b) Using a written description and labeled diagrams, describe the life cycle of a grasshopper.
38. (a) What is respiration?
(b) State three differences between aerobic and anaerobic respiration.
(c) Describe gaseous exchange in a frog.

ANSWERS FOR BIOLOGY 1997

SECTION A

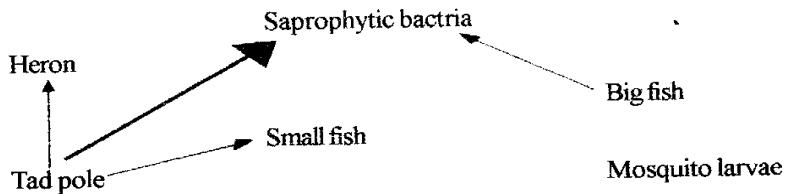
1- D	6-C	11- C	16 -C	21- C	26 -A
2- C	7-A	12 -A	17-D	22 -D	27 -D
3-D	8-D	13 -C	18-B	23 -B	28 -C
4-D	9-C	14-A	19 -C	24 -D	29 -D
5-A	10-A	15-B	20 -C	25 -D	30 -B

SECTION B.

- (a) (i) A habitat is a place in the environment where an organism lives.
(ii) This is a natural system of all plants and animals living together and interacting among themselves and non-living components.

- (b) (i) Primary producers (first trophic level)
(ii) Primary consumers (second trophic level)
(iii) Secondary consumers (third trophic level)
(iv) Tertiary consumers (fourth trophic level)
- (c) - Green plant → Grasshopper → Dove → Kite

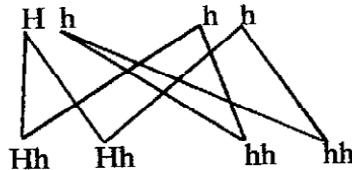
(d) Food web



- 32 (a). The gene for long wings was dominant over that for short wings In this case the parents were homozygous dominant,
(i) Only short winged flies will develop
(ii) The gene for shortness was homozygous recessive.

Let the gene for long wings in F1 generation be H. let the gene for short wings in F2 generation be h parents. Long winged (F1) x Short wings (F2)

Genotype	Hh	hh
Gametes	H, h	h, h
F1 GENOTYPE	Hh	Hh



F1 genotype

Phenotype	Hh	long winged
	hh	short winged

therefore the number of long winged flies, $1/2 \times 90 = 45$ flies

- 33 (a) A-Testes
B - Urethra
C - Vas deferens/sperm duct
D- Urinary bladder

E- Ureter

- (b) (i) It is testosterone hormone
(ii) It should be written on the testes.
(iii) Secondary sexual characteristics in human male include,
- deepening of voice
- growth of facial hair, public hair, armpit hair.
- (c) for storage of urine.
(d) from the kidney.

34. (a) A - epithelium
B - lacteal
C - lymphatic vessel
D - epithelial cell.
E - blood capillaries
- (b) (i) glucose, mineral salts, vitamins and amino acids.
(ii) fatty acids and glycerol.
(c) (i) it has a thin epithelium (one cell thick)
(ii) it has a dense network of blood capillaries.
(iii) they have a lining of moisture for dissolving the food before it diffuses across.
- (d) The absorbed food in B (i.e. fatty acids and glycerol) enter through the lacteal which then join to form the lymphatic system ,the lymphatic system will then drain its contents into the left jugular vein.
- (e) (i) mineral salts.
(ii) vitamins.

SECTION C Answers

35. (a) soil erosion is the removal or washing away of top soil by the agents of soil erosion such as water.
- (b) - gully erosion
Rain drop/splash erosion
Rill erosion,
sheet erosion
wind erosion.
- (c) (i) Overgrazing: this may leave the soil bare the animals may even make foot paths during their movement along which rain water flows that it may develop into gully.

Deforestation also increases soil erosion in such a way the trees are acting as wind breakers, reduce the impact of rain droplets on the soil and the roots of trees help to hold soil particles together

Excessive use of fertilizers may distort soil structure it may be easily washed away by rain water and wind.

Poor farming methods also lead to soil erosion the poor farming methods include the following ;cultivation of crops on steep slopes, ploughing up and down the slope; over cultivation also destroy soil structure.

Other activities like road construction also leaves the soil bare for wind and water erosion to occur.

- (36) (a) Plant lose water to the atmosphere majorly by two processes
(i) transpiration
(ii) gutation

Water diffuses from the air spaces through the stomata in form of water vapour. More water diffuses from the neighboring cell to the air spaces.

Water moves from the cell vacuole to the cell wall which makes the cell sap of these cell more concentrated than that of the inner cells.

Thus water moves from the inner cell into the surrounding cells and then to the air spaces by either osmosis or root pressure.

The process continues until water is drawn from xylem vessel and travels by capillarity from the leaves to the roots.

(b) **Plant**

- Reduced number of leaves this helps to reduce the surface area over which transpiration occurs.
- Reduced number of stomata hence little water will be lost to the atmosphere others may include:
- Sunken stomata
- Some plants reverse the stomatal opening and open the stomata during the night and close them during the day which reduce water loss,
- Through leaf fall, this also reduces surface area over which water loss can occur.
- Others have thick cuticle to minimize water loss.

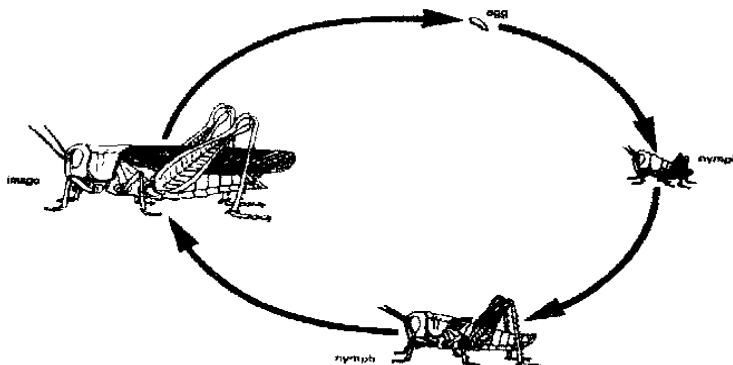
Animals.

- Long loops of henle increase water reabsorption.
- Reduction in the number of sweat glands which reduces the amount of sweat

(37) (a) metamorphosis is a change in form during the development of an organism from young to adult where the young is completely different from the adult.

(b) **Description of a life cycle of a grasshopper.**

- A grasshopper undergoes incomplete metamorphosis
- A female lays eggs in warm moist sand.
- In 10-20 days depending on the temperature ,eggs hatch
- the nymphs are small and wingless at each successive moult, the nymphs increase in size and wings grow larger moulting after the fifth instar the nymphs become adults



38. (a) Respiration is the process by which food is oxidized to produce energy.
b) The difference between aerobic and anaerobic respiration can be summarised in the table below

Aerobic

Glucose is completely broken down to carbondioxide and water

More energy is produced

An aerobic

Glucose is incompletely broken down to lactice acid in animals and Ethanol in plants.

Requires oxygen

Little energy is produced.

Does not require oxygen

36
(c) The respiratory surfaces in frogs include:

- **Lungs** -Here both nostrils and mouth are closed, the glottis open, floor of the mouth is raised, the volume of the mouth cavity is reduced air is forced into the lungs, oxygen dissolved in the moist lining of the lungs diffuses into the blood capillaries, carbon dioxide moves the reverse direction
- **Skin**-Here gaseous exchange occurs by diffusion. The skin is thin, moist and well supplied with blood vessels. Oxygen dissolves in the moist lining of the skin and carbon dioxide diffuses out.
- **Buccal/mouth cavity**. Air is sucked into the buccal cavity by the lowering of the floor of the mouth cavity whose lining is kept moist and well supplied with blood vessels the nostrils first open and mouth and glottis close in order for air not to be lost through them.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1996
Paper 1
2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A

1. Individuals with blood group AB are said to be universal recipients because they have
A. No antigens. C. Both antigens and antibodies.
B. No antibodies D. Antibodies A and B.

2. 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 to receptors.
D. Cell bodies of sensory neurones are found in the receptors.

3. The last segment of a caterpillar bears a pair of structures called
A. Prolegs. C. Claspers.
B. Ovipositors. D. True legs.

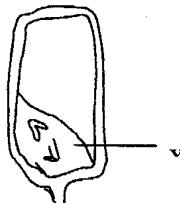
4. In cattle the gene for red coat colour, R, is co-dominant to that for white coat colour, W. If a red cow was mated to a white bull, what would be the phenotype of the F₁ generation?
A. All red C. 3 red: 1 white
B. All white D. True legs.

5. What are the products of the hydrolysis of lactose?
A. Galactose and fructose C. Glucose only;
B. Glucose and galactose D. Glucose and fructose.

6. Photosynthesis is said to have a pair of raw materials, a pair of conditions, and a pair of products. Which of these is the correct set?
A. Carbon dioxide and light; water and chlorophyll, oxygen and sugars.
B. Water and light; carbon dioxide and chlorophyll; oxygen and sugars.
C. Light and chlorophyll; carbon dioxide and sugar; water and oxygen.
D. Carbon dioxide and water, light and chlorophyll; oxygen and sugars.

7. Which one of the following controls the activities of other ductless glands?
A. Tyroid C. Pituitary
B. Adrenal D. Islets of Langerhans

8. A runner is a
A. Stem which bends over and roots in the soil.



In a germinating grain, the function of x is to

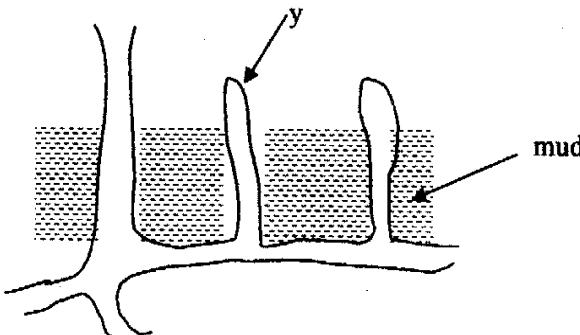
- A. absorb food from the endosperm.
 - B. Provide the first leaves.
 - C. Hydrolyse the food in the endosperm
 - D. Protects the plumule.

20. A mammalian embryo exchanges materials with its mother by

- A. Osmosis
 - B. Secretion
 - C. Circulation
 - D. Diffusion

21. 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, carbon dioxide and energy.
 - C. The exchange of oxygen and carbon dioxide in the lungs.
 - D. The oxidation of sugar to produce carbon dioxide and energy



40

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

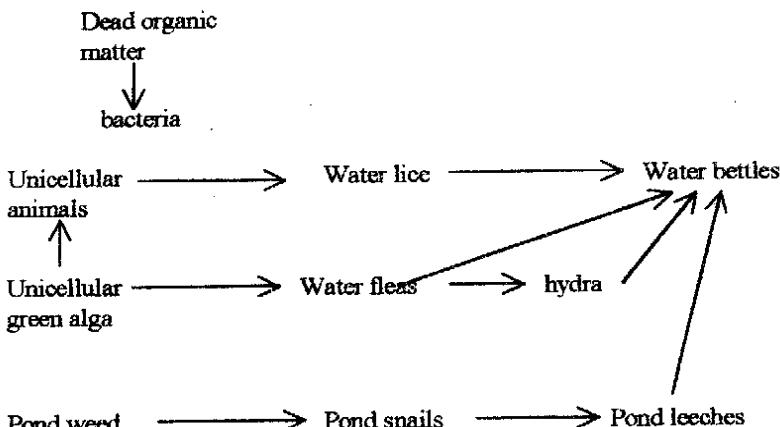
23. In what part of the green flowering plant does meiosis occur?

- A. Seed
B. Flower
C. Fruit
D. Shoot apex

24. 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.

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



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

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

25. In this food web which one the following groups of organisms are

- decomposers?

A. Unicellular green algae C. Water lice

B. Water beetles D. Bacteria

27. Which one of the following features is typical of the class insecta?

A. Jointed legs. C. Complete metamorphosis.

B. Three body parts. D. Exoskeleton

28. Which one of the following types of feathers is most widespread?

A. Convert feather C. Quill feathers

B. D. down feathers.

29. Which one 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.

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.

SECTION B

Answer all questions in this section. Answers must be written in the spaces provided.

31. (a) (i) What is meant by the term mutation?
(b) The gene for normal production of haemoglobin is dominant to the mutant gene which causes sickle cell anaemia. If a female heterozygous for the sickle cell anaemia marries a normal man, illustrate, using suitable symbols, the possible genotypes and phenotypes of the offspring.

32. (a) Distinguish between endocrine and exocrine glands.
(b) Below is a diagram of a human female showing the location of two endocrine glands.

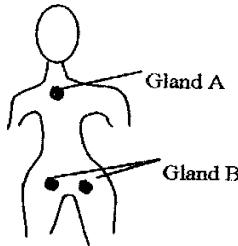
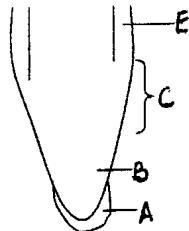


Fig. 1

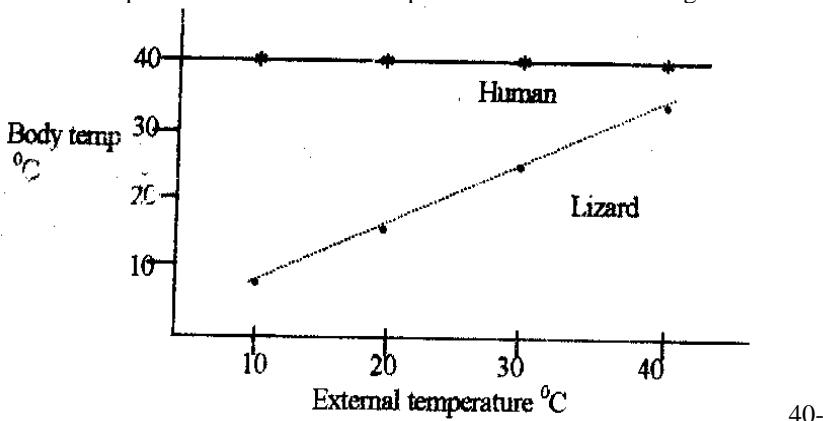
Name the glands A and B and one hormone produced by each.

- 42
- (c) Give three effects of adrenaline in the body.
33. Figure 2 (a) shows a vertical section of the end region of a growing root and Figure 2 (b) shows an enlargement of a cell from the root.



- (a) (i) Name the region labeled A.
- (ii) How does growth occur in the region labeled B?
- (iii) Describe briefly what happens to the cells in the region labeled C.
- (iv) What structures might be expected to grow at the region marked D?
- (b) State the function of region marked A.
- (c) Figure 2 (b) shows a cell from region B.
- (i) Name the process taking place in this cell.
- (ii) Briefly describe what is happening at this particular stage of the process.

34. The graph below shows the relationships between body temperatures and external temperatures in a human being and a lizard.



- (a) What happens to the temperature of each organism as the external temperature increases?

Human
Lizard

- (b) Humans are sometimes described as warm-blooded (homiothermic). State the advantage of this condition.
- (c) Suggest how a lizard living in hot desert conditions might avoid overheating if external temperatures rose above 40°C

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SECTION C

Answer any two questions from this section

35. (a) How does gaseous exchange take place in an insect
 (b) How does gaseous exchange in insects differ from that in mammals?
36. Describe an experiment you would carry out to test for the presence of starch in a leaf.
37. (a) Draw a well labeled diagram of a human female reproductive system.
 (b) Outline the events that lead to the fertilization of the ovum in the human female.
38. (a) Describe the structure of a motor neurone,
 (b) (i) What is meant by reflex action?
 (ii) By means of a diagram, show the path followed by a nerve impulse during a reflex action.

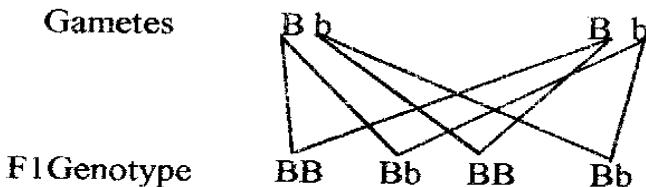
1996 ANSWERS

SECTION A

1-B	11-D	21-A
2-A	12-B	22-C
3-C	13-B	23-B
4-D	14-B	24-B
5-B	15-D	25-B
6-D	16-A	26-D
7-C	17-C	27-B
8-B	18-B	28-B
9-D	19-A	29-C
10-A	20-D	30-D

- 31 (a) (i) mutation is a sudden change in the structure or number of chromosomes or genes
 (b) let the gene for production of normal haemoglobin be B. –
 the gene for sickle cell be

b. Parents male x female Gametes



Phenotypically, all the offspring are normal

BB 1/2 normal

Bb 1/2 normal but carries

32. (a) Endocrine glands are ductless glands and they secrete hormones directly into blood While exocrine glands have ducts and their secretions are through the ducts.

(b) A is thyroid, produces thyroxine

B is ovary produces progesterone or oestrogen

- (c)
- Dilation of pupils of the eye.
 - Increased rate of heart beat.
 - Increased blood sugar.

33. a) (i) A Root cap

(ii) Growth in B occurs by Mitosis cell division

(ii) In part C cells elongate and differentiation of cells starts. The vacuoles take in water, enlarge and the cell wall thicken,
(iii) Root hairs

- (b) Part C protects the root tip.

(c) (i) Mitosis process

(ii) Chromatids are separated and are moving towards the opposite ends of the spindle.

34. (a) **Human.** The body temperature remains constant with increase in external temperature.

Lizards - The body temperature increases with increase in external temperature -

- (b)
- Human can occupy various places in different temperatures
 - Homoeothermic animals can remain active in all temperatures.

- (c)
- It can reduce activity

-It can go under a shade.

-Can also go under rock.

SECTION C

35. (a) Inhalation

The abdomen expands, spiracles open and air enters into the trachea, it then diffuses along the trachea to the tracheoles. These are thin walled and lined with moisture lining and diffuses through the tracheoles into the body cells and Carbon dioxide from the body cells in the opposite direction.

Exhalation

The abdomen contracts and forces air from tracheoles into the trachea and out through the spiracles. The air that comes out contains more carbon dioxide and less oxygen, (b)

gaseous exchange in insects	Gaseous exchange in mammals
Gaseous exchange occurs in tracheoles – Carbon dioxide and oxygen carried by the tracheal system to and from the body - Gaseous exchange less efficient	Gaseous exchange takes place in alveoli – Carbon dioxide and Oxygen conveyed by blood. -Gaseous exchange is more efficient

36. An experiment to test for starch in a leaf.

Materials used.

- Iodine
- Green leaf
- Beaker
- Source of heat
- Water
- White tile
- Alcohol -Alcohol
- Water bat

Procedure

- Boil the leaf in water to kill the protoplasm of the cells and to burst any starch grains present.
- Dip the leaf in boiling tube of alcohol to remove the chlorophyll of the leaf.
- Place the leaf in warm water to soften it.
- Remove the leaf from water and place it on a white tile, then use a dropper to apply iodine solution onto the leaf

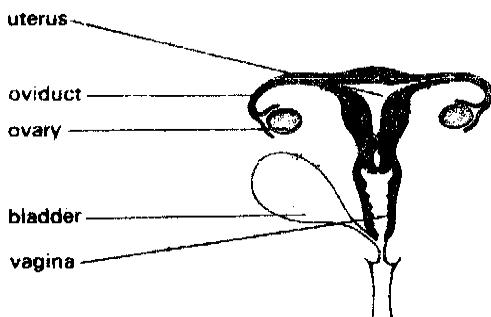
Observation: The leaf turns dark blue in iodine solution.

Conclusion: The leaf contains starch.

Note: For any Biological experiment, the following should be put under consideration

- (i) Title/heading of the experiment,
- (ii) Apparatus/materials used.
- (iii) Procedure taken
- (iv) Observation/Results
- (v) Conclusion.

37. **A diagram of a human female reproductive system**



(b) In the human female the ovary releases the ovum into the oviduct. The movement of the ovum through the oviduct is by either ciliary action or muscular contraction and relaxation of muscles of around - the oviduct (peristalsis)

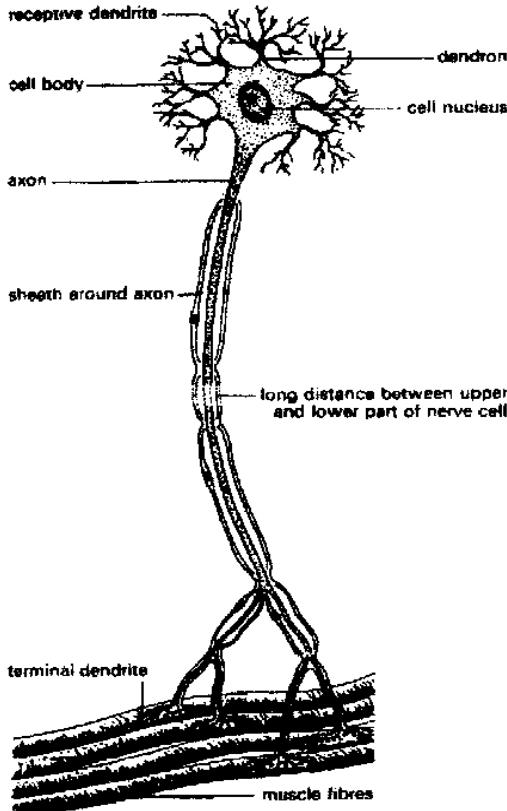
In human male sperms are produced in the testes. The penis erects, copulation takes place and when ejaculation occurs.

The sperms swim towards the fellopian tube (oviduct) from the vagina through the cervix and then uterus. This movement is being facilitated by the peristaltic movement of female's reproductive tract.

When in the oviduct, a single sperm collides with the ovum and fusion of the two occurs a zygote is formed.

Note: that after one sperm has collided and penetrated the ovum, a hard covering is formed immediately to stop the fusion with other species.

38. (a) The structure of a motor neurone (Diagram)



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It is an elongate cell with branched ends. It contains a cell body on one end with Nucleus and cytoplasm.

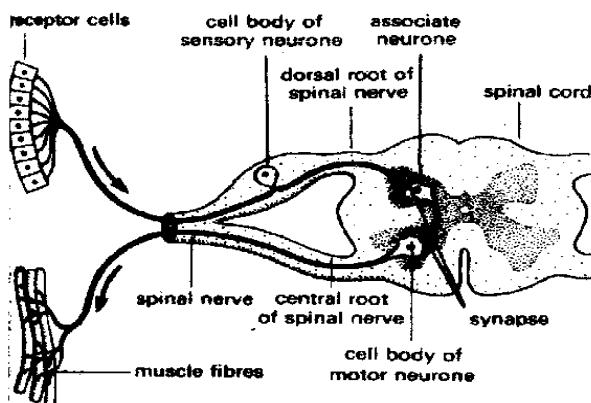
The cell body has dendrons which end into dendrites. The axon is along fibre that originates from the cell body. It may be covered by myelin sheath or not.

The myelin sheath is broken at the nodes of ranvier. The Axon ends into terminal dendrites.

(b) (i) A reflex action is a sudden automatic response to a stimuli not under the control of the brain. It only involves the spinal cord.

(n) The path taken/followed by a nerve impulse during the reflex action is called a reflex arc

Diagram of a reflex arc



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1995

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C.

Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

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SECTION A

1. Enzymes are said to be specific in nature because they
 - A. are proteins
 - B. act in a particular pH medium
 - C. act on one kind of substrate.
 - D. Remain unchanged at the end of the reaction
2. A sample of urine from a man was boiled with Benedict's solution and the mixture turned orange in colour. Which of the following is the best deduction about the condition of this man?
 - A. There was a lot of glycogen in his blood.
 - B. He has a deficiency of insulin in his blood
 - C. His diet has a lot of sugar.
 - D. His kidneys were damaged
3. Which of the following will not cause an evolutionary change on an animal species?
 - A. Having more males than females in the population
 - A. Abundant food supply
 - B. Presence of many predators.
 - C. Severe change in environmental conditions.
4. Which of these are characteristics of all insects?
 - A. Complete metamorphosis and possession of three pairs of jointed legs.
 - B. Possessions of three pairs of jointed legs and body divided into three main parts.
 - C. Possessions of one or two pairs of wings and having three pairs of jointed legs.
 - D. Complete metamorphosis and body divided into three main parts.
5. 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. Increase heat loss by radiation.
6. 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
7. 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.
8. Which one of the following results of seed dispersal may not be an advantage to a plant?
A. reduces overcrowding
B. minimizes spread of disease
C. stops competition of light and air
D. results on colonisation of new areas.
9. A heterozygous red flowered plant is crossed with a homozygous white flower. If red is dominant over white, what will be the phenotypes of the offspring?
A. $\frac{1}{2}$ red and $\frac{1}{2}$ white
B. all white
C. all red
D. $\frac{3}{4}$ red and $\frac{1}{4}$ white
10. Which of the following is the best description of the term double circulation on a mammal?
A. Blood flows into the two lungs and then into the body
B. Blood passes through two chambers of the heart
C. Blood passes through the heart twice in one circulation
D. Blood first flows through arteries and then through veins.
11. 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.
12. The best method that prevents the start of gully erosion on a cultivated hill is
A. contour cultivation B. strip cropping

- A. protection of the foetus from shock
B. transfer of nutrients from mother to foetus.
C. Allowing gaseous exchange between mother and foetus.
D. Prevention of dangerous substances from reaching the foetus.
21. Which of the following is not a component of joints in the endoskeleton?
A. Cartilage
B. Tendon
C. Ligament
D. Synovial fluid
22. Which one of the following structures represents the respiratory surface of a fish?
A. Gill bars
B. Gill rakers
C. Gill chambers
D. Gill filaments.
23. 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.
24. 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 construction 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 mans feeding habits, he can be placed in any of the feeding levels.
25. In humans, the male sex chromosomes are X and Y(X Y) and the female sex chromosomes are X(XX). When a male gamete fuses with a female gamete the sex ratio of
A. 1: 2
B. 1: 3
C. 1: 1
D. 1: 4
26. 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 drugs that prevent the disease.
27. Which one of the following is an example of discontinuous variation in humans?
- skin colour
 - intelligence
 - height
 - blood groups
28. What are the final products of anaerobic respiration?
- Carbon dioxide, water and energy.
 - Carbon dioxide, water and alcohol
 - Carbon dioxide, alcohol and energy
 - Carbon dioxide and alcohol
29. Which one of the following is characteristic of monocotyledons?
- Leaf sheath
 - Net venation
 - Prominent tap root
 - Cork layer
30. What is the functional unit on a nervous system called?
- Dendrite
 - Neurone
 - Axon
 - Synapse.

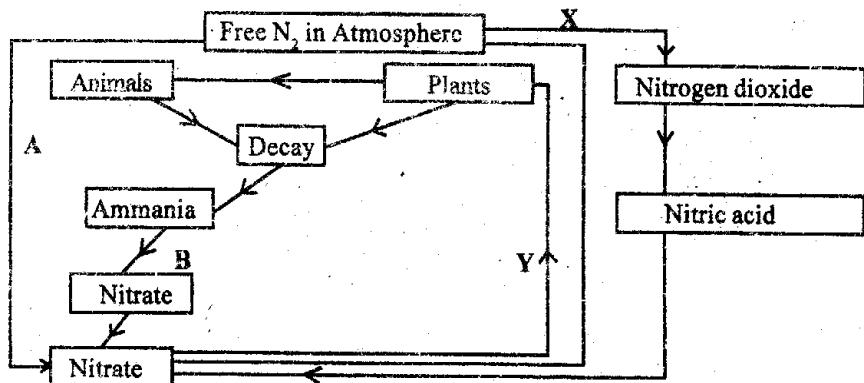
SECTION B

- 31.a. The table below shows the effect of temperature on the activity of amylase on starch six test tubes , each containing a mixture of starch and amylase, were placed on water baths maintained at 0° C, 10°C, 20°C, 30°C, 40°C, and 50°C and allowed to stand. Study the table and answer the questions that follow.

Test tube	Temperature(°C)	Time taken for starch digestion(minutes)
1	0	Starch still present after 60 minutes
2	10	22
3	20	11
4	30	5
5	40	3.5
5	50	starch still present after 60 minutes

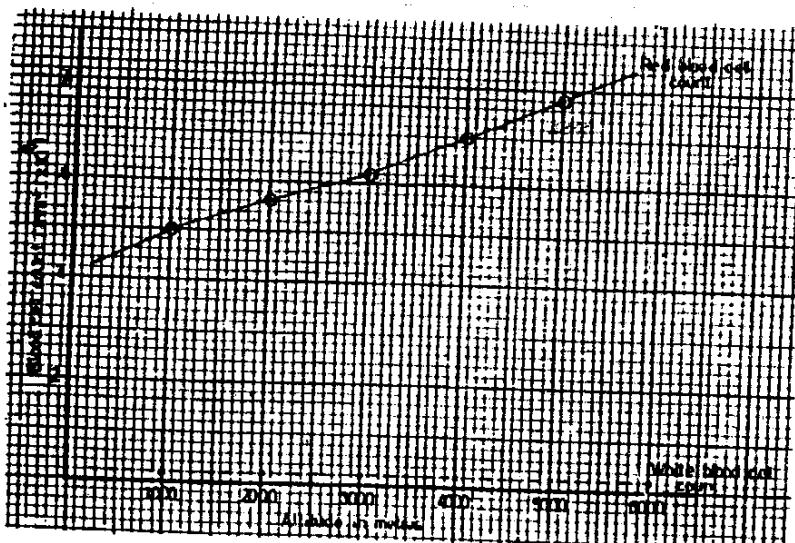
- a. How does temperature affect the action of amylase?
 b. Give one reason on each case for the results obtained in the tubes kept at

- (i) 0°C ,.....
 (ii) 50°C ,.....
- c. Suggest the time it would take amylase to digest starch if the temperature is kept at 0°C
- d. Describe the test you would carry out to determine the substance into which the starch has been broken.
- 32.a. Give three ways of maintaining soil fertility.
 b. State four ways by which soils organisms contribute to soil fertility.
 c. The scheme below represents the nitrogen cycle. Study it carefully and answer the questions that follow.



- (i) Give the general names of the bacteria represented by letters A, B, and C.
 (ii) Name the processes labelled X and Y.
 (iii) On the diagram show by means of arrows, the direction of the process along the lines.

33. a. In the study of evolution , state what is meant by
 (i) a vestigial organ,
 (ii) A fossil,.....
 (iii) variation,.....
- b. Give two causes of variation in an organism.
 c. How has the knowledge of variation helped farmers to improve on their production?
34. The graph below shows the results of blood cell counts taken on people living at different altitudes. The counts are expressed in terms of blood cells per mm^3 of blood.



- What were the red blood cell count at
 - 250 m,
 - 5600m,
- State and explain the relationship between altitude and red blood cell count.....
- Why did the white blood cell count show no change ?
- Where in the body are red blood cells made?
- How does the body deal with old red blood cells?
- Give two ways by which white blood cells defend the body.

SECTION C

- A child sees a fierce looking dog, get frightened and runs. Describe the sequence of events leading to the child's reaction.
- What is pollination?
- Describe the processes that take place after pollination n a flowering plant.
- Give three differences between insect pollinated and wind pollinated flowers.
- Giving two examples in each case, explain what you understand by the terms
 - Parasitism
 - symbiosis.
- How are parasites adapted to their mode of life?
- Why do flowering plants posses simpler excretory organs than

those found in mammals?

- b. Describe how the mammalian kidney forms urine.
- c. What part is played by the mammalian skin on excretion?

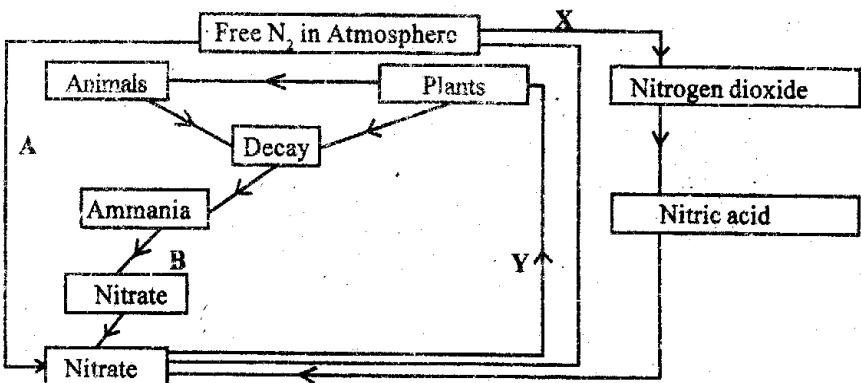
ANSWERS FOR BIOLOGY PAPER -553/1 (UNEB) -1995

SECTION A

1 - C	7 - D	13 - B	19 - C	25 - C
2 - B	8 - D	14 - C	20 - A	26 - B
3 - B	9 - A	15 - B	21 - B	27 - D
4 - B	10 - C	16 - A	22 - D	28 - C
5 - A	11 - B	17 - A	23 - A	29 - A
6 - D	12 - A	18 - D	24 - D	30 - B

SECTION B

31. a, i) At 0°C, amylase has no effect no starch,
- From 10°C - 40°C, the rate of digestion of starch doubles with every 10°C rise in temperature;
 - At 40°C maximum activity of amylase on starch;
 - At 50°C, amylase has no effect on starch;
- b. i) 0°C Amylase enzyme is inactivated;
ii) 50°C Enzyme amylase is denatured / destroyed;
- c. Starch will not be digested at all.
- d. To 3 cm³ of the solution in a test tube, add 2 to 3 drops of benedict's solution; heat to boil, an orange precipitate indicates the presence of reducing sugars or maltose.
32. (a) Crop rotation; mulching; afforestation, mixed cropping.
- (b) Break down / decomposition of organic matter to release mineral salts.
- Aeration and drainage of soil by burrowing activity.
 - Adding fertility to the soil when they die.
 - Conversion of atmospheric Nitrogen to Nitrates in the soil.



- i) A-Nitrogen fixing bacteria.
 B-Nitrifying bacteria.
 C-Denitrifying bacteria,
- ii) X-Nitrogen fixation by lightning.
 Y - Absorption of Nitrates by plants.

- 33.a. i) A vestigial organ - Reduced both in size and function during the course of evolution.
 ii) A fossil - Any plant / animal remains, preserved, covered under sedimentary rocks over a period of time.
 iii) Variation - Differences shown by an individual e.g. of the same species
- b. Environmental - Temperature, pressure, sunlight, humidity.
 Genetic - Mutation, crossing over.
- c. Select the parent stock with good characteristics; cross them to obtain higher yields and better quality and disease resistant varieties.
34. a.i) $250\text{m} = 4.3 \times 10^6 \text{ RBC}/\text{mm}^3$ of blood.
 $5600\text{m} = 8.3-8.4 \times 10^6 \text{ RBC}/\text{mm}^3$ of blood.
- b. The number of RBC increases with increase in altitude. This is because at higher altitudes, there is less oxygen and so more RBC are required to carry enough oxygen.
- c. This is because WBC do not carry oxygen, d. i) Red bone marrow.
 ii) They are broken down by the liver / spleen.
- e. By engulfing and destroying the phagocyte. By production of antibodies.

SECTION C

35. Light rays from the dog enter the eye and fall on the retina; image formed on retina, impulses sent to the brain; Through optic nerve; Boy sees the dog; Brain sends motor impulses to the adrenal glands to secrete; Adrenaline in blood;

This causes: the heart beat to increase in order to pump more blood; the Breathing rate increases in order to carry more oxygen; more glucose is released from the liver to blood, Blood vessels to muscles dilate; and more blood reaches the muscles, increased respiration occurs in the muscles leading to more energy enabling the boy to run.

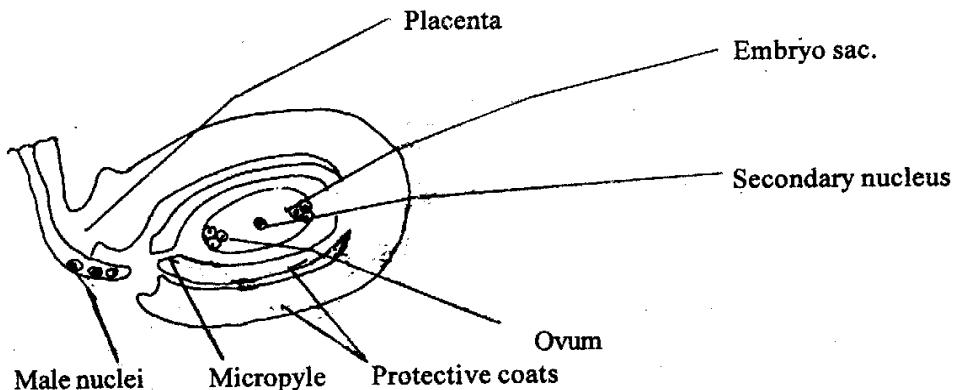
36. a. Pollination is the transfer of pollen grains from the anthers to the stigma of the flower.
- b. The pollen grains land on a ripe stigma; absorb nutrients from the tissues of style and stigma; and germinates; pollen tube grows through the stigma down the style; the pollen tube nucleus has three nuclei; the pollen tube nucleus and two male nuclei; pollen tube enters the embryo sac through the micropyle;

Tip of the pollen tube bursts and the pollen tube nucleus disappears;

The male nuclei move into the embryo sac; one of which fuses with the ovum forming a zygote which divides and develops an embryo;

The second male nucleus fuses with the secondary nucleus to form the endosperm; The integuments become Testa / seed coat; while each ovule develops into a seed and the ovary forms the fruit.

To illustrate fertilization



Insect Pollinated	Wind Pollinated
1 . Large brightly coloured petals. 2. Presence of nectaries and scent. 3 . Small quantities of pollen grains 4 . Stigma enclosed within the flower.	1 . Small dull coloured petals. 2. Absence of nectaries and scent. 3. Large quantities of pollen grains. 4. Stigma exposed outside to trap pollen grains.

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37.a. i) Parasitism:

Feeding relationship that exists between organisms where one organism, the parasite obtains it's nourishment by living inside / on the body of another organism called the host e.g. tapeworm, plasmodium.

Symbiosis:

An Association between two organisms; which is mutually beneficial to both organisms e.g. Nitrogen fixing bacteria in root nodules of leguminous plants, Bacteria in the gut of ruminants.

- b. Possession of devices for penetrating the host for example suckers.
- Possession of devices for attachment onto the host e.g. hooks.
- Possession of devices for self protection against damage e.g. mucus.
- They undergo a period of dormancy in their lifecycles e.g bladder worms in the tape worms or cysts in bacteria.
- They have high rates of reproduction.
- They use intermediate hosts for their transfer to the primary hosts.

38.a. Why flowering plants possess simpler excretory organs.

- Plants convert waste products into insoluble compounds which are stored in organs which drop off such as leaves, petals, barks.
- Some waste products in plants are less toxic.
- Some waste products e.g. Carbondioxide, oxygen, water can be eliminated by diffusion through the stomata and lenticels.
- Some can be re used by plant to synthesize other products e.g. carbohydrates.
- Plants produce waste products at a slower rate.

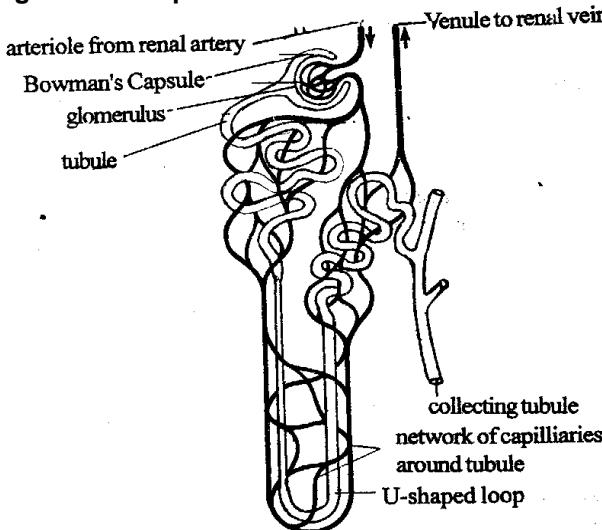
- (b) Kidney consists of small units called Nephrons where urine is formed; Blood carrying the wastes enters the Kidneys through the renal artery. The arteries divide to small capillaries forming the glomerulus.

The arterioles entering the glomerulus are wider than those leaving: this creates a high pressure on the blood in the glomerulus; ultra filtration occurs; this causes urea, water, salts glucose, uric acid to diffuse into the Bowman's capsule; Blood cells and proteins remain unfiltered in the capillaries.

The filtrate passes down the nephron to the proximal convoluted tubule (PTC), where glucose, some water, some salts, vitamins and hormones etc. are selectively reabsorbed into the blood stream.

In the loop of Henle and Distal convoluted tubule, regulated amounts of salts and water are reabsorbed. in the collecting ducts, more water is reabsorbed if necessary. Urine composed of excess salts, excess water, urea, excess heat passes from the collecting ducts to the pelvis, then to the ureta and to the bladder and out through the urethra.

Diagram of a nephron



Vasodilation of the superficial blood arterioles allows excess heat loss by radiation, conduction, convection, evaporation.

Sweat gland produces sweat which removes excess heat, excess salts, excess water and some urea.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1994

Paper 1

2 hours 30 minutes

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. The following results obtained from an experiment done to determine the percentage of air on a sample of soil.

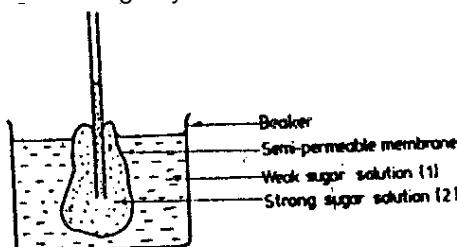
$$\text{Volume of water used} = 10\text{cm}^3$$

$$\text{Volume of soil + water} = 40\text{cm}^3$$

$$\text{Volume of soil + water after stirring} = 37\text{cm}^3$$

From the results, the percentage of air on the soil is

- A. 7.5 B. 8.1 C. 10 D. 23.3
2. Which one of the following flower parts is most important in promoting insect pollination?
- A. Calyx
B. Corolla
C. Stamens
D. Pistil
3. Figure 1 shows an experiment which was set up and left to be observed the following day.



Which of the following events will have taken place?

- (i) solutions 2 will have risen higher in the capillary tube
(ii) the level of solution 1 will have fallen
(iii) the level of solution 2 in the capillary tube will have fallen.
(iv) Concentration of solution 1 in the beaker will not have changed at all.
- A. (I) and (ii) B. (ii) and (iv) C. (i) and (ii) D. (iii) and (v)
4. 2g of food substance was burnt, and the heat produced raised the temperature of 50cm of water from 25°C to 37°C. What is the energy content of the food substance in joules per gram? (Specific heat capacity of water = 4.2 J per gram)

- A. 1260 joules B. 2520 joules C. 300 joules D. 150 joules
5. 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
6. A couple produced four children who were of different blood groups with following genotypes: AO , BO, AB and OO. What were the genotypes of their parents?
 A. AA and OBAO and OB
 B. BB and OB
 C. AB and OO
7. 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
8. 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.
- Which of the characteristic belong to wind pollinated flowers?
 A.(i) and (ii) B.(iii)and (iv) C.(i) and (iii) D. (ii) and (iv)
9. The living together of a fungus and an alga as lichen is called
 A. symbiosis
 B. parasitism
 C. saprophytism
 D. commensalism
10. Which one of the following seed parts plays both roles of protection and nutrition during germination?
 A. Endosperm
 B. Testa
 C. Coleoriza
 D. Cotyledons
11. Why is a shoot being prepared for transpiration experiments normally put under water?
 To
 A. avoid water loss which may cause wilting
 B. prevent loss of sap
 C. prevent air from entering the xylem vessels
 D. remove damaged tissue.
12. Meiotic cell division is important because it ensures that.
 A. there is variation on the number of chromosomes

- 63
- 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.
13. The following are features found in birds.
 (i) light bones
 (ii) webbed feet
 (iii) presence of feathers
 (iv) streamlined body
 which of the features are adaptations for flight?
 A.(i) and (ii) B.(ii)and(iii) C.(iii) and (iv) D. (i) and (iv)
14. Which of the following substances are secreted on mammalian sweat?
 A. Urea, ammonia, water
 B. Urea, carbon dioxide, sodium chloride
 C. Urea, water, sodium chloride
 D. Urea, carbon dioxide water.
- 15.

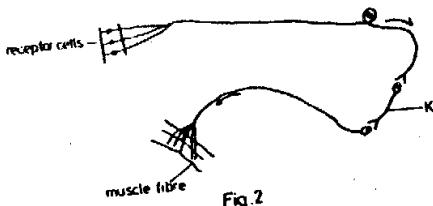


Figure 2 is a simplified reflex arc . The part labeled K is

- A. the relay neurone
 B. a ganglion
 C. the sensory neurone
 D. the motor neurone
16. Nerves, the spinal cord and the brain make up.
 A. a tissue B. a system C. an organ D. an organism
17. Which one of the following shows the correct path followed by light rays to produce an image at the retina?
 A. Cornea, aqueous humour, lens, pupil, vitreous humour, retina.
 B. Cornea, vitreous humour, pupil, lens, aqueous humour, retina
 C. Cornea, pupil, vitreous humour, lens, aqueous humour, retina.
 D. Cornea, aqueous humour, pupil, lens, vitreous humour, retina.
18. 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.
19. Which one of the following characters shows discontinuous variation?
 A. Blood groups
 B. Height
 C. Intelligence
 D. Skin colour in people
20. The similarity in feeding between an amoeba and the fucus mucor is that both
 A. feed on dead organic matter only.
 B. Ingest indigested food materials.
 C. Digest their food within vacuoles
 D. Secrete enzymes onto food materials from their cytoplasm.
21. Which of the following make the skin of a toad an effective respiratory surface?
 (i) moist surface
 (ii) rough skin
 (iii) rich blood supply to the skin
 (iv) large numbers of secretory glands on the skin
 A. (i) and (iii) B. (i) and (ii) C. (ii) and (iv) D.(iii) and (iv)
22. 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
23. Which one of the following types of cells is unspecialized?
 A. Companion cell in plants.
 B. Red blood cell.
 C. Meristematic cell
 D. Nerve cell.
24. During inspiration the
 A. Pressure in the thoracic cavity is reduced
 B. External intercostal muscles relax
 C. Diaphragm becomes dome shaped
 D. The thoracic cavity becomes smaller.
25. Heterozygous red flowered plant (**Rr**) is crossed with a homozygous white plant (**rr**). If **R** is dominant over **r**, what will be the phenotypes of the offspring?
 A. All red

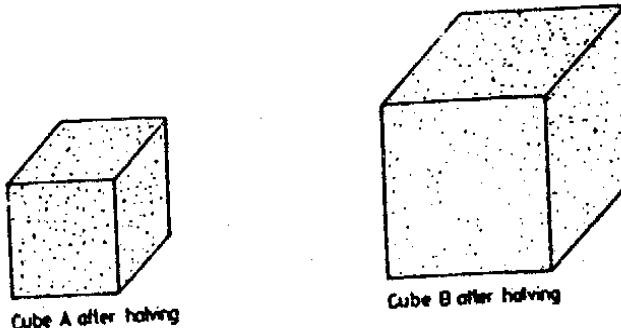
- B. All white
 C. Pink and white
 D. Red and white
26. Which one of the following is characteristic of animal cells?
 A. Presence of cell walls
 B. Cells consist entirely of cytoplasm
 C. Have regular shape
 D. Have large centrally placed vacuoles.
27. Which one of the following dental formulae represents that of a ruminant (eg sheep)?
 D. $\begin{matrix} 2 & - & : & \underline{1} & : & \underline{2} & : & \underline{3} \\ 2 & & & 1 & & 2 & & 3 \end{matrix}$
 B. $\begin{matrix} \underline{2} & : & \underline{1} & : & \underline{2} & : & 0 \\ 2 & & 1 & & 2 & & 3 \end{matrix}$
 C. $\begin{matrix} 0 & : & \underline{1} & : & \underline{2} & : & \underline{3} \\ 2 & & 1 & & 2 & & 3 \end{matrix}$
 D. $\begin{matrix} 0 & : & \underline{1} & : & \underline{3} & : & \underline{3} \\ 3 & & 1 & & 3 & & 3 \end{matrix}$
28. In parts, anaerobic respiration is less efficient than aerobic respiration because during anaerobic respiration
 A. not all the carbohydrates are broken down.
 B. The amount of carbon dioxide released is less than in aerobic respiration
 C. There is less energy released per unit weight of carbohydrate broken down
 D. Less water is produced on anaerobic respiration.
29. 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.
30. Which of the following vitamins is deficient in a person whose gums bleed?
 A. Vitamin C
 B. Vitamin E
 C. Vitamin B₂
 D. Vitamin K

SECTION B

31. The table below shows the effect of wind, still air and stomatal opening on the rate of transpiration of a plant in milligrams of water lost per dm^2 . Study the table and answer the questions following

Stomatal opening (dm)	1	2	3	4	5	6	7
Wind	40	63	74	86	94	110	124
Still air	0	6	12	19	23	27	30

- 66
- a. (i) Compare the rates transpiration in windy and still air conditions.
(ii) Explain your observation.
 - a. How does stomatal opening affect transpiration rate?
 - c. Name three other factors that affect the rate of transpiration.
 - d. State two functions of transpiration to plants.
32. Two different – sized cubes of colourless jewelry A and B were used to represent models living organisms. They were submerged in a coloured dye for a period of time and then removed and cut into half. The diagrams below show the penetration of the dye.



- a(i) Explain the difference between the penetration of the coloured dye in the two cubes.
- (ii) Suppose that the dye represents an essential substance being absorbed by a living organism. Explain how the problem on B could be overcome by a living organism without altering its shape.
- b. Explain how the shape of a red blood cell helps it to function efficiently.

33. a) In cattle, the gene for hornless condition is dominant over the one for horned condition. A hornless cow was mated to a horned bull. Using genetic symbols, show the possible genotypes and phenotypes of the F1 offspring.

Genotypes of F1 offspring

phenotype(s) of F1 offspring

- b. (i) A bull whose horn were removed was mated to a horned cow. Show the possible genotypes of the F1 offspring.

Genotypes pf F1 offspring

.....
phenotype(s) of F1 offspring

(ii) Give a reason for your answer in (b) (i) above.

34. a .(i) Give the main difference between cold – blooded (ectothermic) and warm blooded (endothermic) animals.

(ii) Give one advantage that an endothermic animal has over an ectothermic animal.

(iii) Why are ectothermic animals said to be cold – blooded ?

.....

- b. Give four ways in which an ectotherm reacts to the lowering of external temperature.

.....

SECTION C

35. a (i) What are the similarity(ies) and differences between asexual and sexual reproduction in the spirogyra?
(ii) What is the advantage of a sexual reproduction to such a plant?

b. Describe sexual reproduction in the Spirogyra?

36. a. Describe the digestion of proteins on the human alimentary canal.

b. What may happen to the products of digestion of proteins?

37. Explain how a dicotyledonous leaf is adapted for the process of photosynthesis.

38. a. Give six features which are common to adult insects.

b.(i) What is understood by the term metamorphosis?

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(ii) With the aid of labeled diagrams, give an account of the life cycle of a house – fly.

ANSWERS FOR BIOLOGY PAPER 1994

SECTION A

1. C	7 - D	13 - D	19- A	25 - D
2. B	8 - C	14 - C	20 - D	26 - B
3. C	9 -A	15 - A	21 - A	27 -No. Ans
4. A	10 - D	16 - C	22 - A	28 - C
5. B	11 - C	17 - D	23 - C	29 - B
6. B	12 - B	18 - B	24 -A	30 - A

SECTION B

- 31.a. i) Rate of transpiration is higher in windy conditions:
- Lower in still air conditions.
 - In both cases transpiration rates increased with increase in stomatal opening.
 - There is more water vapour lost when stomatal opening is larger / the reverse is true.
- ii) Wind rapidly removes water vapour from the leaf surface, more water is then removed from the air spaces within the leaf surface.
- b. When stomatal openings are larger, more water vapour is lost into the atmosphere / reverse is true.
- c. Sunshine, light (intensity), humidity, (atmosphere) pressure; water supply, temperature / degree of hotness / coldness.
- d. **functions of transpiration to plants**
- Cools plant;
 - speeds upward movement of water through the plant.
 - Gets rid of excess water from the plant.
 - Transport of minerals.

32. .a. i) In tube A:

The dye has penetrated throughout the tube; due to the large surface area to volume ratio.

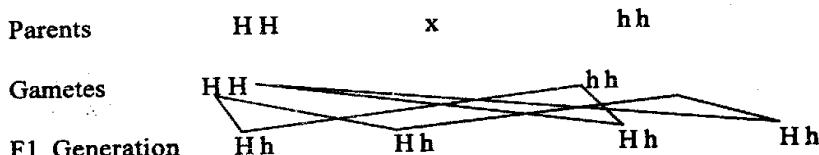
While in Tube B:

The dye penetration does not reach the innermost parts, due to small surface area to volume ratio.

- ii) It would be necessary to develop a transport system. To enable the essential substance to reach all parts of the organism.
- b) Red blood cell is disc flat shaped - Biconcave. This gives large surface area / volume ratio which facilitates diffusion / transports more oxygen.

- 33.a. Let H be for hornless.
Let h be for horned.

Fl Phenotypes - all hornless. Fl Genotypes - Hh, hh



F1 Phenotypes - all horned.

F1 Genotypes - H h, h h

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Phenotypes of F1 generation. All horned.

- ii) The removal of horns from the bull does not affect the genotype of the bull; it remains hh and that of the offspring also remains the same.

34.a. (i)

Ectothermic	Endothermic
Body temp is dependant on the surrounding temperature.	Body temp is generated within the body of an organism / is independent.
Body temp is not constant.	It is constant.

- ii) Endotherms are active over a wide range of external temperature, ectotherms are inactive at extremes of temperature of low or cold.

Endotherms occupy a wider range of habitats, Ectotherms are restricted to fewer habitats.

- iii) Their body temperatures various with that of the surrounding.

- b.
- Curling;
 - Hibernation;
 - Basking in sun;
 - Burrowing under warm objects;

SECTION C

35.a. i) Similarity:

Both asexual reproduction and sexual reproduction lead to increase in the number of cells.

Differences:

A sexual	Sexual
<ul style="list-style-type: none"> Greater number of cells / more offspring. No variation in offspring. Involves mitosis only. Occurs under favourable conditions. No zygospores formed Involves one cell / filaments / 	<ul style="list-style-type: none"> Fewer number of cells / fewer offspring. Variation in offspring. Involves mitosis and meiosis. Occurs under unfavourable conditions. Zygospores formed. Involves two cells / filaments

OR

Parents

H h

x

h h

Gametes

H h

h h

F1 Generation

H h

H h

h h

h h

F1 Phenotypes $\frac{1}{2}$ - horned.
 $\frac{1}{2}$ - hornless.

b. i) Parents

h h

x

h h

Gametes

h h

x

h h

Genotypes

h h

h h

h h

h h

ii) Maintains the original characteristics.

* Eliminates chances of undesirable variation, promotes rapid rate of propagation / plants appear faster.

b. Cell / filaments the side by side.

- Protrusions appear from 2 cells opposite each other.
- Protrusions touch each other.
- Cell walls at point of contact breakdown/disappear.
- Conjugation tube is formed.
- Protoplasm of the cells round off and form gametes.
- Gametes from one cell (of one filament moves / flows through the conjugation tube into the opposite cell of the other filament
- Gametes fuse to form an oval zygospore.

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- Thick walls for around zygospore under favourable conditions zygospore germinates to form a new filament.

36.a. **Mouth:** Protein food chewed / mechanically digested. Food moistened / lubricated by saliva.

Stomach: Mechanical breakdown of food by churning activity by HCL.

Gastric juice produced contains pepsin which breaks down the proteins into short polypeptides / peptides / peptones and renin which coagulates milk protein (casein).

HCL provides acidic medium for digestion.'

Duodenum: Pancreatic juice produced contains trypsin which converts proteins to short polypeptides or peptides or peptones and peptidase chymotrypsin converts short polypeptides to amino acids.

- Alkaline salts in bile, pancreatic juice provide and suitable PH.

Ileum: (Small intestine): Succus entericus / intestinal juice is produced. It contains peptidases / erepsin which convert short polypeptides / peptide into amino acids.

b. The end products of digestion of proteins / amino acids are absorbed through the villi into the blood stream. Transported through the hepatic portal vein to the liver to the tissues where they (amino acids) are used for growth, synthesis of proteins e.g. enzymes.

Excess amino acids are deaminated in the liver to form urea which is excreted while the carbon compound which is used to produce glycogen / fat for storage / energy production / respiration.

37. The leaf is broad / flat / has a large surface area for sun light / air. The leaf is thin, only often a few cells thick and so light gases can easily reach the photosynthesizing cells.

- Presence of stomata guard cells allow entry of gases.
- Thin and transparent epidermis allow penetration of light to inner parts of the leaf.
- The mesophyll cells contains the green pigment chlorophyll able to trap (absorb) the radiant energy for photosynthesis.

- The palisade layer /cells on the upper side of the leaf contains large number of chloroplasts and are in the best position / have best shape to receive enough sunlight.
- The spongy mesophyll has many air spaces and therefore CO_2 can readily diffuse to all photosynthesizing cells.
- The presence of extensive network of veins ensure an adequate supply of H_2O and mineral salts to all the leaf cells and transport off products of Photosynthesis.
- The cuticle is water tight: impermeable and so helps to prevent desiccation of the photosynthesizing tissue.

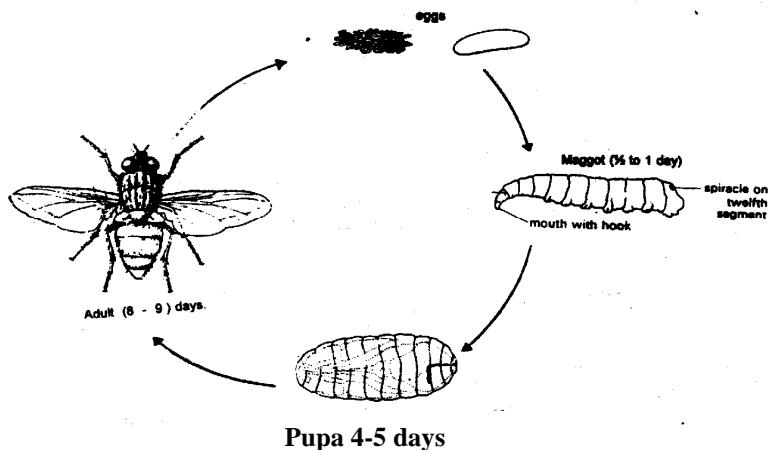
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38.a. Features of adult insects:

- Body divided into 3 parts: head, thorax and abdomen.
 - A pair of antennae / feelers on the head.
 - Pair of compound eyes on head.
 - 3 Pairs of mouth pans.
 - Thorax has 3 pairs of limbs /legs.
 - Jointed / segmented body parts / limbs.
 - Use trachea for gas exchange in terrestrial forms /gills in aquatic forms.
 - Spiracles on the sides for gas exchange.
- b. i) A marked / significant change in form / structure of a pre adult / young larva /nymph to adult.
- Adult female housefly lays eggs (in batches) in moist places / rubbish / dump /rotting etc. places in 12 - 24 hrs.
 - After eggs have been laid eggs hatch into (white) larva / maggot. Larva or maggot actively moves, feeds grows and moults three times in 4 - 5 days. Larva moves to a dry place, changes into brown pupa; is inactive, does not eat / move, tissue reorganisation occurs. In 8 - 9 days imago / adult emerges.

Life cycle of a housefly:

Eggs



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1993

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

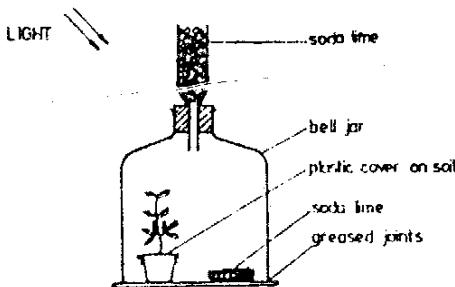
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SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. Which one of these processes helps to lower mammalian body temperature to normal?
 - A. Vasolidation
 - B. Vasoconstriction
 - C. Shivering
 - D. Raising of hair on the skin
2. 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 the number of girls and boys will be normal.
3. Which one of the following tissues has a protective function on plants?
 - A. Xylem
 - B. Phloem
 - C. Cambium
 - D. Epidermis
4. What diseases would you be controlling by pouring molluscides in water?
 - A. Schistomiasis
 - B. Guinea worm infestation
 - C. Typhoid
 - D. Cholera
5. What 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.
6. In an ecosystem , the survival of all living things depends on

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- A. decomposers
 B. primary producers
 C. primary consumers
 D. secondary consumers.
7. If a gekko on a wall is seen eating mosquitoes, flies , moths and grasshoppers, this animal is said to be a
 A. Parasite B. symbiont C. predator D. saprophyte
8. Which one of the following structural adaptations of leaves is important for light absorption during photosynthesis?
 A. Dense network of veins
 B. Large numbers of stomata on leaf surfaces.
 C. Large intercellular air spaces in the spongy layer.
 D. Broad and flat shapes of leaves.
9. Which one of the following is a function of progesterone?
 A. Prepares the uterine walls for implantation
 B. Initiates the process of birth
 C. Initiates ovulation
 D. Initiates formation of corpus luteum
10. The part of the brain that controls breathing is the
 A. Cerebellum B. medulla oblongata
 C. cerebrum D. hypothalamus
11. Which of the following are respiratory surfaces in toads and frogs?
 A. The mouth , webbed toes and skin
 B. Nostrils, mouth and skin
 C. Webbed toes, lungs, and mouth
 D. The mouth, lung and skin.

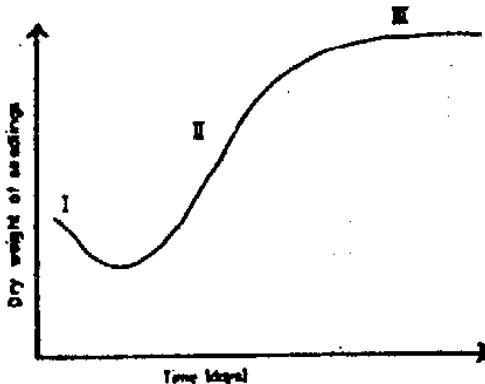


12.

Figure 1 above shows an experiment on photosynthesis set up by student. The soda lime was used to absorb.

- A. any oxygen given off by the plant
 B. any carbon dioxide from the air.
 C. Moisture from the air.

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- D. Carbon dioxide given off by the plant.
13. Which one of the following glands produces a hormone whose normal effect is to influence the rate of heartbeat?
- Pituitary gland.
 - Islets of Lanerhans
 - Adrenal gland
 - Thyroid gland
14. The condition known as oxygen debt occurs during active physical exercise in animals because of the
- accumulation of carbon dioxide during physical exercise
 - the high rate of breathing during physical exercise
 - accumulation of lactic acid in the body
 - accumulation of alcohol in the body.
15. The root which grows from near the base of the trunk of some woody plants is called
- lateral root
 - prop root
 - aerial root
 - adventitious root
16. Which one of the following farming methods would cause pollution in an aquatic habitant?
- mulching
 - crop rotation
 - use of fertilizers
 - application of farm yard manure.



17. What is the possible explanation for the shape of the curve on 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.
18. Which one of the blood groups will not agglutinate with any blood serum when mixed?
A. O
B. A
C. AB
D. B
19. A male cockroach is different from the female cockroach by having
A. styles
B. cercus
C. longer antennae
D. larger abdomen
20. Which of the following conditions are necessary for producing movement on vertebrates?
(i) muscles must be attached to the end of bones.
(ii) Muscular bundles must occur in pairs
(iii) One of a pair of muscles must be more strongly developed than the other.
(iv) One of a pair of muscles must consist of a smooth muscle.
A. (i) , (iii),(iv)
B. (i), (ii) , (iii)
C. (i), (ii) , (iv)
D. (iii), (iv)
21. Which one of the following compounds is a constituent of enzymes?
A. Lipids
B. Polysaccharides
C. Protein
D. Vitamins.
22. One of two identical twins brought up differently was fatter and more healthy than the other. What kind of variation do these show?
A. Discontinuous variation
B. Genetic variation
C. Social variation
D. Habitat variation
23. Which of the following structures in the mammalian ear is concerned with balance? The
A. cochlea
B. semi circular canals
C. eustachian tube
D. oval window

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24. The type of soil with minutes air spaces and high water retention capacity is
 A. sand
 B. clay
 C. silt
 D. loam
25. Which one of the following cannot be used in the classification of plants?
 A. Structure of the flowers
 B. Leaf structure
 C. Type of seeds
 D. Leaf colour.
26. Figure 3 below shows some fruits.

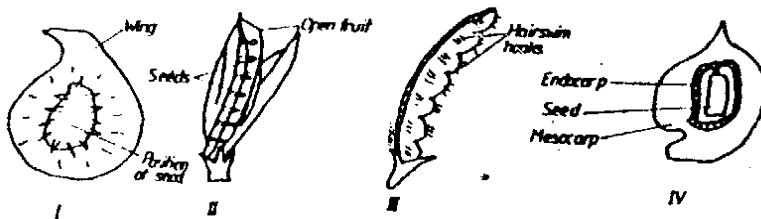


Fig. 3

- Which of them are likely to be dispersed by animals?
- A. I and II
 B. II and III
 C. III and IV
 D. I and IV
27. 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 only slightly separated from the cell wall.
28. Which one of the following diets
 would be recommended for an overweight person
 A. Low carbohydrate, high protein , low fat.
 B. High carbohydrate , low protein , low fat.
 C. High carbohydrate, high protein, low fat
 D. Low carbohydrate, low protein, low fat.
29. Intestinal parasites are not digested by the host's enzymes because of
 A. Possession of attachment devices.
 B. Secretion of large quantities of mucus.
 C. Having a high rate of reproduction

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- D. Lack of their own digestive system.
30. Which one of these is the correct order I which the following organisms occur on a food chain?
- Vulture, antelope, lion
 - Lion, vulture, antelope
 - Antelope, lion, vulture,
 - Lion, antelope, vulture.

SECTION B

31. The table below shows the concentrations of different substances in the glomerular filtrate and urine. Study the table and answer the questions that follow:

Substance	Concentration glomerular filtrate (%)	Urine
Water	13	95
Proteins	0	0
Glucose	93	95
Proteins	0.1	0
Sodium	0.3	0.35
urea	0.003	2.0

- a. Give any one reason for the difference in the concentration of water in the glomerular filtrate and in urine.

.....

- b. Explain the absence of proteins from both the glomerular filtrate and urine.

.....

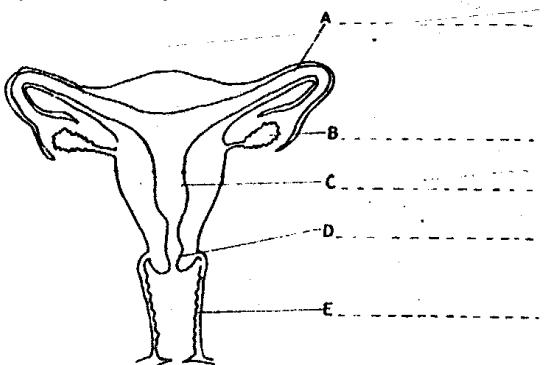
- c(i) Which substance is reabsorbed with

- the highest efficiency
- the lowest efficiency?

- (ii) Which substance is not reabsorbed at all?

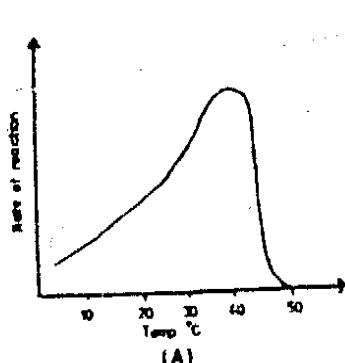
- d. By what factor is urea more concentrated in urine than in the glomerular filtrate?

32. Figure 4 below shows a longitudinal section through the female reproductive system of a mammal.



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- a. Name the parts labelled A, B, C, D and E on the diagram.
b. State any two functions of B.
c. In what two ways are parts A and C adapted to their functions?
A. (i)
(ii)
C. (i)
(ii)
d. State any two advantages the mammalian embryo has over that of a frog during their development.
- 33.a What do you understand by the following terms?
(i) a habitat,.....
(ii) an ecosystem?.....
b. Use the following organisms to construct a food web showing their feeding relationship. Chameleon, moth, grasshopper, herbaceous bug , praying mantis, predatory bug and plants.
c. What is the role of each of the following organisms in the food web:
(i) the plants,
(ii) the grasshopper.
(iii) The predatory bug?
d. Which one of the organisms listed above will have the least energy for any single food chain considered ? Why?

34. The graphs below show the effects of temperature and pH on the activity of an enzyme on the human digestive system.



(A)

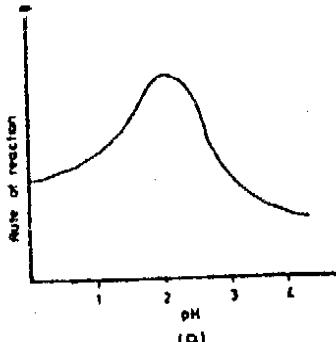


Fig. 5

(B)

At what temperature and pH does the enzyme show optimal activity?

- Suggest one reason for the sharp fall in the rate of reaction of the enzyme as shown in graph A.
- Suggest the identity and location of this enzyme.
 - Give a reason for your answer to c(i) above.
- For the enzyme on c(i) above, suggest the food it acts on the end products.
Food acted on
End products

SECTION C.

35. a) What is growth?
b) Name the main part responsible for producing growth in a shoot.
c) Describe an experiment you would perform to determine the region of most rapid elongation in the root of bean seedling.
36. a) What do you understand by the term irritability as applied to plants and animals?
b) Explain how plants respond to light as a factor of irritability.
c) Name any three other tropic responses in plants.
37. (a) Explain how the action of muscles causes air to pass from the atmosphere into the lungs
b) How does oxygen move from the air in the lungs to the cells of the blood?
c) Give three characteristics of an efficient respiratory system
38. a) What is pollution?

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b) Give an outline of the human activities in Uganda which may result into environmental pollution

ANSWERS FOR BIOLOGY- 1993

SECTION A

1	A	7	C	13	C	19	A	25	D
2	C	8	D	14	C	20	B	26	C
3	D	9	A	15	B	21	C	27	D
4	A	10	B	16	C	22	D	28	A
5	D	11	D	17	D	23	B	29	B
6	B	12	B	18	A	24	B	30	C

SECTION B

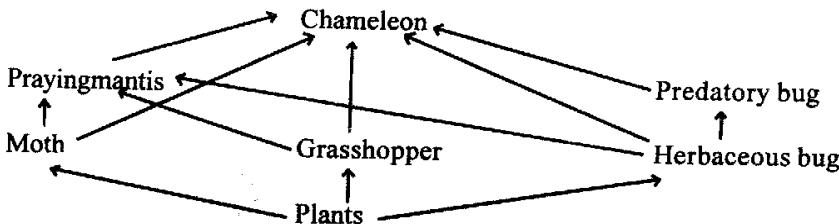
- 31 .a. i) Water has been removed from the glomerular filtrate making it more concentrated. Depending on the concentration of water in blood, a lot is lost in urine, if there is much water in the blood.
- b. Proteins are too large to pass through the glomerular capillaries.
- c. i) Highest efficiency - Glucose
Lowest efficiency - Sodium.
- ii) Urea,
d. X60.
- e. Diabetes mellitus.
- 32.a. A - Oviduct
B - Ovary
C - Uterus
D - Cervix
E - Vagina.
- b. B - 1. Produces ova.
2. Produces the hormone oestrogen and progesterone.
- c. A - i. Has cilia on the inner lining to assist in movement of the ovum.

- ii. Is muscular and the ovum moves by peristalsis or muscular contraction.
- C - i. It is thick walled well supplied with blood vessels.
 ii. It's Elastic,
- d. i) Mammalian embryo receives all the nutrients it needs easily.
 ii) Mammalian embryo is well protected from enemies / predators and mechanical damage.

33. a. i) Habitat is a place in the environment where the organism lives.

ii) An ecosystem is a natural unit consisting of both living and non living components existing together in harmony.

b.



- c. i) Plants are the primary producers.
 ii) Grasshopper is a primary consumer and feeds on the plants.
 iii) Predatory bug: Are secondary consumers feeding on the herbivores or primary consumers.
- d. Chameleon is the last organism of the food chain.

- 34.a. Temperature - 40°C PH - 2.0
 b. Enzymes have been denatured at the temperature above 40°C.
 c. i) Pepsin:
 Location - stomach.
 ii) Pepsin work well under low PH or acidic conditions.
 d. Food acted on proteins, end products, amino acids.

SECTION C.

- 35a. Growth is a permanent increase in size of an organism.
 b. Apical meristem: Terminal buds; auxiliary / lateral buds; cambium.
 c. To determine the region of most rapid elongation in the root of a bean seedling.

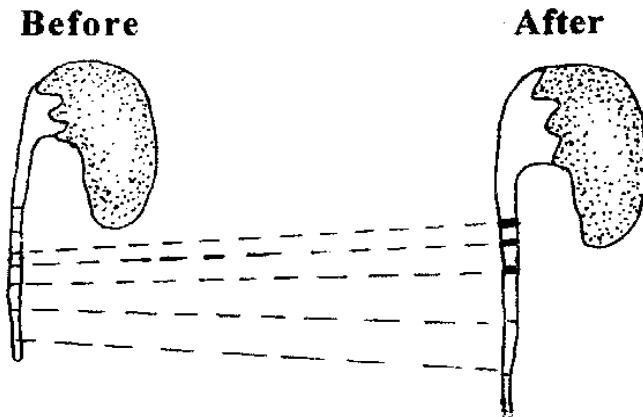
Apparatus:-

Beans seedlings,
black ink,
cork, flask,
water.

Procedure:-

- Take a freshly germinated bean with a root about 2.5. long.
- Mark the root every 2mm with lines in black ink.
- Pin the bean in the underside of a cork with the root hanging downwards and put the cork into the flask with a little water in the bottom.

Put the flask in a dark place.

**Observation:**

The region of growth is indicated by the area where the black lines are further apart than 2mm.

Conclusion:

This shows that growth in length of a root takes place behind the root tip.

- 36.a. Irritability is the ability of an organism to react to changes in the environment
- b. **Procedure:** A few seedlings with actively growing shoots are placed vertically in a closed blackened box with a small opening on one side to allow entry of light from a single direction.

Results: After a few days, there is bending of the plant shoots towards in the direction of light rays.

Conclusion: This demonstrates that shoots are positively phototrophic.

NB: A control experiment can be set up using a rotating Klinostat. The rotating Klinostat results in all sides receiving equal amount of light and therefore the shoots grow upright.

- c. Geotropism: Response to gravity.
Hydrotropism: Response to water.
Thigmotropism: Response to touch.

37.a. **Inhalation Process:** The intercostal muscles contract and raise the ribs upwards and outwards. The diaphragm muscles also contract and flatten out.

These movements increase the size of the thoracic cavity, this lowers the pressure inside. The lungs expand to create space and air moves into them from the atmosphere

b. Gaseous exchange in the alveoli of the lungs takes place by diffusion. The walls of the alveoli and blood vessel are in close contact and are bathed in a fluid.

Oxygen which is at a higher concentration in the alveoli than in blood dissolves in this fluid and diffuses into blood.

Plasma, it is then picked up by haemoglobin of the Red blood cells and transported round the tissues of the body as oxyhemoglobin.

- c. Permanently moist
 - Well supplied with blood capillaries.
 - Large surface area to volume ratio for gaseous exchange.

38.a. Pollution is the natural or artificial addition to an ecosystem of anything in the extent that it harms all or part of the ecosystem in anyway.

b. Use agricultural drugs - pesticides, fertilizers, herbicides, sewage from domestic sources, unnecessary burning which causes smoke. Smoke and fog form smog which is a pollutant. Industrial effluents / wastes.

Radioactive substances from nuclear reactions.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1992

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

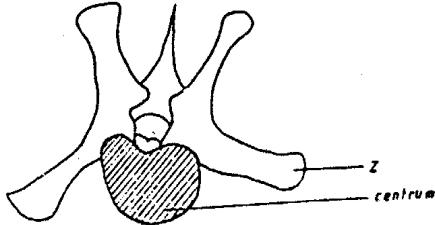
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SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. 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
2. It is known that a lactating mother may suffer from the weakening of teeth and bones which vitamin and minerals would she need to correct this condition?
 - A. Vitamin K, iodine and phosphorus
 - B. Vitamin C, Phosphorous and calcium
 - C. Vitamin A, calcium and iron
 - D. Vitamin D, phosphorus and calcium
3. The organism in food chain that releases materials for re – use by green plants is called a
 - A. decomposer
 - B. secondary consumer
 - C. primary consumer
 - D. primary producer.
4. Green plants produce less carbon dioxide during the day because
 - A. the rate of respiration is low during the day
 - B. some of the carbon dioxide produced is used up internally for photosynthesis
 - C. transpiration interferes carbon dioxide evolution by leaves.
 - D. Most stomata close due to strong heat during the day.
5. Which of the following methods would best determine the rate of growth of a seedling?
 - A. Length of radicle and fresh weight

- B. Diameter of radicle and dry weight
C. Length of radicle and dry weight
D. Diameter of radicle and dry weight
6. Which one of the following is the correct order of arrangement from the smallest to the largest group of organism?
A. Species, order, genus, class phylum
B. Species, class, order, genus, phylum
C. Species, class, order, genus, phylum
D. Species, genus, order, class, phylum.
7. What would happen if a ligament broke?
A. Muscle would be detached from bones.
B. Muscle pull would result
C. There would be dislocation of bones during movement.
D. Synovial fluid leak out from a synovial membrane.
8. Which of these characters is an example of continuos variations in man?
A. Skin colour
B. Albinism
C. Dwarfism
D. Blood group.
9. The element that is essential for the formation of both plant cell walls and bones on animals is
A. iron
B. calcium
C. phosphorus
D. sulphur
10. In favourable conditions, yeast reproduces by
A. fragmentation
B. conjugation
C. sporulation
D. budding
11. Which of the following protozoa has cilia?
A. Amoeba
B. Euglena
C. Paramecium
D. Plasmodium
12. The kidney purifies blood by
A. ultrafiltration
B. absorption and filtration
C. selective absorption and filtration.
D. Ultrafiltration and selective reabsorption
- 13.



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

- A. abdominal muscles
 - B. thoracic vertebra
 - C. diaphragm
 - D. rib
14. Which vessel empties fats into the right atrium of the mammalian heart?
- A. Posterior venacava
 - B. Anterior venacava
 - C. Pulmonary vein
 - D. Pulmonary artery.
15. Which one of these insects does not lay eggs in its life cycle?
- A. Bee
 - B. grasshopper
 - C. Tsetse fly
 - D. House fly
16. Which one of these is not a means of movement on protozoa?
- A. Coelom
 - B. Flagella
 - C. Cilia
 - D. Pseudopodia
11. The type of soil with minute airspaces and high water retention capacity is
- A. sand
 - B. clay
 - C. silt
 - D. loam
18. The chisel – shaped structure if incisor is suitable for
- A. tearing
 - B. cutting
 - C. chewing
 - D. grinding

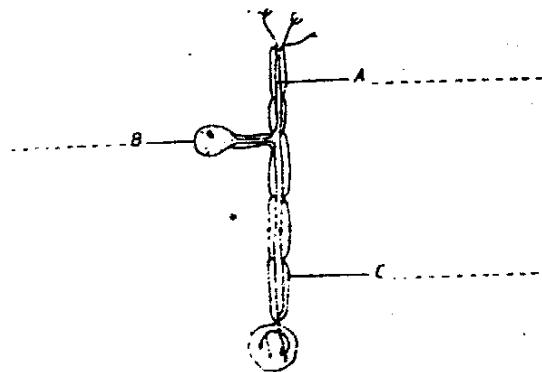
19. Which one of the following cells could have their functions adversely affected by the AIDS virus?
- Erythrocytes
 - Blood platelets
 - Leucocytes
 - Nerve cells
20. Which of the following is true of respiration but not of photosynthesis?
- Oxygen is given out.
 - Carbon dioxide is taken in.
 - Glucose is synthesized
 - Carbon dioxide is released.
21. Which one of the following best describes the path of an impulse on a reflex arc?
- Stimulus – effector – synapse – receptor – sensory neurone – motor neuron
 - Stimulus – receptor – sensory neuron – synapse – motor neuron – effector
 - Stimulus – sensory neuron – receptor – effector – motor neuron – synapse
 - Stimulus – receptor – sensory neuron – synapse – effector – motor neurons
22. Albinism , is inherited through double recessive genes. If **A** stands for normal skin color and **a** the recessive character , which of these parental crosses would produce 25% albino offspring?
- AA x Aa
 - AA x aa
 - Aa x Aa
 - aa x aa
23. Growth of plant root towards water is called positive
- hydrotropism
 - geotropism
 - phototropism
 - thigmotropism
24. Which of the following is a long term adaptation of mammals to low environmental temperature?
- Deposition of fats under the skin
 - Increase on metabolic rate.
 - Raising of hair
 - Reduction of blood flow to the skin.
25. Red flowered peas were crossed with white flowered peas. The F1 were pink flowered. What would be the results of selfing these pink flowered peas?
- All the flowers would be pink
 - Half the flowers would be pin and half would be white.
 - Half the flowers would be red and half would be pink.
 - A quarter of the flowers would be red, half would be pink and a quarter white.

26. Animals **X** and **Y** live together. Animal **X** provides shelter for animal **Y** and animal **Y** makes food for animal **X**. What kind of relationship do these two animals show?
- Commensalism
 - Parasitism
 - Autotrophism
 - Mutualism
27. Biological control as a method of prevention of malaria would include
- Spraying oil on the surface of stagnant water.
 - Spraying of insecticides on the mosquitoes
 - Introducing fish in water bodies.
 - Draining of stagnant water.
28. Which one of the following has no effect on the rate of diffusion?
- Density of diffusion medium
 - Length of diffusion pathway
 - Size of diffusing molecules
 - Concentration gradient.
29. Which one of the following structures in the mammalian male reproductive organ secretes seminal fluid?
- Prostate gland
 - Vasa deferentia
 - Epididymis
 - Seminiferous tubules.
30. Which of the following sets of flower parts do not match.
- Sepals and petals together form the perianth
 - Sepals form the calyx
 - Petals form the corolla
 - Carpels form the androecium

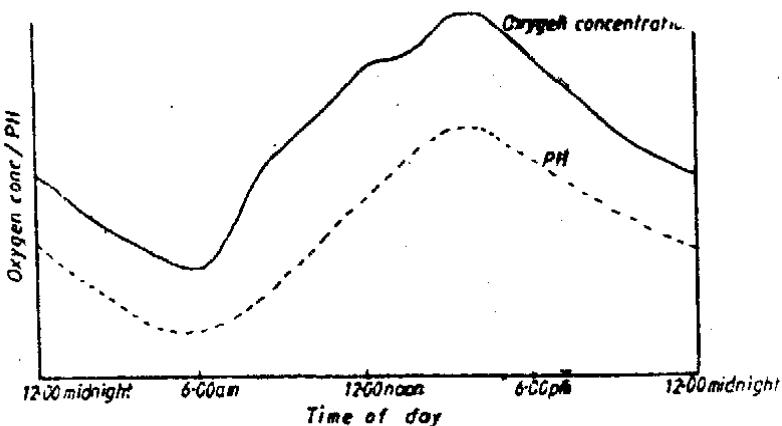
SECTION B

- 31.a. i) Name one organ in mammals which has roles in both the digestive and endocrine systems.
- ii) Give one role on each case, of the organ named above in the digestive system,
endocrine system.....
- b. State any three functional difference the endocrine and nervous systems

- c. The diagram below represents a neurone.



- 92
- (i) Name the parts labeled A, B and C on the diagram
(ii) By means of an arrow, show the direction of the impulse along the neurone.
32. The table below shows approximate numbers of organisms found in an ecosystem.
- | Type of Organism | Number |
|------------------|-----------|
| Grasshopper | Many |
| Hawks | 3 - 4 |
| Snakes | 15 - 3 |
| Green plants | very many |
| lizards | 80 - 120 |
- a. Using the information on the table, draw a pyramid of numbers.
b. Explain what would happen to the other groups of organisms if all the lizards suddenly died off.
-
33. The graphs in figure 1 below show results of an experiment carried out in a glass bath containing water plants. Oxygen concentration and the pH of the water in the bath were measured over a 24 – hour period.



- 93
- a. At what time of the day pH
 (i) lowest
 (ii) Highest
- b. Explain why pH is lowest and highest at the times given in your answers to (a) above.
- c. Explain the rise in oxygen concentration between 6.00 a.m. and 12.00 noon.
- d. What would be the effect on pH if some fish were introduced in the water?.....
- e. The water bath was covered tightly with a dark polythene sheet and after sometime the fish introduced in the water died. Explain why this happened.
34. 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.
 iv) What other function does the excretory organ in the amoeba perform?
- SECTION C.**
35. a i) What is mutation?
 ii) Name three causes of mutation.
 b. i) What role does mutation play in the process of evolution?

- 94
- ii) Give any two unfavourable conditions in man caused by mutation.
 iii) Briefly explain how mutation is applied in agriculture.
36. With the help of a diagram on each case, describe the movement of the
 a. human forearm
 b. insect hind leg.
37. a Distinguish between **diffusion** and **osmosis**.
 b. Describe an experiment to demonstrate osmosis, using a named plant material.
 c. How is the root hair adapted to its function?
38. Give the importance to the plants of each of the soil components that make up a fertile soil.

ANSWERS BIOLOGY PAPER - 553/1 (UNEB) - 1992

1 - B	7 - C	13 - A	19 - C	25 - D
2 - D	8 - A	14 - B	20 - D	26 - D
3 - A	9 - B	15 - C	21 - B	27 - C
4 - B	10 - D	16 - A	22 - C	28 - B
5 - C	11 - C	17 - B	23 - A	29 - A
6 - D	12 - D	18 - B	24 - A	30 - D

SECTION B

31 .a. i) Pancreas / stomach / duodenum.

ii) **Digestive system:** Production of pancreatic juice containing enzymes amylase, lipase, trypsin.

Endocrine system: Pancreas: produces hormone insulin / glucagon which converts excess glucose to glycogen

b.

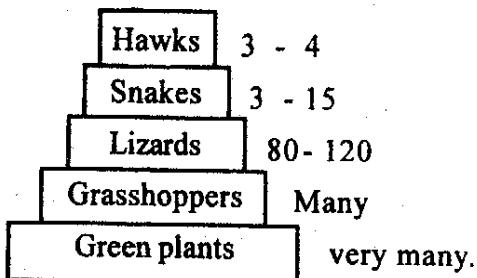
Endocrine	Nervous
Message chemical hormone.	Message is electrical and chemical.
Transmitted by blood.	Transmitted by neurones / nerve cells.

Response may take place in many parts of the body.	Response is localised.
Slow transmission	Rapid Transmission.

- c. A - Axon
 B - Cell body
 C - Myelin sheath

ii) Arrow moves upwards (\uparrow).

32. Pyramid of Numbers:



b. Snakes would decrease due to lack of hawks. Hawks would decrease due to lack of food. Grasshoppers would increase because there are no predators. Green plants would decrease because there will be more grasshoppers feeding on them.

- 33.a. i) 4 : 30 - 6:00 am. (ii) 3 : 30 - 4: 00 pm.
 b. At 6:00 am, there is little light, therefore little photosynthesis; more of the carbon dioxide produced by the plants dissolves to form carbonic acid, which lowers the PH.

At 4:00 pm, there is more light; therefore more photosynthesis. Less of the carbon dioxide produced dissolves into water to form less carbonic acid; hence raising PH.

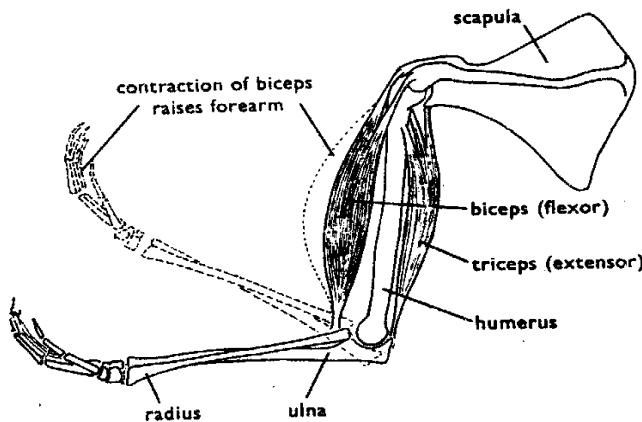
- c. Increased light intensity results in increased photosynthesis,
 d. Fish would give off carbon dioxide and PH would fall.
 e. The fish died off due to lack of oxygen; which resulted from absence of photosynthesis; the black polythene sheet cut off light to the plant.

- 96
- 34.a. i) Malpighian tubules
ii) Contractile vacuole.
- b. Attached to the beginning of the hind gut.
- c. i) Uric acid.
ii) In solid / semi solid form; for water conservation;
iii) Carbondioxide; water.
- d. Osmoregulation.

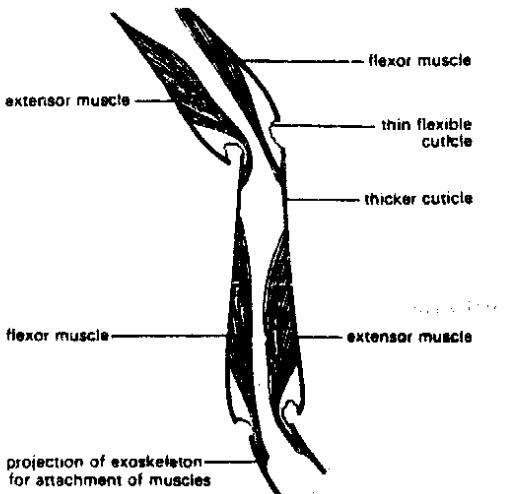
SECTION C

- 35.a. i) A sudden / spontaneous change in the structure of the chromosome or gene,
ii) Mustard gas, colchisins; ultraviolet rays; X-rays.
- b. i) Mutation leads to increase in variations.
Evolution progresses by natural selection of organisms / variations under any set of environmental conditions, unfavourable variations disappear, while the favourable ones survive and multiply.
ii) Sickle cell, hemophilia, albinism.
iii) By selecting organism of different strains, hybrids are produced- which are high yielding; diseases resistant; early maturing.

36.a.



- The Biceps and triceps muscles act antagonistically.
- When the Biceps muscle contracts, it pulls on the radius; thus raising the forearm /the arm bends at the elbow.
- When the Triceps muscle contracts, it pulls on the ulna, thus straightening the arm at the elbow.



When the flexor muscle contracts, the legs bend, when the extensor muscles contract the legs straighten, pushing the insect forwards

37.a.

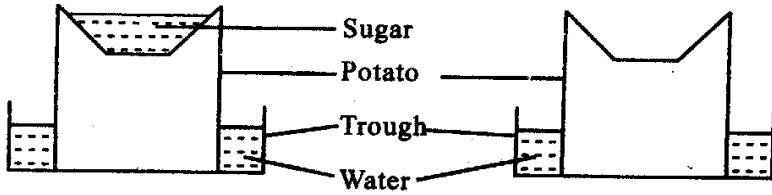
Osmosis	Diffusion
Involves a semipermeable membrane	Does not involve a semi permeable membrane.
Movement of molecules is restricted by a semipermeable membrane.	Movement of molecules is free.
Involves movement of solvent / water molecules	Involves movement of any moving particle.

b. An experiment to demonstrate Osmosis in , Irish potato

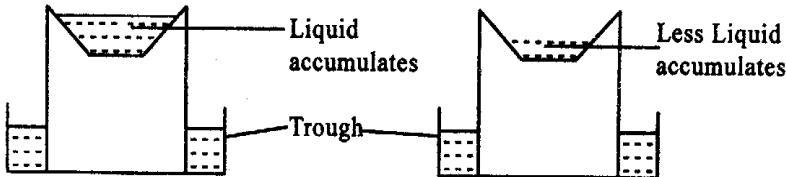
Apparatus: Sucrose/sugar, potato, trough, knife.

Method: Peel a fresh potato, scoop a hole in it; put sucrose crystals in the hole: place in a beaker of water, set a control as above but do not put sugar in the hole.

At the start of experiment



At the end of experiment



Observation: Sucrose solution level will rise, while that in the trough will drop, the level in the control will remain the same.

Conclusion: Water has moved from the solution of low concentration in the beaker to the sucrose crystals by osmosis.

Root hair has no cuticle to resist entrance of water; it has a concentrated vacuole which enables osmotic absorption of water.

They are very many so presenting a large surface area for absorption of water.

Water:

- Component of plant tissue.
- Dissolves mineral salts thus enabling - absorption by plant roots.
- Softens soil for root penetration
- Important in germination.
- Important in photosynthesis.

Air:

- Provides oxygen for respiration of plant roots and soil living organisms
- Provides Nitrogen for fixation by Nitrogen fixing bacteria.
- Provides oxygen for germination

Dissolved Mineral Salts:

- E.g. Nitrogen,
- Potassium,
- Phosphorus,
- Calcium for healthy growth of the plants.

Humus / Organic matter.

- Source of nutrients for the plants.
- Retention of water.
- Improvement of soil structure.

Inorganic / Rock Particles:

- Anchorage of plants, breakdown to give mineral salts, their balance ensures good soil structure.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1991 hours

30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

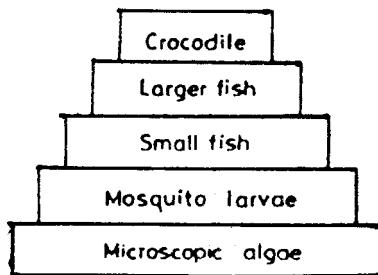
SECTION A

Answer all Questions in this section

1. Which one of the following groups of animals possesses an open circulatory system?
A. Amphibians B. Insects C. Mammal D. Fish
2. A population in equilibrium would be characteristic of a natural community on which
A. pioneer organisms are increasing rapidly
B. immigration is occurring rapidly
C. the pyramid of energy has been reversed.
D. Succession has reached a climax.
3. The rate of glomerular filtration is highest in
A. Man B. amphibians C. fresh water fishes D. marine fishes.
4. A person of blood group A can be transfused with blood of
A. group A only B. group AB only
C. group A and O D. Group B and AB.
5. In which of the following tissues does mitosis occur?
A. Cambium B. phloem C. pith D. xylem
6. The most typical characteristic feature of a thoracic vertebra is the presence of
A. a centrum B. demifacets
C. a long neural spine D. a short transverse process.
7. Functionally the most diversified organ in the human body is the
A. Brain B. liver C. stomach D. kidney
8. A trait which does not express itself unless homozygous is said to be
A. sex -linked B. linked and cumulative
C. a multiple allele D. recessive
9. Which one of the following is the correct sequence of events that occur during mitosis?

- 01
- A. Prophase, metaphase, anaphase and telophase
B. Prophase, anaphase, metaphase and telophase
C. Metaphase, anaphase, , telophase and prophase.
D. Telophase, anaphase, telophase, and prophase.
10. Which one of the following monosaccharaids is a common component of sucrose, starch and glycogen?
A. Fructose B. Galactose C. Glucose D. Mannose
11. What is the main function of the apical meristem on a root?
A. Formation of lateral roots.
B. Secondary thickening of the root
C. Formation of new cells
D. Protection of the root tip.
12. 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 seed on a cold room or refrigerator
D. Dry storage at high temperate.
13. Which one of the following groups of insects all have similar feeding habits?
A Bee, mosquito, caterpillar.
B Housefly, cockroach, praying mantis.
C Tsetse fly, housefly, caterpillar
D Bee, butterfly, bedbug.
14. Blockage of the bile duct would impair the digestion of
A Proteins B Cellulose C Starch D Fats.
15. Secondary growth on plants causes an increase in
A Length B thickness C height D number of branches.
16. An athlete has just finished a race. The phrase "oxygen debt" refers to
A The amount of oxygen originally present on the muscles of the athlete before the race.
B The amount of oxygen taken on after the race and used to complete the combustion of some of the lactic acid.
C The total amount of oxygen taken in during panting after the race.
D The amount of oxygen needed by the lungs after the race for combustion of glucose.
17. Which one of the following is not important function of the liver?
A Detoxification of poisons
B Regulations of cholesterol production
C Storage of amino acids.
D Storage of vitamins and minerals salts.
18. Which one of the following is not an adaptation to facilitate gaseous exchange on organisms?

- 03
27. 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 genotype of the parental peas?
- Tt x Tt
 - tt x tt
 - TT x tt
 - TT x TT
28. Which of the following is true of an atlas vertebra?
- It has a prominent neural spine
 - It has a short neural spine
 - The neural canal is very large.
 - The centrum is modified into odontoid process.
29. The femur is connected to the pelvic girdle of a mammal by
- Cartilage
 - synovial fluid
 - ligaments
 - ball and socket joint.
- 30.



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

- Increase in the number of microscopic algae.
- Increase in the number of larger fish
- Increase in the number of crocodiles
- Decrease in the number of small fish.

BIOLOGY 1991 SECTION B

31. Study the data below carefully ad answer the questions that follow:

Type of ground cover	kg of soil removed annually per 1000m ²	Number of years needed to remove 18 cm of top soil at this rate.
Virgin forest	5	500,000
Grass	755	3,225
Rational cropping	35,800	70

- 04
- | | | |
|-------------|---------|----|
| Cotton | 79,000 | 32 |
| Bare ground | 166,000 | 15 |
- (a) Which type of ground cover is
(i) most efficient,
(ii) least efficient, in soil conservation?
b. Why does a garden of cotton lose soil at a higher rate than a virgin forest?
c. How would you reduce the rate of soil erosion of bare ground?
32. Figure 1 below is a growth curve of a population of yeast cells in a medium. Study the curve and answer the questions that follow.

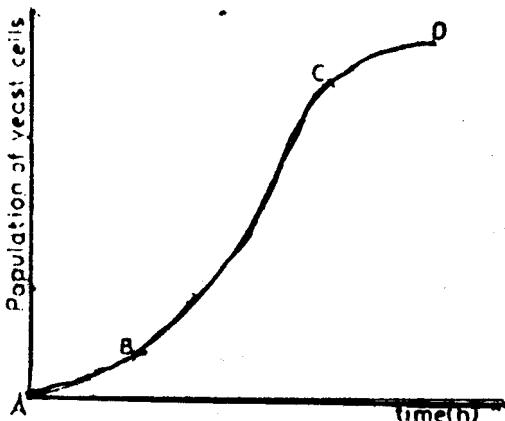


Fig. 1

- Suggest reasons for the changes in the growth curve of the yeast cells between
A and B
B and C
(iii) C and D
Briefly explain how any four factors affect population growth.
33. Figure 2 below shows part of the human alimentary canal and associated organs:

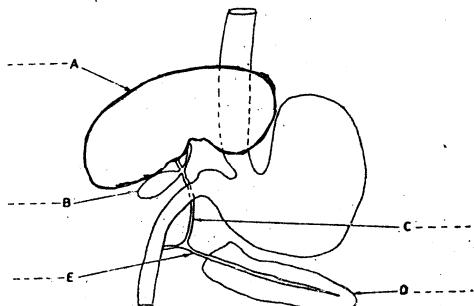


Fig. 2

- 05
- a. Name the parts labeled A to E.
 - b. Briefly explain the importance of structure labeled D in digestion
34. Figure 3 below is representation of a cross section of a root. X shows the xylem cells in the centre of the root and R, a root hair cell. Study the figure and answer the questions that follow.

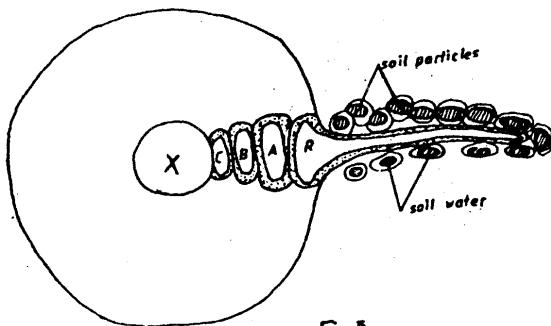


Fig. 3

- a. What part of the root do cells labelled A, B and C represent?
- b. How does the osmotic potential of the cell labeled R compare with that to the surrounding soil solution?
- c. By what means does the cell labelled R obtain water and mineral salts from surrounding soil solution?
 - (i) Water
 - (ii) Mineral salts
- d. Briefly explain the movement of water from cell labelled R to cell labelled C

SECTION C

Answer any two questions from this section

35. a. How is self pollination prevented in flowering plants?

- b. Outline the events leading to the formation of a seed in flowering plants.

36. How does gaseous exchange occur in amphibians on aquatic and terrestrial habitats?

37. a. State four ways by which the mammalian body loses
(i) heat
(ii) water
b. How does the mammalian body maintain a constant temperature?

38. a. What is meiosis and where does it occur on plant and animals?
b. What is the relevance of meiosis on reproduction?
c. In a breeding experiment, plants which were homozygous for white flowers were crossed with those homozygous for red flowers. The resultant F₁ generation all had red flowers.
(i) Explain the absence of white flowers on the F₁ generation
(ii) Using genetic symbols, show the results on the F₂ generation after selfing the F₁ generation.

ANSWERS FOR BIOLOGY PAPER 553/11991

SECTION A

1	B	7	- B	13	- D	19	- D	25 -	A
2	D	8	- D	14	- D	20	- A	26 -	C
3	C	9	- A	15	- B	21	- C	27 -	C
4	C	10	- C	16	- B	22	- A	28 -	C
5	A	11	- C	17	- C	23	- B	29 -	C
6	C	12	- B	18	- C	24	- B	30 -	C

SECTION B

32.a. i) Between A and B there are few reproducing individuals; individuals are still adapting to new environment.

ii) B and C

No environmental resistance / reproducing cell are now fully adapted and are many.

iii) C and D

Environmental resistance sets in; over population sets in; increasing death rates.

b. Food, water, oxygen, temperature, predators, shelter (+ve and -ve aspects).

- 33.a.
- A. Liver
 - B. Gallbladder
 - C. Bile duct
 - D. Pancreas
 - E. Pancreatic duct.

b. Secretes pancreatic juice which contains enzymes e.g. Trypsin which convert proteins into peptides and amino acids; Amylase which converts starch into maltose; Lipase which converts fats into fatty acids and glycerol.

34.a. Cortex.

b. Has a higher osmotic potential; its cellsap is more concentrated than the surrounding soil solution.

c. i) Water - Osmosis; diffusion.

ii) Mineral salts - diffusion; active transport.

d. Water moves from the soil solution through the cell wall of R, water makes the cellsap of R less concentrated than that of A and also raises the turgor pressure. So by osmosis water moves from R to A. In the same way water moves from A to B then to C.

SECTION C

35. a. Unisexual flower /dioecious flower.

- Stamens and carpels ripen at different times i.e. protandry and protogyny respectively.
- Self sterility/genetic incompatibility.
- Stigma being higher than the surrounding stamen.

b. Pollination takes place; pollen tube grows down the style; into the embryo sac. The pollen tube has three nuclei, near the lube is the pollen tube nucleus, and behind it two male nuclei. Pollen tube enters the ovule through the micropyle.

The tip of the pollen then bursts, and one of the male nuclei fuses with the secondary nucleus to form the endosperm.

After fertilization the zygote undergoes cell division to form embryo; The ovule forms the seed and the ovary forms the fruit.

36. **Aquatic habitats:**

Amphibians in aquatic habitats use the moist skin which is well supplied with blood vessels. So gases readily diffuse in and out of the moist skin.

Terrestrial habitats:

Amphibians breathe using the lining of the buccal / mouth cavity. It's also moist and well supplied with blood capillaries which facilitate easy diffusion gases.

They also use the lungs when the amphibian is active, say during the mating-season and needs a lot of oxygen. It takes a large gulp of air and forces it down into its lungs.

37.a. **Loss of heat:**

i) Radiation

- Evaporation/sweating
- Conduction
- Convection
- Through urine, faeces, exhalation.

ii) Water loss:

- Exhalation /breathing out;
- Sweating;
- Urination;
- Faeces/vomiting.

b. Temperature changes are detected by the hypothalamus;

When Cold:

- Increase in subcutaneous fat layer to insulate the body against heat loss.
- Hair is raised.
- Formation of goose pimples.
- Reduction of sweat.
- Vaso constriction of the superficial blood vessels.
- Shivering.
- Increase in metabolic rate therefore more heat is produced.

When Hot;

- Little subcutaneous fat layer to allow easy heat loss.
- Hair lies flat to make less air to be trapped.
- Vasodilation of superficial blood vessels.
- Sweating or panting occurs.
- Fall in metabolic rate thus less heat is produced.

38.a. Cell division which results in halving of the chromosome number and results in production of four daughter cells.

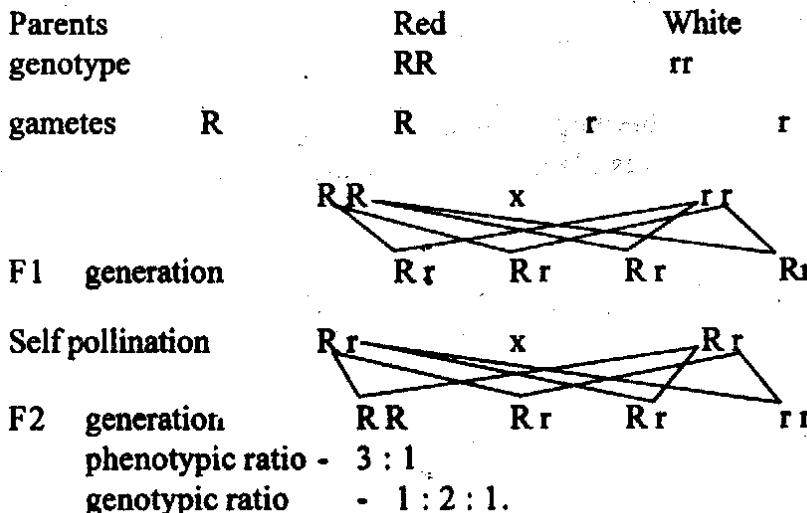
In plants - it occurs in the ovary and anthers of flowers and the spores; In animals - it occurs in the testes and ovaries.

b. Helps to produce reproductive cells or gametes.

Helps to keep the number of chromosomes constant.

c. i) The gene for red flower was dominant over the gene for white flower colour which was recessive.

ii) Let the gene for red colour be R and the gene for white colour be r;



553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1990

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

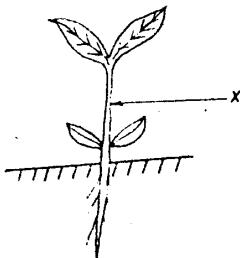
SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

SECTION A

Answer all Questions in this section

1. Ecological systems often have producers, consumers , predators and preys. Which organisms maintain the balance of ecosystems?
 - A. Preys
 - B. Consumers
 - C. Producers
 - D. Predators
2. 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
3. Which one of the following forms part of the insect respiratory system?
 - A Trachea, Tracheoles and bronchioles.
 - B. Spiracle, trachea and tracheoles
 - C. Spiracle , trachea and brondhioles
 - D. Trachea , Bronchus and bronchioles
4. The part marked X in figure 1 is the
 - A hypocotyl
 - B. epicotyl
 - C. coleoptile
 - D. plumule



- 11
5. 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
 6. Mice eat fruits, grasshoppers eat leaves , rabbits eat leaves and woody parts of plants. Which one of the following statements best describes the information given in the passage?
 - A. Herbivores feed on one particular plant.
 - B. Mice, rabbits and grasshopper all eat the same food.
 - C. Each herbivore will select certain food which it will eat it available
 - D. Mice and rabbits compete for the food available.
 7. 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 grains and explosive fruits
 - C. numerous pollen grains and enclosed stigma
 - D. coloured petals and small hairy fruits.
 8. Spirogyra normally reproduces by
 - A. binary fission
 - B. conjugation
 - C. budding
 - D. hyphae
 7. In man the oestrus cycle is also known as
 - A. heat period
 - B. gestation period
 - C. menstrual cycle
 - D. lactation cycle
 8. a defect affecting shape of blood , cells which can be inherited is known as
 - A. haemophilia
 - B. diabetes
 - C. anemia
 - D. sickle cell

- 12
9. in one day old tadpoles , gaseous exchange is performed by
- lings
 - external gills
 - internal gills
 - skin of the tail
10. The part marked X in figure 2 is – on page 48
- xylem
 - Phloem
 - Vascular bundle
 - Cambium
-
13. Which of the following are the end products of the digestion cane sugar?
- Glucose and Fructose
 - Glycerol and fructose
 - Fructose and Galactose
 - Galactose and glucose
14. Which group of organisms is least limited in the sources of food?
- carnivores
 - saprophytes
 - omnivores
 - Herbivores
15. Which of the following statements is biologically true about lymphatic system flow?
- facilitated by the pumping action of the heart.
 - Takes place in one direction only from heart to the tissues.
 - Takes place in one direction only tissues to the heart.
 - Takes place in one direction only from the lymph nodes to the tissues.
16. Clay soil usually water logged due to
- too much water
 - poor drainage
 - small pores
 - a higher force of capillary
17. From which of the following regions of the boy would you find vertebrae with less developed centra?
- . thoracic
 - Lumbar

- 13
- C. Cervical
 - D. Sacral
18. If a microscope eye piece has a number $\times 10$ written on it and the objective lens has a number $\times 45$ written on it, the magnification will be
- A. too much water
 - B. poor drainage
 - C. small pores
 - D. a higher force of capillarity
19. Which one of the following statements is true?
- A. Motor neurons transmit impulses from spinal cord to brain
 - B. Motor neurons transmit impulses from central nervous system to effectors of the body
 - C. Motor neurons transmit impulses from effectors of the body to the central nervous system
 - D. Motor neurons are found only in the central nervous system.
20. Which one of these represents the route taken by urine in a mammal?
- A. Collecting tubule , ureter, bladder, urethra.
 - B. Bladder, ureter, collecting tubule , urethra.
 - C. Ureter, urethra, bladder, collecting tubule
 - D. Urethra, bladder, collecting tubule , ureter.
21. Insects in the dry areas conserve water by passing waste in form of
- A. urea. B. Uric acid crystals C. Ammonia gas. D. Urine
22. Which one of the following types of farming helps in marinating soil fertility?
- A. Crop rotation B. Bush fallowing
 - C. Monoculture D. Mixed farming
23. 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 on the body
 - D. excess proteins are harmful to the circulary system
24. Individuals with blood group O are said to be universal donors because they have
- A. no antibodies
 - B. no antigens
 - C. both antigens A and B
 - D. Both antigens and antibodies.
25. Genes responsible for ABO blood groups in man are examples of ...
- A. multiple alleles
 - B. multiple genes
 - C. sex linked genes
 - D. mendelian factors.

- 14
26. Which one of the following statements is true about the digestion in man?
- A. Digestion of sucrose starts on the stomach
 - B. Digestion of sucrose starts in the ileum
 - C. Sucrose is digested to glucose in the ileum
 - D. Sucrose is converted to glucose and galactose.
27. The least effective environmental factor in soil formation is
- A. wind
 - B. heat
 - C. water
 - D. light
28. The graph below shows the volume of gas produced during photosynthesis.

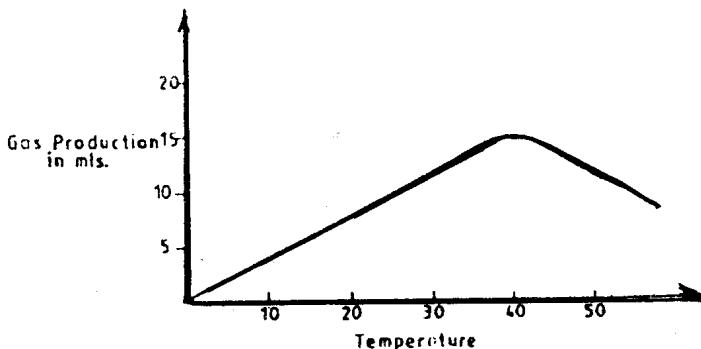
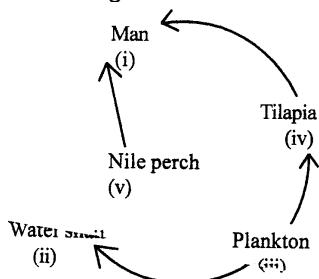


Fig. 3

- What is the possible reason for the fall in volume of gas after 40°C?
- A. There was no more oxygen in the atmosphere.
 - B. Enzymes were denatured.
 - C. Starch was being converted to sugar.
 - D. There was too much sunlight.
29. Figure 4 below shows a food web in one of the East African lakes.



- 15
- To complete the food web arrows should be drawn from
- A. (ii) to (v) and (iii) to (v)
 - B. (iii) to (i) and (v) to (iii)
 - C. (ii) to (iv) and (iv) to (v)
 - D. (i) to (iii) and (i) to (ii)
30. If a normal heterozygous man marries an albino woman, what will be the genotype of the offspring?
- A. Aa and aa
 - B. Aa only
 - C. AA and aa
 - D. Aa and AA.

SECTION B

- 31.a. Figure 5 is a diagram of an ovule. Study it carefully and answer the questions that follow.

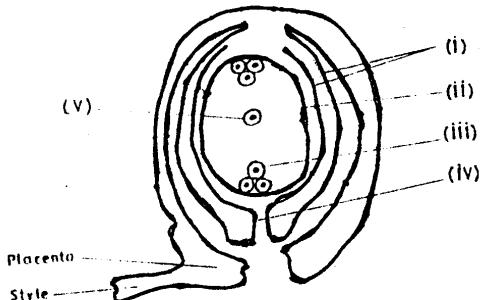
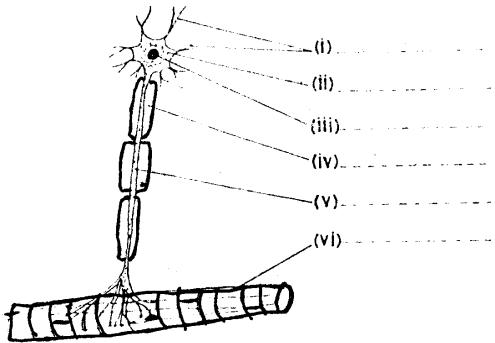


Fig. 5

- Name the parts labelled (i) ----- (v)
(b) What do structures labeled (i), (ii), (iii) (iv) and (v) develop into after fertilization?
c) What are the functions of structures (iv) and (v) at germination?

- 32 Study figure 6 below and answer the questions that follow.

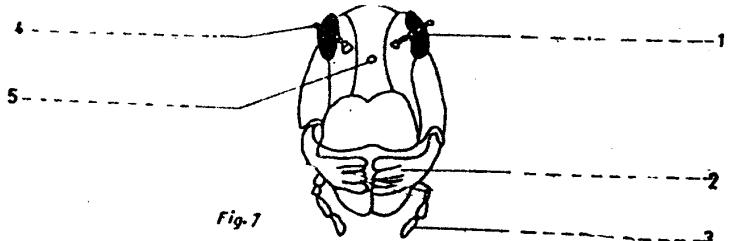


16 Name the parts labeled (I) to (vi) on the diagram

By means of an arrow show the direction of impulse propagation in the diagram above

- What type of neurone is this?
 - What action does it induce in the body?.....
- What is the function of structure labelled (iv)?.....

33. Figure 7 below is a diagram of a body part of a biological organism. Study the diagram carefully and then answer the questions that follow.



Name the parts labelled 1 to 5 on the diagram.

State the view from which the body part of the organism was drawn.

.....

- What are the functions of the parts labelled 1 to 5 on the diagram?
- Suggest the identity of the organism represented in figure 7 above. Give a reason for your identification.

Identity

Reason..... Wh at is the class of the organism you have named on (d) above?

34. a. What is mutation?
- b. State the four causes of mutation.

Give one advantage and one disadvantage of mutation.

Advantage

Disadvantage

What is the role of variation in natural selection?

SECTION C

35. a. What is transpiration?
b. State the environmental factors that affect the rate of transpiration
c. Describe an experiment to show that a plant transpires
36. a. State the methods you would employ to determine the population of animals on a given habitat.
b. Give factors that may affect the distribution of animal populations in any habitat.
37. a. How are birds adapted to flight?
b. Describe how flapping flight is brought about in birds.
38. a. List the excretory products of animals.
b. With the aid of a labeled diagram describe the part played by the mammalian kidney in excretion.

ANSWERS BIOLOGY PAPER - 553/1 - 1990

SECTION A

1	C	7	A	13	- A	19	- B	25 -A
2	D	8	B	14	- C	20	- A	26 -C
3	B	9	C	15	- C	21	- B	27 - D
4	B	10	D	16	- C	22	- D	28 - B
5	B	11	B	17	- C	23	- C	29 -C
6	C	12	D	18	- D	24	-B	30- A

SECTION B

- 31 .a. i) Protective coats / integument,
ii) Embryo sac

- 18
- iii) Ovum or egg cell,
iv) Micropyle
iv) Secondary nucleus.
- b. i) Testa / seed coat,
ii) Seed.
iii) Zygote
iv) Micropyle.
v) Endosperm.
- c. Entry of water or gases exchange,
Source of food for embryo.
- 32.a. i) Dendrites
ii) Cytoplasm
iii) Nucleus
iv) Myelin cell.
v) Axon or nerve fibre.
vi) Muscle fibres / bundle.
- b. Arrow goes down.
c. i) Motor neurone
ii) Causes the muscle to contract.
d. Insulates the axon, speeds up impulse propagation.
33. i) Compound eye
ii) Mandible
iii) Maxillary palp
iv) Antenna
v) Ocellus.
- b. Anterior view
- c. 1) Compound eye - for vision; enables organisms to distinguish different light intensities.
2) Mandible - to seize and cut up food material.
- d. **Identity:** Grass hopper / locust

Reason: Strong mandible for biting and chewing foliage.
e. **Class:** Insecta.

34.a. Mutation is the sudden change in the structure or number of X-somes or genes.

- b.
- i) X-rays
 - ii) Radiation of cosmic rays
 - iii) Electro magnetic waves
 - iv) Mustard gas.

c. **Advantage:** Mutation causes variations which may produce desirable characters.

Disadvantages: May cause death.

d. Variation produces a variety of characteristics, some of which are more suitable to the environment and survive, while others less suitable die out.

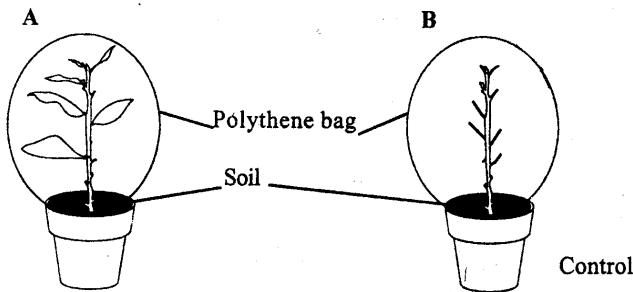
SECTION C

35.a. Transpiration is a process by which plants lose water; to the atmosphere in form of water vapour.

b. Light intensity, humidity, temperature, wind, atmospheric pressure, water.
c. **Heading:** An experiment to show that a plant transpires.

Apparatus: Potted plants one with leaves, the other without leaves, 2 bell jars / polythene papers, anhydrous copper (II) sulphate / cobalt chloride paper.

To show that water is given off during transpiration.



Procedure: A potted plant A with leaves is covered with a polythene paper. A control B is set up identical to A except that all the leaves have been detached. Both are exposed to sunlight for one or two hours.

Observation: The polythene bag of potted plant A had droplets of liquid which turned anhydrous copper (II) sulphate from white to blue / cobalt chloride paper from blue to pink;.

The control B had no droplets of liquid. Conclusion: A plant leaf transpires.

36.a. **Use of the Quadrat:**

- Capture and recapture method
- Total count.
- Line transect.

b. Availability of food, predators and parasites, diseases, light, oxygen, water, mates.

37.a. Forelimbs are wings with a large surface are provided by the feathers.

- Large pectoral muscles.
- Well developed coracoid bones for transmitting the lift to the body.
- Hollow bones to reduce the birds weight.
- Efficient breathing.

b. **During down stroke:**

- Pectoral is major muscle contracts and pulls the wings downwards.
- Air resistance provides a lift upwards

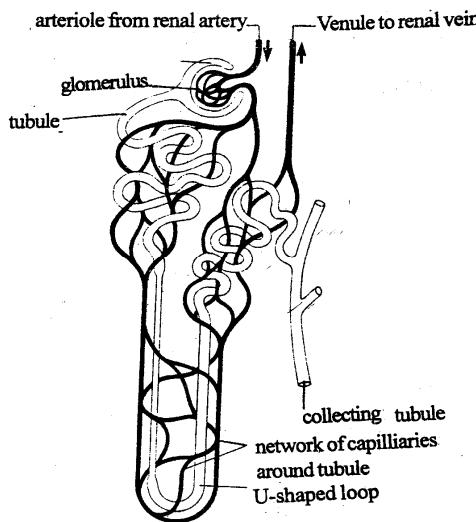
Action of the wings near the tip pushes in backwards and so the bird moves forwards.

During Upstroke

A pectoralis minor contracts, raising the wing more rapidly than during down stroke. Air resistance is reduced due to the concave shape of the wing, the bird bends the wing at the wrist to further reduce the air resistance; the overlapping arrangement of the primary and secondary feathers is such that there is maximum resistance on the down stroke and minimum resistance on the up stroke.

38.a. Carbondioxide, water, heat, urea, uric acid, ammonia, sodium chloride.

b. A diagram of a mammalian kidney



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Ultrafiltration of blood in the glomerulus as the capillary entering is wider than that leaving.

Bowman's capsule collects filtrate of urea, Uric acid, glucose, water, except proteins and blood cells.

Selective reabsorption of glucose, some salts, much water done in the proximal convoluted tubule.

In the loop of henle and distal convoluted tubule, regulated amounts of water and salts are reabsorbed. More water reabsorbed from the collecting ducts if necessary e.g. if the blood is concentrated.

Urine from the collecting ducts enters the pelvis of the Kidneys where it collects; then down to the ureter to the bladder from where it goes out through the urethra.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1989

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

- 22
1. There were many termites in leaf litter layer decomposing it while ant – eaters fed on the termites faster.
This relationship can best be illustrated suing
 - A. Pyramid of Biomass
 - B. Food web
 - C. Food chain
 - D. Pyramid of energy
 2. Epiphytes are not regarded as parasites because
 - A. They do not at any time derive nutritional requirements from the trees on which they grow.
 - B. They have roots and leaves and so can make their own food.
 - C. They never harm the trees on which they grow.
 - D. Both the epiphytes and the trees on which they grow mutually benefit from one another.
 3. Secondary thickening on flowering plants is brought about by division of the
 - A. Phloem cells
 - B. Cambium cells
 - C. Xylem cells
 - D. Cortex cells
 4. The term used to describe the process in changes in types of organisms in a given location is known as
 - A. competition
 - B. habitat
 - C. food chain
 - D. succession
 5. 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.
 6. A tendon is
 - 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 bone meet.
 7. A mosquito larva breathes by means of
 - A. Spiracles
 - B. Gills
 - C. Segments
 - D. Nostril
 8. In vertebrates the joint between an axis and atlas vertebrae is known as
 - A. Ball and socket joint.
 - B. Hinge joint

9. Which portion labeled a - d in the diagram in Figure 1 can be used for propagation.

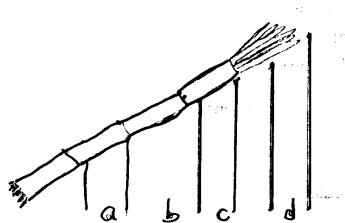


Fig. 1

- A. a
B. b
C. c
D. d

10. Which one of the following chromosomal changes results in the loss of genetic materials?
A. Duplication
B. Inversion
C. Translocation
D. Deletion

11.

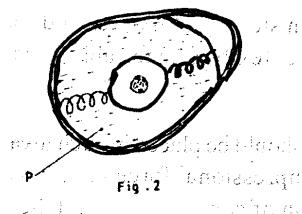


Fig. 2

- Figure 2 shows a diagram of a bird's egg. The main function of the structure labeled P is to

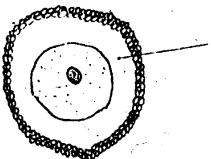
 - A. provide food and oxygen
 - B. store excretory products
 - C. protect the embryo
 - D. provide food and water

12. In higher flowering plants the first male gamete fuses with

 - A. polar nucleus
 - B. synergid nucleus
 - C. secondary nucleus
 - D. egg nucleus

13. The addition of humus to a sandy soil will

- 24
- A. decrease the capillary of the soil
B. improve the water retention of the soil
C. increase the aeration of the soil
D. decrease its mineral content.
14. In cattle, the gene for hornless is dominant to the gene for horns (gene P and p respectively). If a bull and cow with genotypes Pp. are crossed, what percentage of the offspring would be expected to have horns?
A. 25% B. 50% C. 75% D. 100%
15. In the diagram of an ovum in Figure 3, the part marked X is
A. corona radiata
B. ovum
C. follicle cells
D. zona pellucida



16. Antigens stimulate the production of
A. antibodies
B. antitoxins
C. leucocytes
D. lysins
17. Animals X has the following dentition

i	0	c	0	pm	3	m	3
3		1		3		3	
- What type of feeder is animals X?
A. Omnivore B. Carnivore C. Herbivore D. Filter feeder
18. The hormone that is responsible for the conversion of glycogen to glucose in the liver is
A. Secretion B. thyroid C. adrenaline D. insulin.
19. Give all the genotypes of offspring from a father and a mother of blood group A and AB respectively.
A. All AB
B. 3 AB: 1 AO
C. 1 AO : 2 AB : 1 BO
D. 2 AA : 1 AO : 1 AB : 2 BO
20. Which one of the following reactions is likely to occur when a donor of blood group A is transfused with a recipient of blood group B?
A. Antibody a reacts with antigen B
B. Antigen B reacts with antibody b
C. Antibody b reacts with antigen A

- 25
- D. Antigen A reacts with antigen B
21. A healthy person normally has a concentration of 6000 leucocyte per cm³ of blood. A person who has just recovered from an illness would be expected to have
- 2000 per cm³
 - 3000 per cm³
 - 6000 per cm³
 - 12,000 per cm³
22. The diagram in Figure 4 shows a plasmolysed plant cell that has been transferred into water. What is likely to happen to the cell if it is left in water for 1 ½ hours?
-
- A. It will lose water to the surrounding and decrease in size
B. It will absorb water from the surrounding and increase in volume
C. It will not experience any change in size
D. The vacuole will shrink and disappear altogether.
23. One of the major functions of vitamin C in the human body is
- to provide body resistance against diseases.
 - To provide resistance against blood cells
 - To add bulk to food eaten
 - To increase rate of heart beat.
24. Which one of the following structures separates the nucleoplasm from cytoplasm
- Plasma
 - Plasma membrane
 - The cell wall
 - The nuclear membrane
25. Phagocytosis is a process whereby
- white blood cell ingest and destroy bacteria
 - white blood cells cause the bacteria to stick together
 - red blood cells dissolve the outer coats of invading bacteria and so destroying them.
 - Antibodies fight antigens.
26. Which one of the following links the middle ear with the skull?
- Staues
 - Ear drum
 - Round window
 - Oval window
27. A knee jerk is a
- conditioned reflex action
 - reflex action

- C. voluntary action D. tascis action
28. Table 3 below give feeding habits of aedis mosquitoes on human blood meal from 6 p.m. to 12 midnight.

Table 3

Time of Feeding	6pm	7p.m	8 p.m.	9 p.m.	10 pm	11pm	12 midnight
Number of mosquito biting	0	1	1	3	25	24	16
Volume of blood in the git of mosquito (ml)	0	0.00 1	0.002	0.05	0.5	0.4	0.08

The best conclusion on aedis feeding habit from table 3 is that

- A. aedis is active at 10 p.m. to midnight , when people are sleeping
 - B. aedis is active only after midnight
 - C. mosquito feeds only when blood is hot
 - D. mosquito feeds on blood of sick people.
29. Which of the following is Not a pigment?
- A. Hemoglobin
 - B. Melanin
 - C. Carotene
 - D. Tocopherol
30. A place where an organism lives is its
- A. Environment
 - B. community
 - C. Habitat
 - D. Ecosystem

SECTION B

Answer all Questions in this section. Answers must be written in the spaces provided.

31. Figure 5 shows the diagram of a stomach of a ruminant animal.

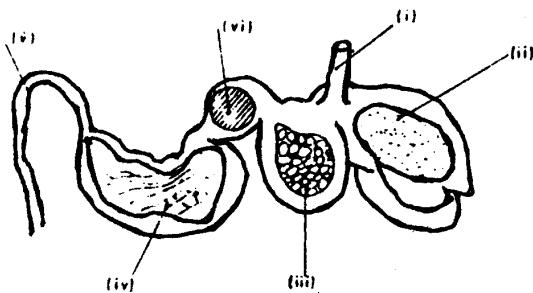
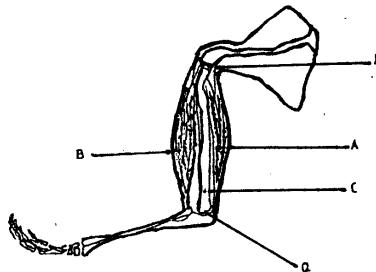


Fig. 5.

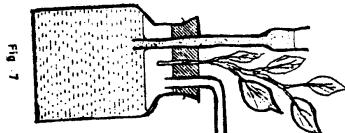
- 27
- a. Name the parts labelled (i) to (vi)
 - b. Using arrows, indicate the direction of food movement in the stomach of the ruminant.
 - c. What is the dental formula of a sheep?
 - d. Give any four reasons why Herbivorous animals obtain maximum nourishment from plant tissues.

32. Figure 6 shows a diagram of the internal structure of an arm.



- a. Name the parts labelled , A, B and C.
Give one function of structure.
(i) A
(ii) B
(iii) C
- c. Name the type of joint that exists at
i)P
ii) Q
- d. What may cause the accumulation of lactic acid in A and B?
e. What would be the effect of high concentration of lactic acid on A and B?
.....

33. Figure 7 shows a diagram of an experimental set up.



- (a) Identify five experimental errors that were made on setting up the experiment.
- b) What is the experimental set up supposed to measure?

- c). Name any four external factors that may influence the results of the experiment.
34. Figure 8 represents food relationships among living things in nature.

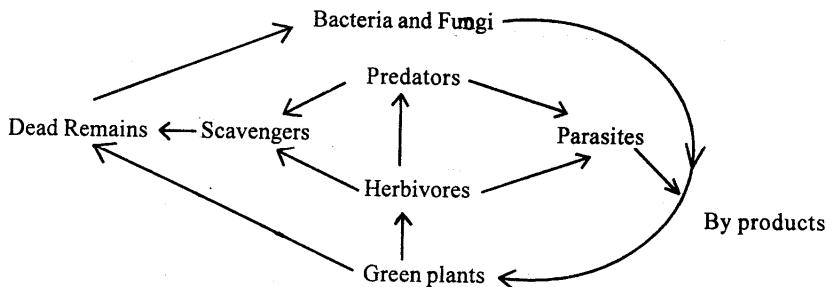


Fig. 8

- a. What is the role of fungi and bacteria in the relationship above?
- b. (i) Name two processes in living organisms that lead to the formation of by-products shown in the diagram.
- (ii) Name any one product of each process named in (i) above.
.....
- c. Give an example of
(i)a predator
(ii) a scavenger
- d. What would happen if
(i) herbivores were removed from the food relationship?
.....
- (ii) green plants were removed from the food relationship?
- e. Construct a simple food chain of the living things found on the relationship above.

SECTION C

Answer any two questions from this section.

35. a. What are the components of a fertile soil?
- b. Describe an experiment to show that loam soil drains faster than clay soil.
- c. State the difference between the properties of sand and clay, apart from the one mentioned on (b) above.
36. a. What is an endocrine gland?

- 29
- b. Draw and label a diagram to show the location of the endocrine glands in the human body.
 - c. outline the role of the '**master gland**' in the body.
37. a. What is an endocrine respiration?
b. What is the difference between internal and external respiration?
c. How does gaseous exchange occur in bony fish?
38. a. What is a parasitic mode of nutrition?
b. Describe the life cycle of a tapeworm.
c. Give reasons why a tapeworm is a successful parasite.

ANSWERS: BIOLOGY PAPER 553/1 (UNEB) -1989

SECTION A

- 1 - C 7 - A 13 - B 19 - D 25 A
- 2 - C 8 - C 14 - A 20 - B 26 D
- 3 - B 9 - B 15 - D 21 - D 27 B
- 4 - D 10 - D 16 - A 22 - B 28 A
- 5 - C 11 - D 17 - C 23 - A 29 D
- 6 - B 12 - D 18 - C 24 -D 30 C

SECTION B

31. a. i) Oesophagus
ii) Rumen
iii) Reticulum
iv) Abomasum
v) Duodenum
vi) Omasum.
- b. On the question paper
- c) $\frac{0}{3} \quad C \frac{0}{1} \quad PM \frac{3}{3} \quad M \frac{3}{3} = 32$
- d. i) Long guts which provides a large surface area for digestion.
ii) Rumen and caecum having bacteria and fungi which digest cellulose converting them to sugars.

- 30
- iii) Chew cud or ruminant i.e. chew food for the second time after swallowing,
 - iv) Members of vitamin B complex are manufactured in the Rumen
- 32.a. A - Triceps muscle.
- B - Biceps muscle.
 - C - Humerus.
- b. i) A Upon contraction stretches or lengthens and lowers the arm.
- ii) B Upon contraction bends or raises the arm.
- c. i) P Ball and socket joint
- ii) Q Hinge Joint.
- d. When those muscles A and B undergo vigorous exercise or over activity such as lifting heavy things leads to the production of lactic acid
- e. pain in the muscles or muscle cramps
33. a) Plant shoot not dipped in the water
- b) Tap root present in the water reservoir
- c) No scale on capillary tubing
- d) Whole set, up is not filled with water
- e) Cut end of the shoot is not fitted into the rubber tubing
- b. to measure the rate of water uptake
- C. Wind or air movement
- Light intensity
 - Amount of water in soil
 - Temperature
34. a. decay or composition
- b. (i) respiration
- ii excretion
- ii) (i) carbon dioxide
- ii . urea
- c. i) Lion
- ii) vulture
- d. (i) Green plants would be so many
- (ii) The whole food chain would be destabilized
- (iii) Green plants → herbivores → predators → scavengers → dead remain

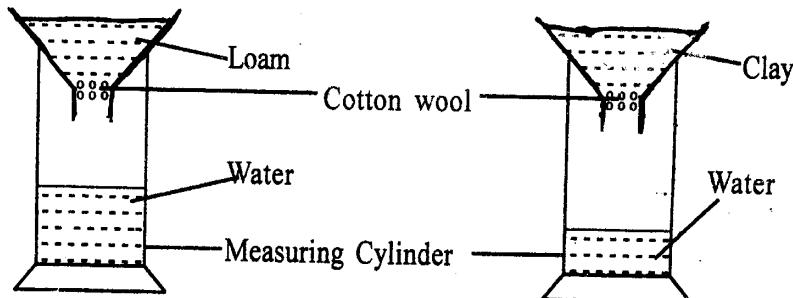
SECTION C

- 35 a. Air , water ,living organisms ,mineral salts , organic matter, inorganic matter.

b. **Heading:** Experiment to show that loam soil drains faster than clay soil.

Apparatus : Dry loam and clay soil, two measuring cylinder, two funnels, cotton wool.

To show that loam drains faster than clay soil



Procedure:

Stand two filter funnels in the necks of two 100 cm^3 measuring cylinders.

Place dry loam and clay soil in each of the measuring cylinders.

Pour 50 cm^3 of water on each of the soil at the same time and leave to drain through; note the time taken for the water to drain through each, when water has stopped dripping through each funnel read the level of the water in the measuring cylinders.

Observation: water drains through loam soil faster than clay soil.

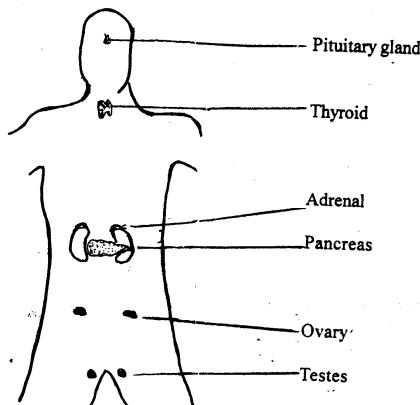
Conclusion:

Loam soil drains faster than clay soil **or** Loam soil has a better drainage than clay soil.

Loam	Clay
1. Moderately fine / smooth particles.	Very fine / smooth particles.
2. Moderate water retention	High water retention.
3. Moderate pore spaces or air spaces.	Small air spaces / pore spaces.
4. Moderately sticky / rough when moist.	Sticky when moist.

36.a. An endocrine gland is one that has no ducts / opening (ductless) and secretes chemicals known as hormones.

b. Position of endocrine glands in the human body.



c. Master gland controls all the activities of the endocrine gland e.g.

36. a) Antidiuretic hormone (ADH) controls amount of water reabsorbed into the blood by the Kidneys?
b) Growth hormone - influences growth.
c) Thyrotropic hormone stimulates the thyroid gland to grow and produce thyroxine.
d) Follicle stimulating hormone (FSH) stimulates the gonads (ovaries and testes) to produce sex hormones.
e) Luteinizing hormone induces ovulation.
f) Adrenocortico trophic hormone (A.C.T.H) stimulates the adrenal cortex to produce the hormone cortisone.

37.a. Anaerobic respiration is the breakdown of carbohydrates to release energy in the absence of oxygen.

- b. The release of energy in living cells is called **Internal Respiration** while the supply of air in and out of the lungs is called **External Respiration** or breathing.
c. Gaseous exchange in fish occurs by means of gills. Oxygen dissolved in water is absorbed by the gills the filaments have thin walls enabling oxygen to diffuse rapidly to the blood.

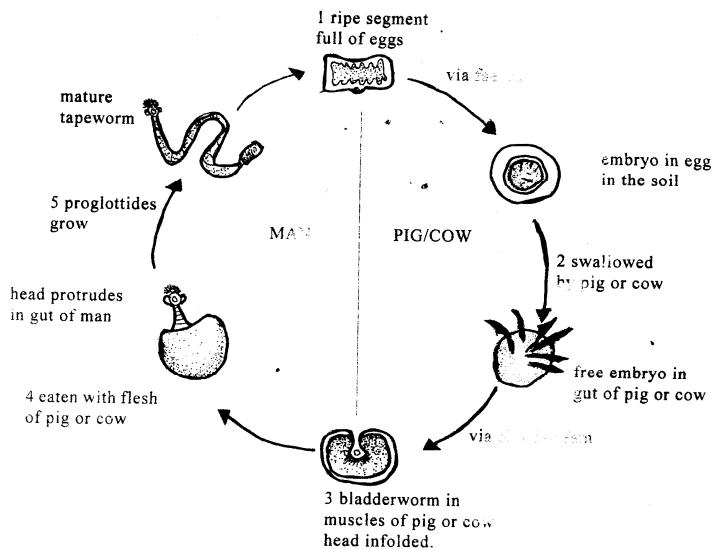
The great number of gill filaments provides a large surface area when the gills are immersed in water.

A continuous stream of water is kept flowing past the gills, and this stream is maintained by the movement in the operculum and the opening and closing of the mouth as the water flows between the gills, oxygen is taken up and carbon dioxide diffuses out.

Water passes out of the fish through the operculum and is sucked in through the mouth.

38. Parasitic mode of nutrition is one in which an organism (a parasite) feeds on another (host) in which it normally causes harm.

Life cycle of a tapeworm



Description:

1. Ripe segments full of eggs are passed out by a mature tape worm via faeces in the grass or soil.
 2. When the pig/cow (intermediate host) goes grazing; it eats up the embryo in the eggs which develops in its gut into an embryo with six hooks.
 3. Free embryo in the gut of a pig will pass via the blood stream into a bladder worm in the muscle of a pig or cow with the head in folded.
 4. When raw or half cooked pork or beef is eaten a young tape worm pops out and attaches to the gut of man with it's hooks.
 5. Segments or proglottides grow to a mature worm whose last segments keep breaking off and are lost in the faeces; life cycle starts again.
- c. Hooks and suckers to attach firmly to the gut of man.
- Short reproductive cycles / many eggs.

- Cannot be digested by hosts' enzymes due to a lot of mucus produced.
- Long / flat body thereby presenting a large surface area for absorption of food.
- Intermediate hosts e.g. cow/pig so easy spread.

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1988

Paper 1

2 hours 30 minutes

34

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. A sexual reproduction is spirogyra takes place by
 - A. fragmentation
 - B. cell division
 - C. conjugation
 - D. binary fission
2. When two organisms live together to their mutual benefit, the relationship is called
 - A. parasitism
 - B. symbiosis
 - C. commensalism
 - D. saprophytism
3. The paths followed by impulses during a reflex action are:
 - (i) muscle
 - (ii) sensory neuron
 - (iii) sense organ
 - (iv) association neuron,
 - (v) motor neuron

The correct order followed by impulses is

- (iii); (iv); (ii); (v); (i)
 - (i); (v); (iv); (ii); (iii)
 - (iii); (ii); (iv); (v); (i)
 - (ii); (iii); (iv); (v); (i)
4. Which one of the following glands secretes growth hormone in mammals?

- 35
- A. Pancreas
 B. Pituitary gland
 C. Adrenal gland
 D. Gonads.
5. 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. A mixture of red, white and roan
- 6.

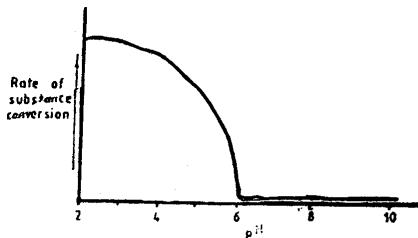


Fig. 1

Figure 1 is a graph showing the effect of increasing pH on the rate of substrate conversion by a digestive enzyme. The enzyme is most likely to be

- A. lipase
 B. trypsin
 C. pepsin
 D. salivary amylase

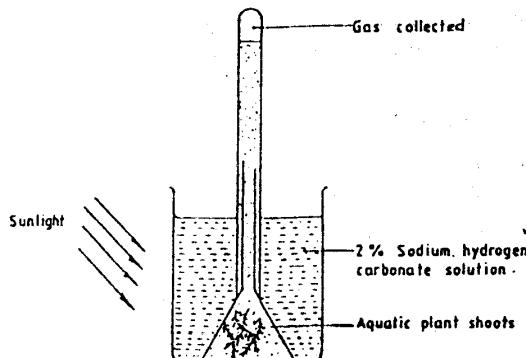


Fig. 2

- Figure 2 shows the diagram of the apparatus that can be used to collect the gas evolved in photosynthesis. Questions 7 and 8 refer to the diagram.
7. Which one of the following would produce the largest volume of the gas in a given time?
- increasing light intensity
 - increasing the temperature
 - increasing the concentration of sodium hydrogen carbonate
 - increasing both light intensity and the concentration of sodium hydrogen carbonate.
8. Sodium hydrogen carbonate is used in the experiment because it
- catalyses photosynthesis
 - supplies carbon dioxide to the aquatic shoots
 - provides a medium in which aquatic plants grow.
 - is absorbed by the aquatic plant to keep the leaves turgid.
9. Which one of the following animals produce the smallest eggs.
- Frog
 - Snake
 - Chicken
 - Elephant
10. Which one of the following will prevent soil erosion?
- Regular hoeing
 - Growth of grass plants
 - Addition of fertilizer
 - Ploughing down the slope
12. Which one of the following is not a difference between a typical plant cell and animal cell?
- Animal cells contain small vacuoles whereas plant cells usually have one or two large vacuoles
 - Animal cells have cell membranes only whereas plant cells have cell walls only.
 - Animal cells are usually flaccid whereas plant cells are usually turgid.
 - Animal cells never contain chlorophyll whereas plant cells do.
13. Natural immunity is developed by
- Taking preventive drugs.
 - Inoculation with mild strain of pathogen
 - Injection with antibiotics to the disease organism
 - Catching the disease and recovering from it.
14. The female mosquito sucks blood because
- it requires iron to make haemoglobin
 - it needs to feed on liquid food at around 37°C
 - it obtains materials essential for egg production

- 37
- D. its mouth parts are designed to pierce the skin of mammals.
15. Which one of the following is the definition of a community?
- Place where an organism lives.
 - Number of species interacting in a locality
 - Nutritional inter – relationships of organisms.
 - Influence of one organism on another.
16. Lack of protein on the diet of a child is responsible for
- kwashiorkor
 - marasmus
 - pellagra
 - rickets.
- 16.

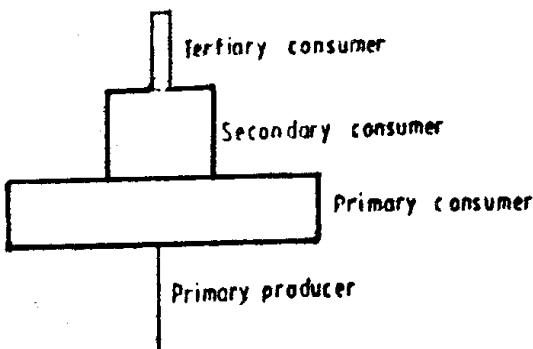
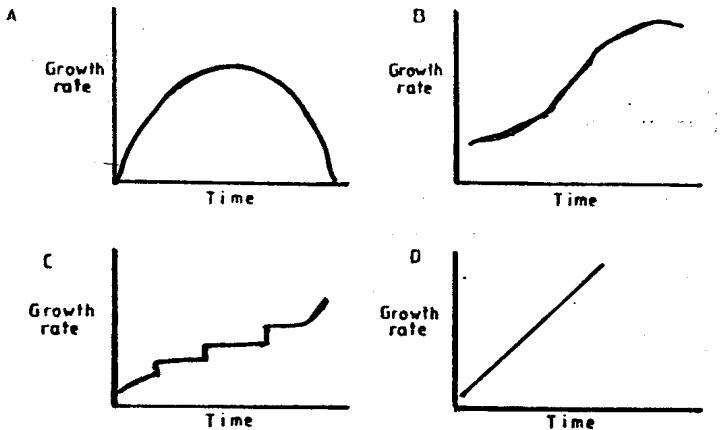


Figure 3 shows a pyramid of numbers for a food chain.
Which of the following could form a link in this chain?

- A herd an antelope on an African plain.
 - A locust swarm on a maize field
 - A plague of caterpillars.
 - Round worms on a child's gut.
17. Which one of the following types of bacteria causes the conversion of ammonia into nitrites and nitrates?
- Nitrifying bacteria
 - Denitrifying bacteria
 - Putrefying bacteria
 - Nitrogen fixing bacteria
18. Which one of the following is one of the characteristics of insects?
- Two pairs of antennae
 - Jointed legs
 - External skeleton
 - Body divided into head, thorax and abdomen.
19. Which one of the following graphs show the growth pattern of an insect?



20. Oxygen is mainly transported in the
- plasma
 - platelets
 - white blood cells
 - red blood cells
21. Which one of the following processes is not linked with transpiration?
- Absorption of water by roots.
 - Transportation of sugars
 - Cooling of leaves.
 - Provision of mechanical support.
22. A plant growth movement in response to a stimulus from external environment is called
- tropism
 - photoperiodism
 - a tactic movement
 - a nastic movement.
23. The following is a list of some parts of the alimentary canal; stomach , ileum , colon and oesophagus.
Which of the following places them in the correct order in which food passes through?
- Stomach , ileum, colon, oesophagus
 - Oesophagus, stomach, ileum, colon
 - Oesophagus, stomach, colon, Ileum.
 - Stomach, colon, oesophagus, ileum
24. Which one of the following is not an example of excretion?
- A man sweating
 - A tree dropping its leaves
 - A dog salivating
 - A goat exhaling.
25. Some of the following events occur when seeds epigeal germination:

- (i) testa splits
- (ii) hypocotyl grows fast.
- (iii) Epicotyl grows fast
- (iv) Cotyledons appear above the ground
- (v) Cotyledons remain below the ground.

Which of the following are the events that occur?

- A. (i), (iii) , (iv)
 - B. (i) , (iii) , (v)
 - C. (iii), (iv), (v)
 - D. (i), (ii), (iii)
26. Which one of the following equations best represents the overall process of photosynthesis?
27. The function of a ligament is to
- A. link a bone to muscle
 - B. link a bone to bone
 - C. provide lubricating fluid at joints.
 - D. Provide cushioning at movable joints.
28. Which one of the following is the best description of respiration?
- A. Breathing in oxygen and breathing out carbon dioxide.
 - B. Absorption of oxygen in the alveoli.
 - C. Release of energy in the cell.
 - D. Gaseous exchange.
29. Which one of the following functions of the skeleton applies only to insects?
- A. Providing camouflage
 - B. Protection
 - C. Levers of locomotion
 - D. Determining body shape exactly
30. Fertilization is said to have occurred when.
- A. a sperm has reached the ovum
 - B. pollen grains of the same species have reached the stigma.
 - C. A pollen tube nucleus has reached the ovule .
 - D. Nuclei of the male and female gametes have fused.

SECTION B

- 31.a. Figure 4 shows the vertical section of a mammalian heart.

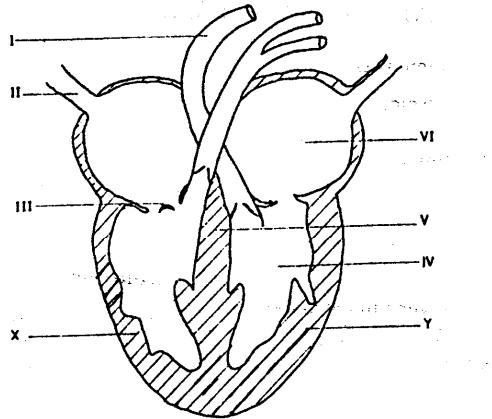


Fig. 4.

- a. Name the parts labelled (I) - VI.
 b. What is the function of the structure labelled (III)?
 c. Which side of the heart contains deoxygenated blood?
 d. Explain why wall Y is thicker than wall X.
-
- e. Complete the following table by naming the main artery and vein which serve the parts of the body listed in the first column.

Part of body	<i>Main artery</i>	<i>Main vein</i>
Lungs		
Liver		
Kidney		

- f. Why is it an advantage for blood to pass through the heart twice on order to circulate around the body?
32. A potted dicotyledonous plant was placed in darkness for three days. Four leaves A, B, C and D from the plant were then treated, as shown in the table below, without removing the leaves from the plant.

Leaf	Treatment	Observation after iodine test

A	Upper surface only coated with petroleum jelly	
B	Lower surface only coated with petroleum jelly	
C	Both upper and lower surface only coated with petroleum jelly	
D	Both surfaces were not coated	

- 41
- a. Record, in the table above, the expected colour change for each leaf after treatment with iodine solution. Use the following phrases: intense blue black; faint blue black; very faint blue black; and yellow brown.
- b. Give reasons for the colour change you record in (a) for each of the leaves A, B, C and D.
- 33.a. Complete the table below by stating one function and one effect of deficiency in flowering plants for each of the elements listed.

Element	Function	Effect of deficiency
Nitrogen		
Phosphorous		
Magnesium		

b. Name the symptoms caused by the deficiency of each of the following elements in the diet of man.

- (i) Iodine.....
- (ii) Calcium.....
- (iii) Iron.....

34.

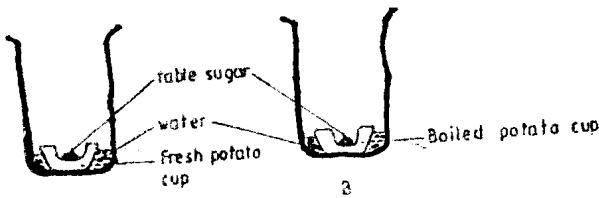


Fig. 5

Figure 5 shows the set up of an experiment to investigate osmosis.

a) What is meant by the term 'osmosis'?

- 42
- b) If the set up was left to stand overnight, state what was observed.
(i) in A.....
(ii) in B.
- c. Explain your observation
(i) in A.....
(ii) in B.

SECTION C

35. a. What is 'tissue respiration'?
b. Explain why tissue respiration is an important process.
c. Describe an experiment to show that germinating seed liberate carbon dioxide
36. a. Outline the importance of water to green plants.
b. Explain how water moves from the soil through a tall tree to the atmosphere.
37. a. Briefly describe the digestive processes that take place in
(i) the duodenum
(ii) the ileum
a. How is the absorption surface of the alimentary canal adapted for its function?
38. a. State , giving two examples in each case, what is meant by the following terms:
(i) Voluntary action
(ii) Involuntary action.
b. A person touches a hot object with a finger and the hand is quickly withdrawn. Give a full account of what happens from the moment the object is touched up to the time the hand is withdrawn.

ANSWERS BIOLOGY PAPER 553/1

SECTION A

1 - C	7 - D	13 - D	19 - C	25 - A
2 - B	8 - B	14 - B	20 - D	26 - D
3 - C	9 - A	15 - A	21 - D	27 - B
4 - B	10 - B	16 - B	22 - A	28 - C
5 - D	11 - C	17 - A	23 - B	29 - D
6 - C	12 - D	18 - A	24 - C	30 - D

- 43
- 31.
- i) Aorta
 - ii) Venacevo
 - iii) Tricuspid Valve
 - iv) Left Ventricle
 - v) intra ventricular septum
 - vi) Left atrium.
- b. Allow deoxygenated blood to pass from the right atrium to the right ventricle,
- c. Right side.
- d. Wall Y has to pump blood round the whole body while X pumps blood only to the lungs.
- e.
- | Part of body | Main artery | Main vein |
|--------------|-------------|---------------------|
| Lungs | Pulmonary | Pulmonary |
| Liver | Hepatic | Hepatic Portal Vein |
| Kidney | Renal | Renal |
- f. Deoxygenated blood first enters the heart, then sent to the lungs for oxygenation, oxygenated blood is then passed back, into the heart to be pumped to the rest of the body at a high pressure.

32. a.

Leaf	Observation after iodine test
A	Very faint blue black
B	Faint Blue black
C	Yellow brown
D	Intense blue black

- b. **A:** Upper surface has been coated and so blocked and yet it has a number chloroplasts which absorbs light necessary for photosynthesis, so the very faint blue black colour
- B:** Lower surface has stomata which allow gaseous exchange, but it has been coated with the jelly so covering the stomata. Upper surface has chloroplasts to absorb sun light necessary for photosynthesis this is not coated, so the faint blue black colour

C: Both surfaces are coated, there will be no starch formation, hence the colour of iodine which is yellow brown is obtained

D: Both surfaces are not coated, so there will be adequate starch formation leading to the intense blue black colour of iodine

32.

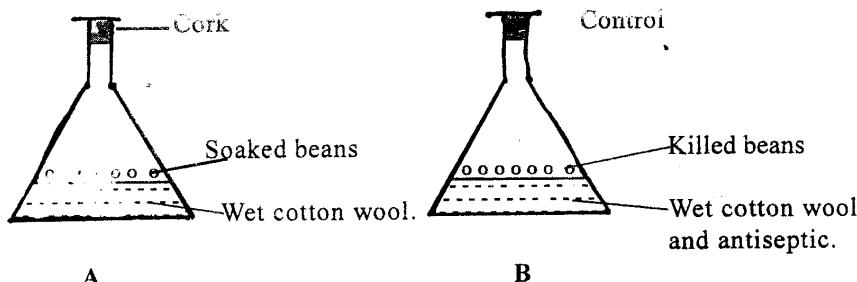
Element	Function	Effect of deficiency
Nitrogen	Gives plant leaves a deep green colour.	Chlorosis or yellowing of leaves.
Phosphorus	Early root formation	Poor development of WOoS.
Magnesium -	Formation of Chlorophyll in leaves	Interveinal Chlorosis

- b. i) Iodine: Swelling of thyroid gland.
The disease: Goitre.
- ii) Calcium: Poor bone and teeth development
The Disease: Rickets.
- iii) Iron: Reduced red blood cell count and oxygen transport resulting in Anaemia.
- 34.a. Osmosis is the passage of water molecules from a weak to a strong solution through a semi permeable membrane.
- b . i) In A : The sugar in the fresh potato would be dissolved and the fluids would accumulate in the 'Cup' .level of water in the beaker decreases
- ii) In B: There will be no water observed in the 'cup' and the volume of water in the beaker stays the same.
- c.i) In A – Fresh potato is capable of carrying osmosis.
- ii) In B – Boiled potato does not carry osmosis. Boiling destroys the cell membrane which is no longer semi permeable.

SECTION C

- 35.a** Tissue respiration is the process by which energy is released in cells . In the presence of oxygen, glucose is oxidized to produce carbondioxide, water and energy.
- b. It releases energy for use by the organism for growth and muscular contraction.
- C Experiment that germinating seeds liberate carbon dioxide.

Apparatus –wet cotton wool, two flasks , soaked seeds, boiled seeds ,antiseptic.



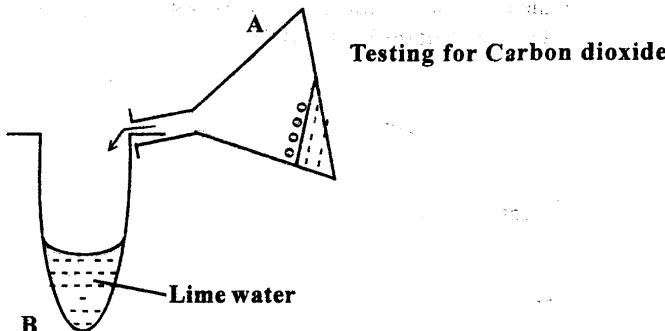
Procedure

Wet cotton wool is placed in two flasks A and B. soaked seeds are added to A and equal number of boiled seeds to B . Flask B should contain a little antiseptic to prevent fungal or bacterial growth, which might produce carbondioxide.

The flasks are securely covered and left in the same conditions of light and temperature until germination is clearly seen in A. The seeds in B should not germinate.

The gases in each flask are then tested by removing the cork and tiling the flask over a test tube of limewater and then shaking up the test tube.

Result



246
The air from flask A should turn the lime water milky. Air from B has no effect.

Conclusion: During germination seeds give out carbodioxide

- 36.a. transport water from soil up to the leaves .
- Dissolves and transports mineral salts
 - A basic raw materials for photosynthesis.
 - For cooling of higher plants.
 - Solvent for organic compounds
 - A major constituent of proto plasm
- b. The water enters the roots by osmosis and rises up the stem partly by being pushed from below and partly by being pulled from above. The pushing force is known as root pressure.
The pull from above called the transpiration pull is created by the evaporation of water from the leaves.

Water is passed from cell to cell into the center of the root until it enters xylem vessels and is carried up the root in the transpiration stream.

37.a. i) **Duodenum**

- Presence of food in the duodenum stimulates the duodenal walls to produce secreting which stimulates the liver to produce Bile;
- Bile is secreted to the duodenum via the Bile duct ; Bile emulsifies fats ; pancreas produces pancreatic juice, which contains three enzymes , amylase converts starch to maltose .
- Trypsin converts, proteins to peptides and amino acids.
- Lipase converts fats to fatty acids and glycerol.

ii) **The ileum.**

- Final digestion and absorption takes place.
- Erepsein or peptidase converts peptides to amino acids
- Sucrase converts sucrose to glucose and fructose.

- Lactase converts lactose to glucose and galactose.
 - Maltose converts maltose to glucose
 - Lipase converts fats to fatty acids and glycerol .
- b. **Adaptation**
- Long therefore presents a large surface area for absorption
 - Thin epithelium so fluids can easily diffuse through them
 - Has thousands of villi therefore presents a large surface area for absorption.
 - Numerous blood capillaries for absorption of food.
- 38.a.i) Voluntary action – A result of a conscious decision or act of will affected by the cerebrum
- Examples: Scratching your head, picking a chair, running instead of walking.
- ii) **Involuntary Action:** A result of an unconscious activity or without the control of the will.
- Example: swallowing ,sneezing
- b. The stimulus is the heat of the object. This is detected by the temperature receptors in the skin, which send impulses through the sensory neurons to the brain and spinal cord.
- From here interpreted message are transmitted through an intermediate or relay neuron to a motor neuron and back to the effectors which are the muscles of the arm . The biceps contracts triceps relaxed and one with draws the arm

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1987

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided.

SECTION A: (30 MARKS)

Attempt all questions in this section by writing in the box provided, the letter representing the most correct answer.

1. The increase in girth of woody stems is due mainly to the formation of
 - A. sclerenchyma fibres.
 - B. Secondary xylem
 - C. Secondary phloem
 - D. Secondary cortex.
2. 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 green plants back into the soil.
 - C. Digging live green plants back into the soil
 - D. Addition of artificial fertilizers to the soil.
3. The following shows hypothetical results from an experiment to determine the water ad humus content of a garden soil.
 - weight of a crucible - P_g
 - weight of a crucible + soil = Q_g
 - weight of a crucible + soil after drying to constant weight = R_g .
 - Weight of crucible + soil after heating to red hot = S_g .Which one of the following expressions gives the percentage of the humus content of the soils?
 - A. $\frac{R_g - P_g}{S_g - P_g} \times 100\%$
 - B. $\frac{R_g - P_g}{Q_g - P_g} \times 100\%$
 - C. $\frac{R_g - S_g}{Q_g - P_g} \times 100\%$
 - D. $\frac{R_g - S_g}{Q_g - S_g} \times 100\%$
4. What stage of cell division is represented in the diagram below?

- 249
- A. Anaphase.
 - B. Prophase
 - C. Metaphase
 - D. Telophase.
5. Which of the following plant food storage organs contains most of the food substance?
- A. Stem tubers.
 - B. Root tubers.
 - C. Fruits
 - D. Seeds.
6. Which one of the following is the correct order of food movement on the gut of a ruminant?
- A. Rumen → reticulum → psalterium → abomasum.
 - B. Reticulum → rumen → abomasums → psalterium.
 - C. Rumen → reticulum → abomasums → psalterium:
 - D. Reticulum → rumen → psalterium → abomasum.
7. which one of these diseases is caused by hormonal deficiency?
- A. Scurvy
 - B. Diabetes
 - C. Rickets
 - D. Poilimyelitis.
8. The nucleus on the embryo sac that fuses with male nucleus to form a zygote on a flowering plant is.
- A. polar nucleus
 - B. antipodal nucleus
 - C. synergid nuclues
 - D. egg nucleus
9. Under what condition is lactic acid likely to be accumulated on man?
- A. During sleep.
 - B. When engaged on a vigorous physical exercise
 - C. After breathing on excess carbon dioxide
 - D. After consuming a lot of malt.
10. A person with blood group **O** is said to be a universal donor because
- A. lacks antibodies on his serum
 - B. has both the antigens and antibodies in his blood
 - C. has only antigen **A** in his red blood cells.
 - D. Lacks antigen on his red blood cells.

11. Fig. 1 below, shows the changes in the dry weight of seedlings during germination.

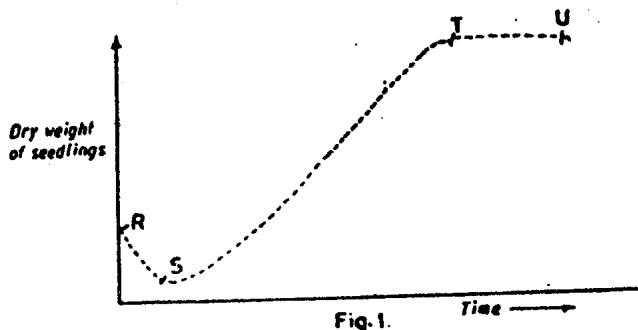


Fig. 1.

The dry weight of seedlings decreased between R and S because

- A. Stored food is used up for respiration and growth.
- B. Mineral salts are lost to the soil.
- C. The seedlings lose water through transpiration
- D. Bacteria present on the soil also consume some of the food stored.

12. The reason for the more or less constant dry weight as shown between points T and U in Fig 1 is because

- A. the growth of seedlings continues at a steady rate .
- B. the seedlings stop feeding.
- C. The seedlings have died
- D. Growth of seedlings ceases but they continue to feed.

13. Which of the following characteristics are true of all Arachnids?

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

14. Which one of the following expressions can be used to determine the magnification power of a microscope? The magnification of the eye piece

- A. \times the magnification of objective lens
- B. $+$ the magnification of objective lens.
- C. \div the magnification of objective lens.
- D. $-$ the magnification of objective lens.

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15. When a semi – permeable membrane is placed between a weak and strong aqueous solution, the molecules of water move across it, until equilibrium is established. Which one of these statements below illustrates this situation?
- The contents of human small intestines and the neighbouring blood capillaries
 - Entry of water from soil to root hairs of a plant.
 - The removal of excess water from the kidneys.
 - The collection of sweat from blood vessels to the skin surface.
16. A medium of low pH stops the action of
- Pepsin
 - Lipase
 - Ptyalin
 - Maltose
17. Which one of the following is a function of thyroxin?
- Controls water reabsorption in the body
 - Controls basic metabolic rate in vertebrates.
 - Regulates activities of other endocrine glands.
 - Controls the functioning of the thyroid glands.
18. The type of muscles found in the gut, excretory systems and blood vessels of a mammalian body is described as
- striped
 - skeleton
 - voluntary
 - involuntary.
19. During the development of a mammalian embryo four structures develop around the embryo, named
- (i) allantois
 - (ii) chorion
 - (iii) amnion
 - (iv) yolk sac.
- Which of these are protective membranes?
- (ii) and (iii)
 - (i) and (iv)
 - (iii) and (iv)
 - (i) and (ii)
20. A vertebra has a short neural spine canal, and a vertebral arterial canal. From this description , the vertebra belongs to
- cervical region
 - thoracic region
 - lumbar region
 - caudal region
21. The following are advantages of vegetative propagation except

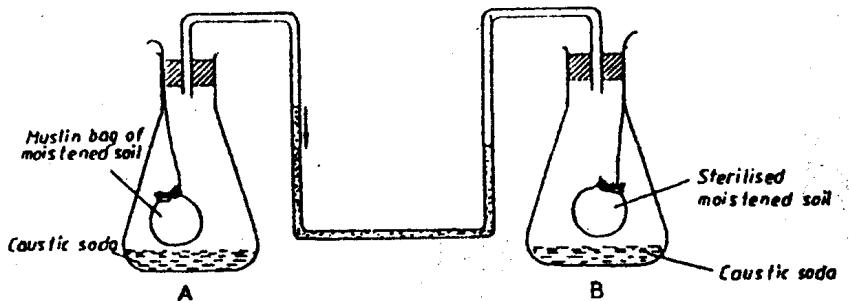
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- A. maintenance of parental characteristics in the offspring.
B. Early maturity of the offspring.
C. Production of more vigorous offspring.
D. Possibility of raising offspring where otherwise would not grow.
22. Which one of the following organisms does not use blood to carry oxygen within its body?
A. Fish
B. Bee
C. Snake
D. An earthworm
23. Which one of the following is common respiration and photosynthesis?
A. Energy is released
B. Both occur in all living cells
C. Food oxidations is common to both
D. Oxygen , carbon dioxide and water are involved.
24. In mammals ; the anti – diuretic hormone (ADH)
A. Stimulates the reabsorption of water in the urineferous tubules.
B. Inhibits the reabsorption of water on uriniferous tubules.
C. Inhibits the action of osmoreceptors regulate the osmotic pressure of blood.
D. Stimulates the nephron so that there is an increase in the formation of the glomerular filtrate.
25. 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.
26. 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.
27. Simple aquatic plants containing chlorophyll and usually with bodies not differentiated into root, stem and leaves are
A. fungi
B. liverworts
C. mosses
D. algae
28. Which one of the following is a modifies taproot?

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29. A. Carrot tuber
B. Onion bulb
C. Cassava tuber
D. Sweet potato tuber
29. In an experiment a stem of a young herbaceous plant was cut into equal strip pieces and each placed in a solution.
- 1st into 5% salt solution
 - 2nd into 2.5% salt solution
 - 3rd into 1% salt solution
 - 4th into 0.5% salt solution
- Which of the pieces is most likely to be short and flaccid?
- A. 1st piece
 - B. 2nd piece
 - C. 3rd piece
 - D. 4th piece
30. Choose the most suitable description of sieve tubes in plants. They are made of
- A. dead cells and transport water in plants
 - B. living cells and transport water in plants
 - C. dead cells and transport food from leaves to other parts of the plant.
 - D. Living cells and transport food within the plant

SECTION B

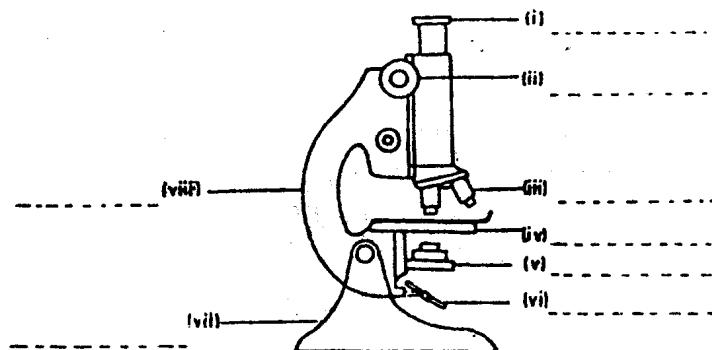
31. (a) Explain briefly what you understand by the terms:
- (i) Meiosis.....
 - (ii) Mitosis.....
- (b) Where do meiosis and mitosis occur?
- (c) A plant with yellow leaves was crossed with a plant with green leaves. The gene for yellow leaves is recessive to that of green leaves. The odd spring obtained were all green .
- (i) What is the genetic ratio if F_1 is called selfed?
Show your working.
.....
- (ii) What is the phenotypic ratio of F_1

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



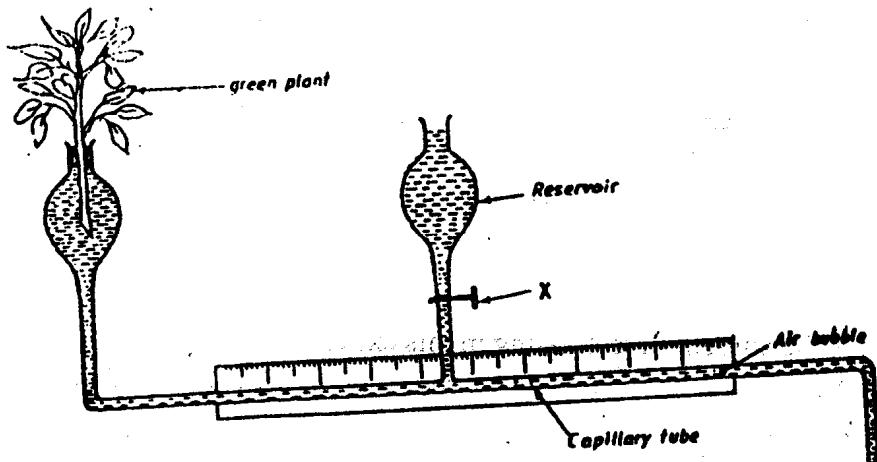
- a. (i) What is the student investigating in this experiment?
.....
(ii) Which of the flasks acted as a control?
.....
- b. What is the use of the caustic soda solutions on flasks A and B?
.....
- c. What would you observe if the experiment is left to continue for a few days? Explain your observation.

33. Fig. 11 is a drawing of an instrument used in a laboratory.



- a) Identify the instrument.
.....
- b) Name the parts labelled (i) – (viii) in the spaces provided on the diagram .

- b. What are the functions of (I), (ii) , (iv) and vi)?
34. Fig III below shows an experimental set up.



SECTION C.

35. Recently there has been a campaign on tree planting in Uganda. Outline the importance of forest on wildlife conservation in Uganda.
- 36.a) What is meant by the term metamorphosis?
b) Describe the changes that occur during frog or toad metamorphosis.
- 37..a) What is photosynthesis?
b) List the conditions necessary for photosynthesis.
c) Describe an experiment to show that any one of the named conditions is necessary for photosynthesis.
38. a) Name the constituents of the mammalian blood
b) Give three structural differences between an artery and a vein
c) What are the differences on blood content between the blood carried by hepatic portal vein and hepatic vein.

ANSWERS - 1987 SECTION A

1 - B	7 - B	13 - C	19 - A	25 - C
2 - C	8 - D	14 - A	20 - A	26 - B
3 - C	9 - B	15 - B	21 - C	27 - D
4 - A	10 - D	16 - C	22 - B	28 - A
5 - B	11 - A	17 - B	23 - B	29 - A
6 - A	12 - D	18 - D	24 - A	30 - D

SECTION B

31a. i) **Meiosis:** - Cell division involving two successive cell divisions resulting in four daughter cells each containing half the number of chromosomes in the original cell.

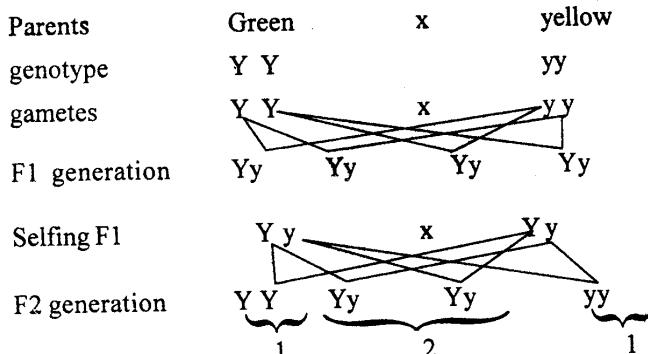
ii) **Mitosis:** - Cell division following duplication of chromosomes in which two daughter cells are formed each having exactly the same chromosome number as the parent cell.

b. Meiosis occurs in germinal cells namely the testes in male animals and ovaries in female animals meiosis in plants occurs in the anthers and ovaries of flowers.

Mitosis occurs in somatic cells, Malpighian cells of epidermis, epidermal cells of the gut, bone marrow.

In plants mitosis occurs in the apical meristems and cambium.

c. i) Let yellow be y
Let green be Y



Genotypic ratio when F1 is selfed is 1 : 2 : 1 i.e. 1 YY ; 2 Yy ; 1 yy.

ii) Phenotypic ratio of F2 = 3 : 1 i.e. 3 Green : 1 yellow.

32.a.i) That the soil contains microorganisms that will respire.

ii) Flask B

b. To remove any carbon dioxide produced in the flasks.

c. Originally there is an equal amount of air in both flasks. The microorganisms in the flask A use oxygen during respiration and give out carbon dioxide which is absorbed by the caustic soda thus reducing the pressure in flask A causing the rise in the water in the U tube on the side or flask A.

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- 33.a. A microscope
b. i) Eyepiece
ii) Coarse adjustment
iii) High power objective
iv) Stage
v) Iris diaphragm
vi) Mirror
vii) Base
viii) Arm.
- c. i) Is where the specimen is observed from and it magnifies the specimen
ii) Moves the stage up and down to allow focussing.
iv) The platform on which the specimen is laid,
vi) Used to reflect light through the specimen.
34. a. Potometer.
b. i) Wind helps to remove the water vapour in the air around the leaf or plant and increases the rate of transpiration so the air bubble moves very fast.
ii) The rate of transpiration is high during the presence of light. This is because light affects opening of the stomata and provides energy as heat for the evaporation of the water so the air bubble moves faster.

SECTION C.

- 35.
- Habitat for monkeys, birds , insects.
 - Water catchment which is important in maintaining the climate .
 - Protection of species of both plants and animals which live there
 - Wind breakers for farmland and settlement.
36. a . Metamorphosis is a change inform during the development of an organism from egg to adult stage.
- b.
- Eggs are laid by females followed by fertilization in water [external fertilization].
 - After 30 hours –Hatching of eggs into larva or toad poles. Breathing is by external gills .4-8 days –special sense organs develop e.g. nasal sacs, eyes and inner ears, mouth develops followed by horny jaws with small teeth.

- 4 weeks .The external gills become replaced by external gills and operculum develops 8 weeks –limb buds appear which gradually develop into paired limbs hind limbs appearing first .
- A pair of lungs develops
- 10 weeks –The tad pole undergoes sudden metamorphosis into the adult which can live on land.

37 a. Photosynthesis is the processes by which living plant cells manufacture their own food in form of carbohydrates from carbondioxide and water using sun light energy.

- b.
1. presence of chlorophyll
 2. Presence of carbondioxide
 3. Presence of light
 4. Optimum temperature
 5. Water presence

Experiment:

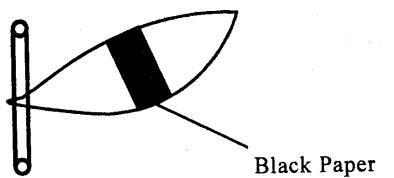
To show that light is necessary for photosynthesis

Apparatus ;

Black paper or aluminium foil ,detached leaf ,beaker ,white tile ,alcohol ,iodine test tubes.

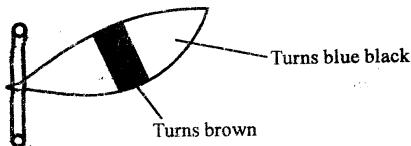
Method :

A strip of black paper or [aluminium foil] is attached on the destached leaf .After 4-6 hours of light the leaf is detached and tested for starch. The uncovered part of the leaf is used as a control .



Observation

The part of the leaf covered with black paper turns brown while the uncovered part of the leaf turned blue black with iodine



Conclusion : The part covered with black paper did not have any starch while the uncovered part had it. The covered part did not receive sunlight. Therefore light is necessary for photosynthesis.

38 a. Blood cells namely; Red blood cells ,white blood cells , platelets ,blood plasma .The constituents of plasma include , water , proteins , glucose ,lipids, aminoacids, salts ,enzymes hormones ,antigens ,antibodies ,urea

b. Differences between an artery and a vein

Artery	Vein
1. Have thick walls	1. Have thin walls
2. Have more elastic fibres.	2. Have elastic fibres.
3. Have a smaller lumen relative to diameter	3. Have a wider lumen relative to diameter.

blood in the hepatic portal veins carries blood rich in digested food such as amino acids and glucose to the liver.

Hepatic vein carries deoxygenated blood from the liver to be taken back to the lungs for oxygenation .

553/1 BIOLOGY (Theory) Paper 1 Oct./Nov. 1986

2 hours 30 minutes

SECTION A. (30 MARKS)

- Which of the following is not a kingdom in the classification of living things?
A. Monera B. Fungi C. Protista D. Plantae
- Select the organism that belongs to a different class from the others.
A. Flea B. Mite C. Scorpion D. Tick
- Which of the following cannot be used to put plant specimens into different groups?
A. Shape of leaves B; Size of leaves C. Type of venation D. Type of root system

4. A scientific name consists of two words. To which groups do they belong?
A. Genus and class
B. Genus and order
C. Genus and species
D. Genus and family

5. The following organisms are made up of cells except
A. Amoeba B. Tapeworm C. Virus D. Yeast

6. The following characteristics are found in Arthropods. Which one is only found in some?
A. Exoskeleton B. Segmented bodies C. Compound eyes D. Jointed limbs

7. Which of the following features is not characteristic of monocotyledonous plants?
A. Parallel venation B. Leaf sheath C. Soft stem D. Tap root

8. The following organisms have scales except
A. Catfish B. Dove C. Tilapia D. Tortoise

9. Select the animal that has different types of teeth (is heterodont).
A. Gecko B. Monkey C. Toad D. Vulture

10. The best method of finding out the number of trees of a particular species in a forest is
A. Quadrant method. B. Line transect method.
C. Capture-recapture method. D; Direct counting.

11. A student viewed a specimen on a slide using a microscope. He used a x 10-eye piece and a x40 objective. The magnification of the image he saw was
A:x4 B:x50 C. x400 D:x410

12. A number of organisms of different species living in a particular locality is called
A. A community B. A population C. An ecosystem D. A habitat

13. Which type of leaf arrangement is represented here?
A. Alternate B. Spiral C. Opposite D. Whorled

14. A group of cells that are co-ordinated to perform a particular function is called
A. An organ B. A system C. A tissue D. An organism

15. Friesian and Boran cattle belong to the
A. Same genus but different species
B. Same species but different varieties
C. Same order but different genera

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- D. Same family but different orders
16. When a sample of soil is shaken with water and then left to settle, which of the following would settle first?
A. Silt B. Sand C. Clay D. Gravel
17. Which of the following soil characteristics does not directly affect plant growth?
A: pH B. Particle size C. Air content D. Water content
18. Which of the following is not a role of soil organisms?
A. Aerating soil B. Adding humus to soil.
C. Weathering rock. D. Removing nitrogen from soil.
19. Select the statement that is incorrect.
A. Clay helps soil to retain water. B. Humus helps soil to retain water.
C. Some of the water in clay is not available to plants.
D. All the water in the soil can be absorbed by root hairs by osmosis.
20. Which of the following does not improve the crumb structure of soil?
A. Green manuring. B. Mixed fanning.
C. Artificial fertilisers. D. Crop rotation.
21. Capillarity is responsible for movement of water
A. Upward in soil
B. Down to deeper layers in soil
C. Horizontally in soil
D. Down the slope
22. In which of the following is loss in surface soil greatest?
A. gully erosion B. Rill erosion C. Sheet erosion D. Splash erosion
23. Water retention is highest in
A. Loam soil B. Sandy soil C. Clay soil D. Gravel
24. Which of following is not a human activity?
A. Deforestation B. Overgrazing C. Afforestation D. Overstocking
25. Which of the following statements is incorrect?
A. Sand is silicon oxide.
B. Clay is complex of aluminium and silicon oxides.
C. Iron oxide gives a red or brown coating to soil particles.
D. Crumb structure of soil depends entirely on its humus content.
26. When a mixture of soil and water was allowed to settle, the water above was brown in colour. This was due to the presence of particles of ____
A. Silt B. Sand C. Clay D. Gravel
27. Which of the following is not an effect of soil erosion?
A. Loss of soil
B. Reduction in soil fertility.

- C. Flooding due to siltation.
D; Increase in water level due to siltation.

28. In the sandy soil, select the range that represents the diameter of sand particles.

A. Less than 0.002mm B. 0.02 to 0.002mm
C. 2 to 0.02mm D. Greater than 2mm

29. Which of the following processes does not add carbon dioxide to the air?

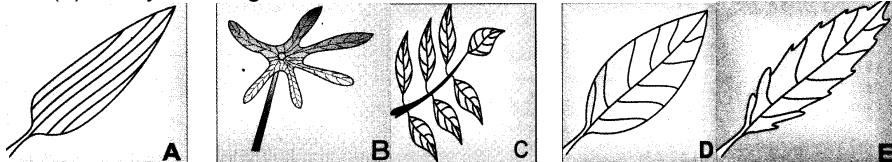
A. Respiration B. Decomposition C. Photosynthesis D. Burning

30. The following cause soil degradation except

A. Capillarity B. Leaching C. Soil erosion D; Soil exhaustion

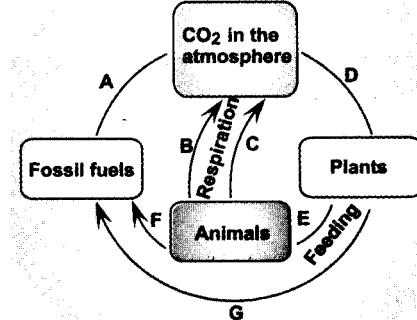
SECTION B

32. (a) Study the diagrams A-E and state three observable features of each.



- b) Using observable features only, construct a dichotomous key that can be used to identify the specimens.

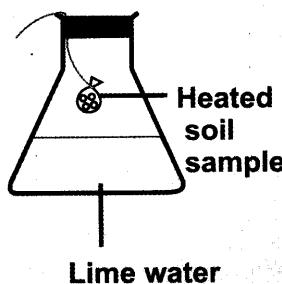
33. Figure 3 summarizes how carbon is recycled in nature. Study it and answer the



following questions.

- a) Complete arrows A, D and E.
 - b) Label arrow A, C, D and F.

- c) What is the importance of the carbon cycle in nature?
 - d) What is the role of micro-organisms in the



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soil sample and divided it into two halves. One of the halves was heated strongly. They then set up an experiment as shown in Figure 4.

- a) What was the students' aim?
- b) Why was the soil sample heated strongly?
- c) Make a labelled diagram to show how a suitable control would be set up.
- d) What would be observed after two days?
- e) What is the importance of macro-organisms in soil?

SECTION C

35. (a) List any structural differences between a stem and a root.

b) What are the functions of a stem?

c) What adaptations of stems enable them to serve additional functions?

36. (a) In what ways does the lifecycle of a housefly differ from that of a cockroach?

b) Giving examples, explain how insects can be useful and harmful to people.

c) What adaptations of insects enable them to transmit diseases?

37. (a) Name the chief agents of weathering and explain how they bring about breaking down of rocks to form soil.

b) What other process is involved in the formation of soil and explain its role?

38. (a) State the difference between clay soil and sandy soil.

b) John bought a piece of land where the soil is sandy. (i) What disadvantage does it have if John intends to grow crops on it?

(ii) What advice would you give him to improve on that soil?

ANSWERS TO REVISION QUESTIONS

SECTION A

1.C.	6.C	11. C	16.D	21. A	26. C
2. A	7.0	12. A	17. B	22. B	27. D
3.B	8. A	13. C	18. C	23.C	28. C
4.C	9.B	14.C	19. D	24.B	29. C
5.C	10. B	15. B	20. C	25. D	30. A

SECTION B

31. (a) Microscope

- b) A - Eye piece, B - Barrel (tube), C -Objective lens, D – Stage, E – Mirror,
G — Limb (arm), F - Stand (base), H - Fine adjustment knob
I - Coarse adjustment knob

c) Functions of the parts

- A - The part one looks through. Has a lens that magnifies the image.
C - Magnifies the image.
D - Slide is placed on the stage.
E — Receives light and reflects it so that it passes through the hole on the stage to the specimen.
F — Keeps the microscope still and stable.
G - Supports the lenses and stage H and I - Used to focus the microscope so that one can see the specimen.
- d) (i) The slide should be clean to ensure that the object placed on it is the only thing to be seen.
(ii) The coverslip protects the objective lens from any liquid on the specimen.
(iii) The hole enables light to get to the specimen.

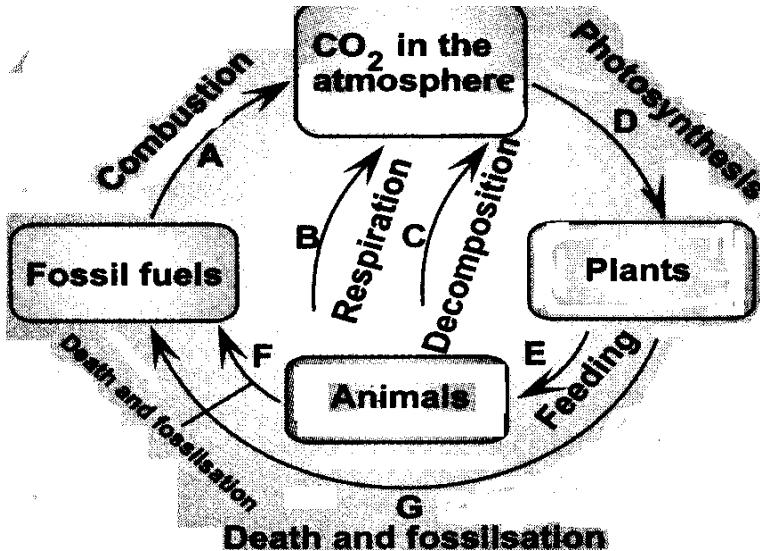
32. (a) A- Has a leaf sheath. Has parallel veins. Has hairs.
B - Has a stalk. Blade is divided into 6 lobes. Has network of veins.
D Has a stalk. Has entire margin. Has network of veins.
E - has a stalk has serrated margin has network of veins

b) This key below is just an example. Many correct keys can be made. To find out if a key is correct, use it to identify the specimens. A correct one will enable you to identify all.

Dichotomous key

1. Has leaf sheath..... A Has leaf stalk.....go to2
2. Blade divided into leaflets..... C Blade not divided into leaflets... go to.....3
3. Has serrated margin.....E Has entire margin.....go to.....4
4. Blade divided into lobes..... B Blade no divided into lobes.....D

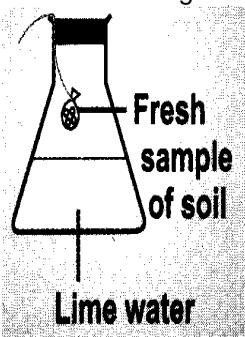
33. (a) and (b)



- c) It enables carbon **used** by plants and animals to be returned to the atmosphere. The plants can then use it again to produce food for themselves-and other living organisms.
- d) Micro-organisms speed up the rate of decomposition, one of the process that returns carbon dioxide to the air.

34. (a) To show presence of micro-organisms in soil.

b) To kill micro-organisms in the soil. Figure Z



- c)
- d) The lime water in the experiment would be colourless while that in the control experiment would have turned white or cloudy.
- e) Macro-organisms:
- Aerate soil when they burrow, e.g earthworms.

- Take the organic matter they feed on into the soil, e.g plant material.
- When they feed on organic matter they cut it into small pieces and digest some, adding humus to the soil.

SECTION C

35. (a) Differences between a stem and a root

Stem	Root
Has nodes	Has no nodes
Has buds	Has no buds
Vascular bundles not in the centre	Vascular tissues are in central position
Has no root hairs	Has root hairs

b) Supporting leaves, buds.

- Hold out leaves so they can get light and carbon dioxide .
- Holds out flowers so they can be reached by pollinating agents.
- Conduction of water and salts from roots to leaves.
- Conduction of food from leaves to other parts.

c) May be modified to corms, rhizomes, tubers for storage of food. All these become swollen with food.

May be modified for vegetative reproduction by having buds e.g. corms, rhizomes, runners etc.

Some are modified into tendrils, which grow around supports, thus enabling the plant to climb.

36. (a) Differences between the Lifecycles of a housefly and a cockroach

Lifecycle of a housefly	Lifecycle of a cockroach
4 stages (egg, larva, pupa, adult).	3 stages (egg, nymph, adult).
Larva is very different from adult.	Nymph is similar to adult, differ mainly in size.
Involves breakdown of larval tissues to form adult structures i.e undergoes complete metamorphosis.	Does not involve breakdown of tissues of nymph i.e. undergoes incomplete metamorphosis.

- b) Insects pollinate flowers of plants which are useful to people e.g butterflies, bees.

Some insects are edible and are, therefore, a source of protein e.g. termites, grasshoppers.

Some produce substances that are useful to people e.g. silkworms produce silk, bees produce wax used to make candles and polish. They also produce honey which is used as food and medicine.

Harmful

Some insects spread disease e.g. housefly (dysentery, trachoma, typhoid), mosquitoes (malaria, yellow fever), fleas (plague), cockroaches (typhoid).

Some destroy crops e.g. butterflies (cabbages, citrus fruit leaves, sweet-potato leaves), moths (stems and leaves of maize, sorghum, sugarcane).

Some destroy stored food e.g. bean weevils, rice weevils, maize weevils.

c) Adaptations that enable insects to transmit diseases.

- Hairy body of housefly enable it to carry germs.
- Feeding habits of housefly involves vomiting on solid food so as to dissolve it. It may add any germs that it had picked earlier.
- Housefly feed on variety of food e.g. human food, faeces, vomit etc.
- Mosquitoes (anopheles) are most active during hours when people are asleep.
- Mosquitoes produce a substance that prevents blood clotting. They add it to blood thus ensuring ensure it does not clot when they are feeding.

37. (a) The chief agents of weathering are. oxygen in the air, water, wind, changes in temperatures, plant roots and ice.

How they cause weathering:

Atmospheric oxygen oxidizes rocks, particularly those containing iron. This happens during humid, damp and hot conditions especially in the tropics.

Water dissolves carbon dioxide in the air to form a weak solution of carbonic acid. This acid dissolves some constituents of rocks such as lime. When organic matter decomposes, carbon dioxide is formed. This adds to the carbon dioxide rain water picks from the air. The acid weakens rocks and causes them to crumble. Water in rivers and streams carries solid particles. These may hit rock causing it to weaken and later crack. These cause physical weathering.

Wind carrying pebbles and sand particles during sand storms makes them hit against rocks, thus weakening them.

Sharp changes in temperature cause rocks to expand when temperatures are high and contract when they are low. This causes rock to crack and crumble.

Plant roots secrete an acid which dissolves the rock. This enables roots to grow through rocks when cracks form.

Ice. When water in cracks of rocks forms ice, it makes the cracks expand and the rocks eventually crumble.

b) Decomposition of organic matter adds humus to soil.

38. (a) Difference between clay soil and sandy soil

Clay Soil	Sandy Soil
▪ Small particles	Large particles
▪ Small airspaces	Large air spaces
▪ Contains less air	Contains more air
▪ Retains more water	Retains less water
▪ Low permeability to water (poor drainage)	•More permeable to water (better drainage)
▪ Higher capillarity	Lower capillarity

b) (i) Disadvantages of sandy soil

- Low water retention means the plants may not get enough water for growth.
- Getting less water would lead to getting less salts since they must dissolve in water before they can be absorbed.
- Leaching is fast in sandy soil. This would make salts move down to deeper layers where roots may fail to get them.
- Low capillarity means water may not rise from the water table high enough to be reached by plant roots.

(ii) Add humus to the piece of land.

- The humus would narrow the spaces between the large particles.
- This humus would increase the water retaining capacity.
- It would reduce permeability thus reducing leaching of mineral salts.
- The capillarity of the soil would also improve.

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2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in Sections A and B, plus two questions in Section C. Write the answers to Section A in the boxes provided, answers to Section B in the spaces provided, and answers to Section C in the answer booklets provided

SECTION A

Select the best answer to each question.

1. The following are the main reasons why living organisms need food except
A. To grow
B. To obtain energy
C. To get protection from diseases
D. To move
2. The main reason for including food stuffs containing roughage in the human diet is ____
A. To provide carbohydrates
B. To add bulk to the food .
C. To provide energy -
D. To provide vitamins
3. Which of these is produced during the light-independent stage of photosynthesis?
A. Hydrogen ions (H^+) B. ATP C. Glucose D. Oxygen
4. Select the condition that does not arise from deficiency in diet ____
A. Kwashiorkor
B. Sickle cell anaemia
C. Marasmus
D. Night blindness
5. Which of the following organs serves no other function apart from nutrition?
A. Salivary glands B. Pancreas C. Liver D. Stomach
6. In which of the following organisms is digestion both internal and intracellular?
A. Mucor B. Mammal C. Amoeba D. Insect
7. Which of the following is not a function of the liver?
A. Manufacturing plasma proteins. B. Storing glucose.
C. Storing vitamin A. D. Deaminating excess amino acid.
8. What is the importance of HCl in the equation pepsin
$$\text{Protein} \xrightarrow[\text{HCl}]{\text{Pepsin}} \text{peptides}$$

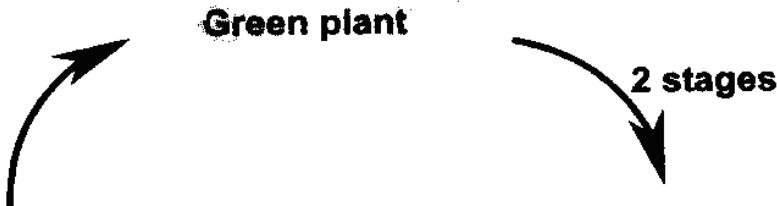
A. To react with the protein.
B. To neutralise the protein.

- C. To kill bacteria in the food.
 D; To provide a suitable P
9. Where in the stomach of a ruminant are bacteria that produce cellulase found?
 A. Abomasum B. Reticulum C. Omasum D. Rumen
10. To which organism does the dental formula,
 3 1 4 2
 i— c - pm - m —, belong?
 3 1 4 3
 A. Cow B. Dog C. Man D. Sheep
11. The carbon dioxide used for photosynthesis by flowering plants is obtained through the
 A. Breathing roots B. Lenticels C. Stomata D. Lower epidermis
12. Which of the following processes require magnesium?
 A. Formation of chlorophyll
 B. Synthesis of protein
 C. Formation of haemoglobin
 D. Formation of bone
13. Select the element that is required by plants in small quantities,
 A. Calcium B. Iron C. Phosphorus D. Manganese.
14. Which of the following processes does not add carbon dioxide to the air?
 A. Respiration B. Decomposition C. Photosynthesis D. Burning
15. The following cause soil degradation except
 A. Capillarity B. Leaching C. Soil erosion D; Soil exhaustion
16. Which form of maize contains most nutrients?
 A. Pop corn B. Corn flakes C. Fresh maize D. Porridge
17. Which of the following enzyme does not catalyse the breaking down of its substrate to simpler substances?
 A. Amylase B. Pepsin C. Rennin D. Lipase
18. Which of the following is not digested?
 A. Maltose B. Dipeptides C. Sucrose D. Galactose
19. In the ruminants the bacteria which produce the enzyme cellulase are found in the _
 A. Caecum and appendix
 B. Rumen and reticulum
 C. Abomasum and omasum
 D. Caecum and colon
20. The function of the canine tooth is
 A. Cutting B. Tearing C. Shearing D. Crushing
21. Which of the following enzymes catalyses the breaking down of starch in the duodenum?
 A. Ptyalin B. Amylase C. Diastase D. Salivary amylase
22. Which of the following does not happen to glucose made during photosynthesis in the plant?

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- A. It is broken down during respiration to release energy.
B. It is converted to starch for storage.
C. It is built into cellulose to form cell walls.
D. It is converted to glycogen for storage.
23. On a cross-section of a leaf. Select the layer that contains the largest number of chloroplasts.
A. Lower epidermis B. Upper epidermis C. Palisade D. Spongy layer
24. In which tissue are sieve plates found?
A. Phloem B. Xylem C. Cambium D. Pith
25. Which of the following is not required for photosynthesis?
A. Water B. Mineral salts C. Carbon dioxide D. Light
26. Select the statement that is incorrect.
A. Caterpillars are herbivorous. B. Tadpoles are herbivorous.
C. Frogs are carnivorous. D. Butterflies are omnivorous.
27. Which of the following is not an adaptation of the ileum for absorbing food?
A. Production of succus entericus B. Length of ileum
C. Presence of villi D. Presence of micro villi
28. The following parasites are surrounded by digested food except _____.
A. Ascaris B. Trypanosome C. Plasmodium D. Tapeworm
29. Which of the following organisms digests its food externally?
A. Housefly B. Mucor C. Amoeba D. Tilapia
30. Which of the following is not stored in plants?
A. Sucrose B. Glucose C. Protein D. Cellulose

SECTION B

31. Figure 3 summarises photosynthesis in green plants.



Requirements

- List the requirements for photosynthesis.
- Name the two stages of photosynthesis and the products of each stage,
- What is the importance of photosynthesis to living organisms?

32. Figure 4 represents Rhizopus, a common mould.

- How does Rhizopus feed?

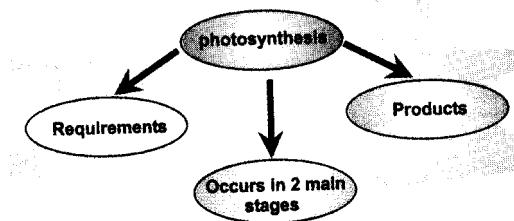
c) State two differences between nutrition in Rhizopus and that in Amoeba.

33. An extract of cabbage leaves was prepared by crushing cabbage leaves with a little water in a mortar. Unheated extract was added dropwise to 2ml of DCPIP in a test tube until the DCPIP lost its colour. Extracts heated for 5 and 15 minutes were tested similarly. The results obtained are shown in the table in Figure 3.

Time extract was heated in minutes	Number of drops of extract that decolourised DCPIP
0	5
5	20
15	20 dye remained blue after 50 drops

- a) What is DCPIP used to test?
- b) What is the effect of heating the extract?
- c) What would happen if (the cabbage is shredded or cut into very small pieces before cooking? Give reasons.
- d) What advice would you give about preparation of vegetables for human consumption?

34. Figure 4 gives some information about nutrition in green plants.



- a) What does a green plant need in order to carry out photosynthesis?
- b) Name the two main stages and state what happens in each of them.
- c) Name the products and give one use of each to the green plant.

SECTION C

35. (a) What is the importance of water to living things?
(b) Describe an experiment you would perform to compare the concentration of vitamin C in an orange and a passion fruit.

36. (a) Outline the chemical changes that starch undergoes in a human digestive system.

b) In what way is the structure of the ileum suited to its functions?

37. (a) What does a green plant need in order to make proteins?

b) Describe an experiment you would perform to show that magnesium is necessary for the healthy growth of plants.

38. (a) What is meant by the following terms:

- Marasmus
- malnutrition
- kwashiorkor

b) What should people do to ensure that they have enough food all the year round?

c) Why are animals that are harbouring parasites likely to be killed and eaten by predators?

ANSWER TO REVISION QUESTIONS 1985

SECTION A

1.D	6.C	11. C	16.C	21. B	26. D
2.B	7.B	12. A	17. A	22. D	27. A
3. C	8.D	13. D	18.C	23. C	28. C
4.B	9.D	14. C	19. D	24. A	29. B
5. A	10. B	15.A	20.B	25. B	30. D

SECTION B

31. (a) Carbon-dioxide, Water, Light intensity and Chlorophyll

b) Stages of photosynthesis and their products

Stage	Products
Light dependent stage (light phase)	<ul style="list-style-type: none">•Hydrogen ions•energy in the form of ATP•Oxygen
Light - independent stage (dark phase)	<ul style="list-style-type: none">•Glucose

- c) •Provides food for the plants, which in turn are used as food by animals.
•Produces oxygen which is used for aerobic respiration to release energy.

32. (a) A - Reproductive hypha. B - Feeding hypha. C - Stolon.

b) Rhizopus derives food from the organic matter on which it grows, e.g bread.

- Feeding hyphae grow into the substrate.
- These hyphae secrete digestive enzymes onto the substrate.
- The enzymes break down the organic matter to soluble absorbable compounds.
- The digested food is then absorbed by the feeding hyphae from where it is passed on to the rest of mould.

d) Differences between nutrition In Rhizopus and Amoeba

e)

Nutrition In Rhizopus	Nutrition In Amoeba
• Does not ingest food	• hood is ingested
• Digestion is external	•Digestion is internal
• Rhizopus grows on its food	• Amoeba doesn't grow on its food

33. (a) DCPIP is used to test for vitamin C.

b) Heating the extract destroys vitamin C.

c) Shredding or cutting into very small pieces increases the surface area through which the cabbage loses vitamin C to the water. Vitamin C is water soluble. The surface area exposed to heat would have also been increased. The cabbage would, therefore, lose vitamin C at a fast rate.

d) If it is possible eat the vegetables raw since they lose vitamins on heating.

- If eaten raw, clean them using boiled salty water that has cooled down to kill any micro-organism on them,
- Treatment with vinegar also kills germs.
- If they need to be cooked, do so only for a short time. This can be done by steaming them or boiling in a little water.

34. (a) The requirements of a green plant are:-

Light, carbon dioxide and water, (no need to mention chlorophyll because the question tells us the plant is green).

b) Light dependent stage (light stage)

- Water is split into H^+ and OH^- ions
- Chemical energy in the form of ATP is produced.
- Both H^+ ions and ATP are used in the dark stage.
- Light independent stage (Dark reaction/stage).
- Carbon dioxide is reduced to produce glucose.

c) The products are glucose and oxygen,

- The plant uses glucose as substrate during respiration to release energy.
- The oxygen is used in aerobic respiration to provide energy.
- used to form proteins, cellulose, starch, etc)

SECTION C

35. (a) Plants use water:

- Plants use water as raw material for photosynthesis.
- Water dissolves mineral salts in soil and the plant can only absorb them when they are in solution.
- Water is a solvent in which materials that are transported within plants and animals dissolve.
- Water is a constituent of protoplasm
- Metabolic activities take place in a water medium.
- Water is necessary for the germination of seeds.
- Water is necessary for fertilisation e.g in fish and amphibia.
- Water is the home of some plants and animals.

b) Aim. To compare the concentration of vitamin C in an orange and passion fruit.

Apparatus and materials:

Test-tubes, dropper, beakers, knife, measuring cylinder, DCPIP, orange, passion fruit.

Procedure:

- Cut the orange and squeeze its juice into a beaker.
- Measure 2 ml of DCPIP and put it into a test-tube.
- Add orange juice to DCPIP drop by drop, until the DCPIP is decolourised.

- Record the number of drops added.
- Repeat procedure using passion fruit.
- Compare the number of drops added in each case.

Conclusion.

The juice which required fewer drops to decolourise the DCPIP has a higher concentration of vitamin C.

36. (a) In the mouth, salivary amylase hydrolyses cooked starch to maltose.
In the duodenum, pancreatic amylase hydrolyses the remaining starch to maltose.

In the ileum, maltose hydrolyses maltose to glucose.

- b)
- c) The lining of the ileum has cells that produce enzymes.
- The lining of the ileum is folded to form villi, which increase the surface area exposed to digested food.
 - The cells of the lining have microvilli on the free surface. These further increase the surface area.,
 - Presence of blood capillaries for absorption of amino acids and simple sugars.
 - Presence of lacteal into which fat droplets are absorbed.

37. (a) To make protein a green plant needs. carbohydrates, mineral salts such as nitrates, sulphates, phosphates and energy (chemical).

b) Aim. To show that green plants need magnesium for healthy growth.

Apparatus and materials

Boiling tubes, millet seedlings, cotton wool, culture solution containing all required elements, culture solutions lacking magnesium, black piece of paper or cloth.

Procedure:

- Put a culture solution lacking magnesium into a boiling tube.
- Use cotton wool to support a millet seedling in the boiling tube, ensuring that the roots reach the culture solution.
- Wrap the tube with black paper to prevent algal growth (die algae would use up the nutrients too).

- Set up a control, using a complete culture solution.
- Observe the experiment for four weeks.
- Make sure the seedlings used are the same size and have the same number of roots and leaves at the beginning.

Observation. The seedlings in the culture solution lacking magnesium will have yellow leaves.

- The seedlings in the complete culture solution will be larger and their leaves will be green.

Conclusion. Magnesium is necessary for healthy growth of green plants.

38. (a) Marasmus. This is starvation, resulting from a diet that does not provide enough energy or calories. The body uses proteins as a source of energy. The muscles waste away.

Malnutrition. This refers to components of the diet being missing, inadequate, or in missing or in excess.

Kwashiorkor. This is a protein deficiency illness. It often develops in young children who are weaned too early and are given food that is deficient of protein e.g maize. The child has symptoms like very thin limbs, wrinkled skin, large belly and slow growth.

b) To ensure they have food throughout the year people should:

- Grow enough food during the planting season.
 - Store some food for the dry season.
 - Preserve food properly, using appropriate methods according to the type of food. These methods include salting, smoking, drying, refrigeration.
- e) Parasites rob these hosts of their food. The hosts are weaker than those that are parasite-free. They do not run as fast to escape the predators. In addition to being weak, they may also be sick and, therefore, less able to

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BIOLOGY PAPER 2

SECTION A

Answer all questions by selecting the best alternative to each question.

1. Which statement best explains why amoeba does not need a transport system?
 - A. It has a small surface area
 - B. It has a small surface area to volume ratio
 - C. It has a large surface area
 - D. It has a large surface area to volume ratio
2. Which of the following blood vessels allow exchange of materials between blood and body tissues?
 - A. Arteries B. Capillaries C. Veins D. Arterioles
3. Which plant tissues are responsible for transport of substances within plants?
 - A. Cortex and phloem
 - B. Epidermis and xylem
 - C. Cambium and xylem
 - D. Phloem and xylem
4. The function a lymphocyte is to
 - A. Engulf bacteria
 - B. Produce antibodies
 - C. Bring about blood clotting
 - D. Carry respiratory gases
5. Which set of conditions would promote the fastest rate of transpiration?
 - A. Dry air, low temperatures, wind
 - B. Moist air, high temperature, still air
 - C. Dry air, high temperature, wind
 - D. Moist air, low temperature, still air
6. Which chamber of a heart receives oxygenated blood from the lungs?
 - A. Left atrium
 - B. Left ventricle
 - C. Right atrium
 - D. Right ventricle
7. The cells in a leaf that has wilted would be
 - A. Turgid
 - B. Flaccid
 - C. Plasmolysed
 - D. Fully turgid

8. Which of the following is not involved in the uptake of salts by plants from the soil?
A. Osmosis B. Diffusion C. Active transport D. Facilitated diffusion
9. Select the incorrect statement about the pulse rate in human beings.
A. It increases with exercise
B. It increases with excitement
C. It decreases during rest
D. It decreases with anxiety
10. Food does not move within Amoeba by
A. Diffusion B. Active transport C. Osmosis D. Facilitated diffusion
11. The rate of heart beat in humans is on average is
A. 60 beats/min B. 40 beats/min C. 72 beats/min D. 80 beats/min
12. The indicator used to test for water in experiments on transpiration is _____.
A. Litmus paper
B. Bromothymol blue
C. Hydrogen carbonate indicator
D. Cobalt chloride paper
13. Which of the following is/are found in blood plasma but not tissue fluid?
A. Fibrinogen and carbon dioxide
B. Plasma protein
C. Urea and oxygen
D. Dissolved food
14. Which of the following organisms digests its food externally?
A. Housefly B. Mucor C. Amoeba D. Tilapia
15. Which of the following is not stored in plants?
A. Sucrose B. Glucose C. Protein D. Cellulose
16. Why is it difficult or impossible for an insect to drown head first?
A. The antennae are sensitive to water
B. There are no spiracles on the head
C. It would float on water in a horizontal position
D. Its legs spread and prevent it from going in head first.
17. The rings that prevent the collapsing of the tracheae of insects are made of
A. Cartilage B. Chitin C. Cuticle D. Keratin
18. Amoeba exchanges gases with the water around it through the _____.
A. Contractile vacuole
B. Ectoplasm
C. Cell membrane
D. Endoplasm
19. Which of the following use gills for gaseous exchange?

- A. Fish and frogs
B. Frogs and tadpoles
C. Fish and tadpoles
D. Frogs and toads

20. Which of the following processes involves enzymes?
A. Breathing B. Aerobic respiration C. Gaseous exchange D. None of these

21. Select the statement that is incorrect.
A. Aerobic respiration produces more energy than anaerobic respiration
B. Animals use oxygen for respiration all the time
C. Plants use carbon dioxide for respiration during the day.
D. Gaseous exchange takes place by diffusion.

22. Respiration occurs in the following except A. Red blood cells B. White blood cells C. Muscle fibres D. Amoeba

23. In which of the following situations is a muscle likely to acquire an oxygen debt?
A. Sleeping B. Walking
C. Running a marathon race D. Running a 100 metre race

24. In which compound is the energy that is released during respiration stored?
A. Adenosine monophosphate
B; Adenosine diphosphate
C. Adenosine triphosphate
D. Lactic acid

25. Which of the following gives the meaning of compensation point?
A. Rate of respiration is higher than the rate of photosynthesis.
B. Rate of respiration is equal to the rate of photosynthesis.
C. Rate of respiration is lower than the rate of photosynthesis.
D. Neither respiration nor photosynthesis is taking place,

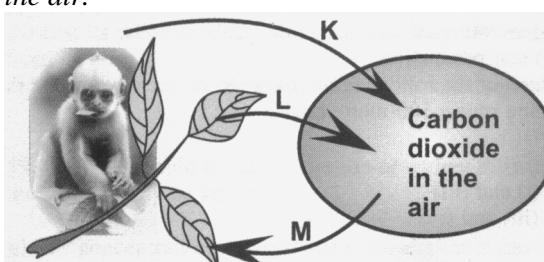
26. Which of the following cannot be used as an indicator to show the presence of carbon-dioxide?
A. Hydrogen carbonate indicator B. Bromothymol blue
C. Lime water D. Soda lime

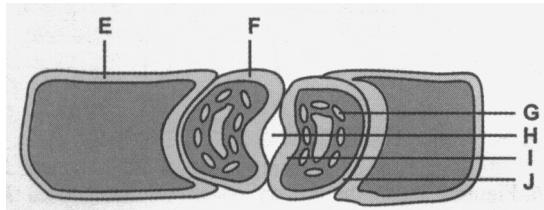
27. Select the structure that is not used for gaseous exchange.
A. Bronchiole B. Tracheole C. Alveolus D. Filament

28. Which of the following structures does a toad use to exchange gases with its surroundings?
A. External gills, internal gills, lining of buccal cavity
B. Skin, lining of buccal cavity
C. Lining of buccal cavity, skin, lungs

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- D. Lining of buccal cavity, lungs.
29. Select the organism that uses different openings for taking air in and taking it out. , A. Tortoise B. Flamingo C. Catfish Di Rabbit
30. In which order would the following be used as substrate for respiration?
A. Glycogen, glucose, protein, lipid B. Glucose, glycogen, lipid, protein
C. Glucose, lipid, glycogen, protein D. Glucose, glycogen, protein, lipid.

SECTION B

31. Figure 3 is a transverse section through a tissue found in a flowering plant.
- Name the tissue.
 - Name
(i) cell X.
(ii) The part of X through which the section was cut.
(iii) Y.
(c) State the function of cell X.
(d) Give any four differences between X and xylem vessels.
32. Figure 4 above represents a root hair surrounded by soil particles
- Label parts A, B, C, D:
 - How does the root hair absorb water from the soil?
 - What would happen to a plant if it were continuously irrigated with salty water.
33. Figure 2 shows the relationship between animals, plants and carbondioxide in the air.
- 
- Study it carefully and answer the questions that follow.
- Name the processes labelled K and M.
 - When do processes K and M take place?
 - At what time of day would you expect the movement of carbondioxide along arrow L to take place? Name the process responsible for it.
34. Figure 3 represents some cells in the lower epidermis of a leaf.



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- a) Name the cells E and F.
 - b) Label the structures G, H, I and J.
 - c) Complete the drawing of cell E to show its structure. Label the structures added.
 - d) State three differences between cells E and F.
 - e) State the function of:
 - (i) Cell F
 - (ii) Structure H.

SECTION C

35. (a) Explain why single-celled organisms like amoeba do not need a circulatory system.
- b) List the parts of the circulatory system of a mammal.
- c) What is meant by "double circulatory system"?
36. What are the functions of the lymphatic system?'
- b) State 5 similarities and 3 differences between the circulatory system and the lymphatic system.
- c) What is the relationship between elephantiasis and transport systems?
37. (a) Describe an experiment you would carry out to demonstrate that animals produce carbon dioxide. b) How do people benefit from the process of anaerobic respiration?
38. (a) Why is it necessary for some organisms to have specialised respiratory surfaces?
- b) State the characteristics of a respiratory surface.
- c) Write a word equation that summarises aerobic respiration.
- d) State any three differences between aerobic and anaerobic respiration.
- e) Name the gas that is abundant in air but not used by plants or animals.
- f) What is the overall effect of animals and plants living in a normal environment?

ANSWERS FOR UCE REVISION QUESTIONS 1984

SECTION A

- | | | | | | |
|------|-------|-------|-------|-------|-------|
| 1. D | 6. A | 11. C | 16. B | 21. C | 26. D |
| 2. B | 7. B | 12. D | 17. B | 22. A | 27. A |
| 3. D | 8. A | L3. B | 18. C | 23. D | 28. D |
| 4. B | 9. D | 14. | 19. C | 24. C | 29. C |
| 5. C | 10. C | 15 | 20. B | 25. B | 30. B |

SECTION B

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31. (a) Phloem
b) (i) Sieve tube
 (ii) Crosswall (sieve plate)
 (iii) Pore / perforation
c) X conducts soluble nutrients from the leaves to growing points. These include sugars, amino acids and other growth substances.

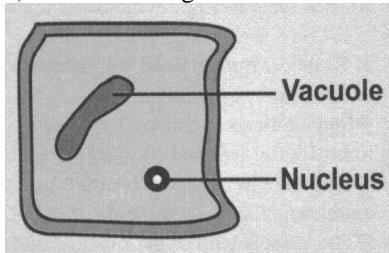
d) **Differences between X and xylem vessels**

X	Xylem vessels
Living cell	Composed of dead cells
Crosswalls present and perforated to form sieve plates	Crosswalls absent
Contains cytoplasm	No cytoplasm
Cell walls not thickened with lignin	Walls thickened with cellulose and hardened with lignin
Conducts food from leaves to other parts of the plant	Conducts water and dissolved salts from root to leaves

32. a) A —cell wall B — cytoplasm C — vacuole D — nucleus
b) The sap in the vacuole has a higher concentration of salts than the solution in soil. The sap sets up an osmotic pressure. Water moves from soil into the root hair by osmosis.
c) The salty water would be more concentrated than the sap in the vacuole. Water would, therefore, be withdrawn from the root hair by osmosis. The plant would will and eventually dry up and die.

33. (a) K — Respiration.
M — Photosynthesis.
- b) K takes place all the time and M takes place during the day.
- c) Movement of carbon dioxide along arrow L occurs at night. The process responsible for it is respiration
- d) Nitrogen
- e) To keep the level of carbon dioxide in the atmosphere more or less constant. It also keeps the level of oxygen more or less constant.

34. (a) E — typical epidermal cell F — guard cell
- b) G — chloroplast H — stoma/stomatal pore I — proximal wall J — distal wall
- c) Drawing of Cell E.



- d) See table below
Differences between cells E and F Set up of experiment

E

- More regular in shape
- Does not have chloroplast
- Cell wall is evenly thick

F

- Bean-shaped
- Has chloroplast
- Cell wall thicker near the stoma than away from it

- e) (i) Cell F regulates the size of the stoma.
(ii) It allows gaseous exchange and transpiration.

35. a) The cell is the destination of the transported substances. In single-celled organisms, oxygen, carbon dioxide, soluble food and waste products move over very small distances within the organism. Some substances move by diffusion while others move by cyto-plasmic streaming.
- b) Heart, blood vessels namely arteries, veins and capillaries.
- c) Blood returning from the body passes through the heart twice before going back to the body. It flows into the right side of the heart, which pumps it to the lungs for oxygenation. This is called pulmonary circulation. The oxygenated blood then goes through the left side of the heart from the lungs to the body.

This is called systemic circulation.

36. (a) **Functions of the lymphatic system:**

- Provides lymphocytes which produce antibodies and antitoxins for protecting the body against invading micro-organisms.
- It drains tissues of tissue fluid.

b) (i) **Five similarities between the circulatory system and lymphatic system:**

- Both involve movement of fluids.
- Both have lymphocytes.
- Both have valves to prevent back (flow).
- Both transport food and waste products.
- Fluid moves through vessels.

ii)

Lymphatic system	Circulatory system
Lymph is the fluid that moves	Blood is the fluid that moves
Lymph moves in one direction	Blood moves in two directions (to and from heart)
No erythrocytes (red cells)	Erythrocytes present
Not pumped by heart	Heart pumps blood

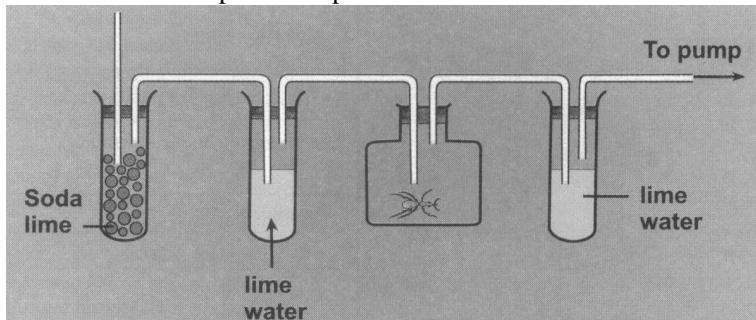
c) Relationship between elephantiasis and transport system .

- Elephantiasis is caused by microfilarial worms.
- They live in lymph, especially in the ankle region.
- The vessels tend to get blocked and the region gets bigger and bigger.
- The skin in that region tends to crack and is prone to infection.

37. (a) Aim: To show that animals produce carbon dioxide.

Apparatus and materials: Jar, rubber bungs, test-tubes, soda lime, lime water, delivery tubes, aspirator pump, rat or toad or a number of insects.

Procedure. the set up of the experiment



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- The soda-lime removes carbon dioxide from the incoming air so that the animal breathes in no carbon dioxide.
 - The lime water on the left tests the air to prove it has no carbon dioxide.
 - The lime water on the right tests the air breathed out for carbon dioxide.
 - The pump ensures that air flows through the set-up.

Expected observation

The lime water on the left remains colourless while that on the right turns milky.

Conclusion: This would show that the animal(s) produced carbon dioxide.

b) Brewers and bread makers use yeast.

- Anaerobic respiration by yeast produces carbon dioxide and ethanol.
- The bakers use carbon dioxide to make the dough rise.
- The brewers collect the ethanol.

38. (a) Large organisms need respiratory organs with a specialized respiratory surface because they have a small surface area to volume ratio. Diffusion of oxygen into the body and carbon dioxide out of the body through the body surface would be too slow to meet the organisms' requirements.

b) Characteristics of a respiratory surface:

A large surface area for fast gaseous exchange.

Thin or covered with a thin membrane to offer a short diffusion distance.

Is moist because gases diffuse through membranes in solution form.

Has a rich supply of blood capillaries, apart from the tracheoles of insects, to maintain a diffusion gradient.

d) Aerobic vs anaerobic respiration

Aerobic respiration	Anaerobic respiration
Uses oxygen	Does not use oxygen
Yields more energy	Yields less energy
Products are carbon dioxide and water	Products are lactic acid in animals and ethano! and carbon dioxide in plant cells
Molecules of products are smaller	Molecules of products are larger

Paper 2 (553/2)

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A Biology practical Guide

A BIOLOGY PRACTICAL

Introduction

The study of life science can be informative as well as exciting. Laboratory investigations provide laboratory experiences that will enhance your understanding of the concepts presented in life science. This section of the book is intended to meet the aims and objectives of biological practicals. Some of the aims of carrying out biological practical are as follows:

1. To carry out simple physiological experiments and chemical tests, make accurate observations in orderly manner and make conclusions and interpretations of results based on certain biological principles.
2. To be able to apply practical biological knowledge to your day to day life
3. Relate structures of organisms to their functions, i.e. finding how structures are adapted to their functions, to compare and contrast structures or organisms.
4. Making accurate observations of living or preserved biological specimens and recording them accurately and orderly in written, tables, charts, or clearly drawn diagrams.

The laboratory investigations (practicals) will help you to:

- Discover facts relating to scientific concepts.
- Use techniques associated with the tools of life science.
- Correlate observations with known facts.
- Formulate hypotheses about events associated with life science.
- Use a scientific method to solve problems in the laboratory.
- Investigate concepts presented in the text books.

The following are important in practical session

1. outline what you intend to do.
2. Read over any written instructions carefully before you begin *any* investigation.
3. If you are designing and conducting an independent investigation such as a science a fair project, you must plan very carefully before beginning.
4. Once you understand the procedure you will be using, the-next thing is to make sure that the materials you need are available
5. Be sure that you know how to use the equipment, if not ask your teacher.
6. One of the most important aspects of scientific investigation is accuracy.
7. Critically examine or study the specimens. When examining a specimen observe the size, shape, colour, texture and number of structural parts. During observation one is supposed to use all the five sense i.e. smell, touch, sight, taste etc.
8. While following the procedure you must make certain that all data is recorded exactly and precisely immediately. Do not wait to record any observations

Magnification

The basic formula used for magnification is the

Size of the drawing..... (l)

Size of the specimen

However you do not need to state this on the question paper.

Magnification is a ratio and therefore, has not units. Magnification should always be stated with a multiplication sign before (not after) the resulting figure from the calculation e.g. $\times 2$ and not $2x$ (the latter is read as two x and the former times two). Fractions (e.g. $\times 2\frac{1}{4}$) and decimals (e.g. $\times 2.4$) are acceptable. Magnifications can be even stated in words e.g. two times or six and half times.

The figure for the magnification should be written below the diagram preferably on the right if a space is not provided for it and In any case writing M or Mag to denote it is not necessary. Controversy however, remains on which size to measure i.e. length or width of the specimen.

For specimens that have a single line of symmetry (e.g. those longer than they are wide) it is better to measure the lengths of the specimen and drawing and then determine the magnification using the formula given above. Such specimens are - bananas, most flowers, achenes of *Bidens pilosa*, schizocarps of *Desmodium*, bones, caterpillars, most insects, leaves and onion bulbs.

On the other hand, for round specimens and those with more than one line of symmetry preference should be made wherever possible to the width (or diameter) of both the specimen and drawing. These include fruits like tomatoes, oranges etc.

The diameter measured in both cases should be the same. Do not measure the length of the specimen and then width of the drawing. The formula can then be modified to

Length of the drawingii)

Length of the specimen

Or Width of the drawingiii)

Width of the specimen

Finally remember to give the magnification beginning with X

Drawing of graphs

Some practicals e.g. on enzyme activity, water retention of soils and osmosis may result in data which the student may be asked to present on a graph.

Remember these fundamental points:

1. Give an appropriate title to your graph. The title should normally mention the variables being plotted.
2. Draw the axes (preferably in pencil) and put arrows at the end of the lines. Very often arrows are omitted and where the graph paper is supplied the student uses the lines on the graph as a reference without drawing the axes. This is wrong.

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3. Label the axes appropriately. This includes units i.e. time (sec) volume (cm^3) etc.
 4. The horizontal axis usually represents the data that could be present even if the rest of the data were not. This data is called the independent variable e.g. time. On the vertical axis it is called dependent variable e.g. height, weight.
 5. Choose an appropriate scale and mark off the axes clearly. The scales should be stated: 1 cm represents... or 1 small square represents ... and not 1 square represents ... The graph paper provided really has many squares of different dimensions if you study it carefully. Well-stated scales facilitate quick interpretation of the graph.
 6. The graph should take up as much of the paper as possible, since large graphs are much easier to read than small ones. E.g. 1cm = 2 minutes or 1cm = 2 kgs. Remember once you choose the interval for the scale you can't change it. That is you can't say that 1 block = 1 day and the second block = 10 days.
 7. The next step is to mark the points for each pair of numbers. When all points are marked, draw the best straight or curve line between the points. Draw the best line possible which may not include every point in the data.
 8. Your graph should have a title which has a relationship with the variables.
 9. Where more than one graph has been drawn always draw a key to explain the graphs in an appropriate place preferably to the right of the graph.
 10. Make the plots on the graph with an appropriate mark which is not too big and too small to be seen. Determine whether the shape of the graph is a straight line or a curve and using a sharp pencil draw the straight line using a ruler or the curve in free hand but draw a smooth curve and avoid rubbing.
 11. Finally, remember that a dirty graph results in loss of marks.

In examination marks are awarded for

- Title if correctly stated giving details of the variables plotted.
- Drawing of axes. If these are properly drawn arrow ends.
- Labelling of axes if well stated with units
- Marking of axes if neatly Indicated

- Scales If properly stated and used
- Plots If accurately placed
- Neatness of the graph
- Key if stated (where required)
- Graph shape

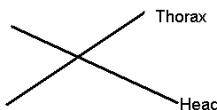
Hints on biological drawings and labeling

1. Diagrams and drawings are essential parts of practical work but they also play their part in theory.
2. So drawings in biology need not be artistic i.e. should not be drawn as in fine art. There are several things you need to remember as you make your laboratory drawings which include:
3. You should simply draw what you see and label as many parts or structures as possible.
4. make the drawing large enough so that it may be easily studied; include all the visible structures in your drawing.
5. Drawings should also show the spacing between the parts of the specimen in proportion to its actual appearance.
6. In order for your drawings-to be most useful to you, you need to label them. All labels should be clearly and neatly printed.
7. Lines drawn from label to corresponding parts should be straight (use a ruler).
8. Label lines should never cross each other.
9. make sure that label lines go-to the parts of the drawing for which it is intended. Do not let them fall short of its targets.
10. Never shade your drawing.
11. Be sure to title all your drawings. Provide suitable headings that clearly indicate the nature of the drawing, e.g. a diagram showing the transverse section of an orange. Some one who looks at your drawing should be able to identify the specimen
12. Remember neatness and accuracy are the most important parts of any laboratory drawing. Never copy a diagram from the text book.
13. Remember you do not have to be an artist to make good laboratory drawings.
14. Use a good quality, sharp pencil (HB is normally the best) **don't** use pens, colored pencil etc.

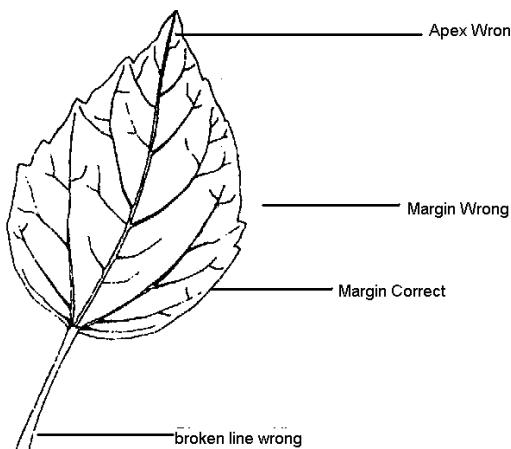
15. The lines on the drawings should be clear and unbroken without sketchy lines.
16. Rub out any unwanted lines.
17. Make single pencil lines without sketching or shading.

Labelling

1. A complete label consists of a labelling line and word (the label) adjacent to it that describes the part labelled.
2. There are some techniques that should be followed to make correct labels. The following should therefore be kept in mind when labelling:
3. Preferably draw the labelling line and write the label in pencil not ink as this presents problems when you make a mistake and have to rub.
4. Draw horizontal labelling lines wherever possible and where this is not possible at least the part next to the word should be horizontal.
5. Do not put arrow heads. Always use a line.
6. Labelling lines should never cross.



7. Because when they do it implies that the labels are interchangeable i.e. any part labelled in this case can be a leg or a wing.
8. Labelling lines should touch the structure being labelled. If they do not touch then the student is labelling the space where the labelling lines begin.



9. They should not even go beyond the part being labelled because then they may be touching some other structures. The diagram below illustrates this point very well,

The label should be correctly spelt because in many cases a wrong spelling may form another word of biological meaning

altogether e.g. metamorphosis for metapophysis, neutral for neural, rot for root, bud for bird.

In some cases the spelling error makes the label look nasty or funny e.g. west for waist, Stock for stalk facts for facets, transfer process/transparent process for transverse section.

Do not label in plurals when pointing at a single structure.

Do not label on the diagram. Biological diagrams differ from maps in geography in this respect

Where brackets are used they should include all the parts intended. A common adage (saying) in drawing is that in all cases draw what you see and not what you imagine to be there.

If the specimens are a bean and tomato the identity will be a seed and a fruit because a bean has one scar while a tomato has two scars respectively.

For vegetative organs, for example an onion the identity is a bulb because of its swollen fleshy leaves covered by dry scaly papery leaves with a short stem. Sweet potato is a root tuber because it has no buds and scale leaves.

In case of comparison between two specimen

While comparing specimen, you should make use of your power of observation, i.e. Use observable features or consider the shapes, sizes and textures of the specimen. Look for parts that occur on one specimen but are absent on the other but features such as color and size that change with environment are usually not preferable.

E.g. state two differences between specimen S (orange fruit) and F (Passion fruit)

Specimen S	Specimen F
Has more than one locule	Has only one locule
Seeds are attach around a central axis	Seeds are attached the inner wall of on the fruit

In case of similarities e.g. between a cockroach and worker bee.

- Both have three body parts, both have jointed legs.

Summary on the general areas leading to loss of marks

- Spelling errors especially of technical terms
- Failure to follow the procedure correctly
- Lack of language in stating identities, adaptations, classifications, reasons for classification stating of views and naming habitats, modes of dispersal etc.
- Lack of self expression during description, stating uses (functions) of specimens or their parts, in comparisons.
- Incomplete descriptions
- Stating functions other than those asked for other than those asked for
- Stating similarities other than those asked for

- Lack of contrast in the differences
- Drawing, labelling and stating correct magnification. These range from wrong diagrams to poor ones, wrong labels to badly spelt ones and wrong magnification to none at all.

Dichotomous keys

The term dichotomous stems from two Greek words *di* which means two and *chotos* which means branches and involved grouping the organisms provided into two groups which are further subdivided into two groups until a single individual remains in a group which is then said to be classified.

The basis of the construction of dichotomous keys is classification basing on the facts that: living things vary and their variations (differences & similarities) can be used to place organisms into groups and that this can be done so systematically to place organisms into larger groups or smaller ones accordingly.

The student in order to construct a dichotomous key from the materials (or specimens) provided needs to find out which ones are alike and which ones are different. Sometimes these differences are small and a careful study is needed to see them.

The differences and similarities required here are basically those in structure. These are called **characteristics**. Size and colour may not be useful in the construction of dichotomous keys.

Hints to follow

1. Lay the specimens in front of you on the table in one group (this is the whole collection).
2. Look for some (body) part present in some of the specimens but not in others (this is an example of a characteristic) e.g. in leaves some may be compound others simple in insects some may have wings others without in leaves which are all simple some may be hairy and others smooth.
3. This is the first division. You now have two groups (the need not be equal in number). Divide each of your smaller groups into two more groups. This requires you to choose another characteristic. You will have four groups on the desk in front of you.
4. Now take each group again (where they are two or more specimens) and go on to divide them using another characteristic. Use a characteristic only once.
5. This is an artificial practical way of classification of the specimens in which they are split into successive pairs basing on their structural similarities and differences until a single organism remains alone in a group in which it's said to be classified.

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But not Lamina hairy

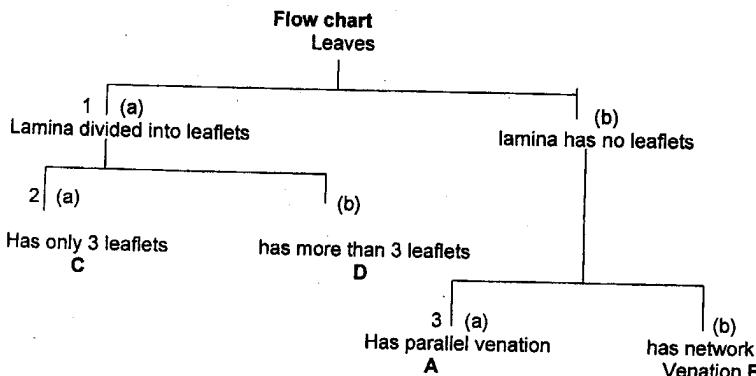
Lamina not hairy

Example

Classify the following specimen by making a dichotomous key.

- A maize leaf (A)
 - Lantana leaf (B)
 - Bean leaf (C)
 - Cassia leaf (D)

Solution:



Has parallel venation

has network Venation

The dichotomous key:

- The answer is as follows:

 1. a) Lamina divided into leaflets. go to 2
 b) Lamina has no leaf go to 3
 2. a) has only 3 leaflet? C
 b) Has more than 3 leaflets D
 - 3 a) has parallel venation A
 b) Has network venation B

Practical language:

There are some English words, which are not accepted in biological expression. Some of which are;

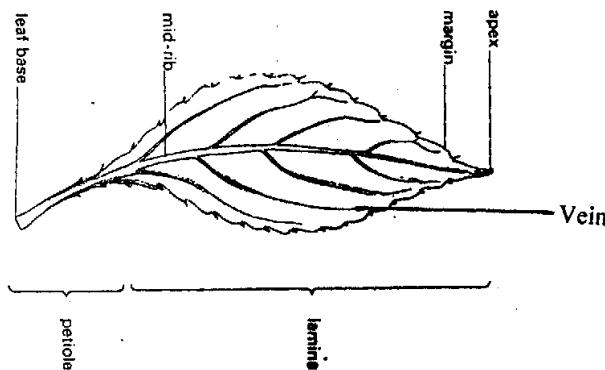
- Help, assist, act as and aid
- E.g. it is unacceptable to say that leaves have chlorophyll that helps to trap sunlight. Instead it is better to say leaves have chlorophyll used to trap sunlight.
- Adaptation to its function should state the observable features of the specimen and its function.
- E.g. the Adaptation of the cockroach to living successfully in its environment. It has long legs enable it to move fast but not having legs to move fast. Thus the adaptability of the feature to its function should be clearly stated.

Plant Leaves

Leaves are identified by possession of,

- petiole,
- leaf base,
- lamina and
- midrib
- And an axillary bud in the axil.

Structure of a leaf



Describe the physical features of the leaf e.g.

Leaf apex; it can be, sharp pointed or blunt

Pointed apex



or round apex



Leaf margin; there are various margins e.g.

Spinny margin



serrated margin



smooth margin



wavy margin



Lamina:

The lamina can be described as, hairy lamina that makes it rough and its purpose is to reduce rate of transpiration which is an adaptation of the plant to areas of high temperatures e.g. deserts. The hair can be on either side or on one side and its good to specify with it.

Or the lamina may be smooth (not hairy)

The lamina can also be thick and succulent (juicy) to store water and food materials.

Venation: This is the arrangement of veins in the leaf. This can be net or parallel.

Leaf stalk: A leaf may have a stalk (for dicot plants) or a leaf sheath (mo plants). The stalk or the sheath may be smooth or hairy.

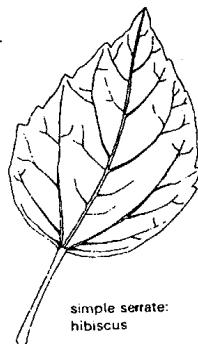
Types of the leaves

There two main types of leaves;

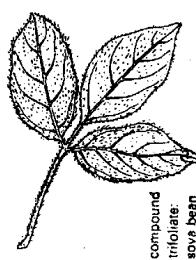
- Simple leaf: The lamina is not divided into leaflets.
- Compound leaf: The lamina is divided completely into leaflets.

Illustrations of simple and compound leaves

(i) Simple leaf



(ii) compound leaf



NB: Simple leaves can be further classified as follows;

- Entire (linear)
- Palmate
- Digitate
- Tri-lobed

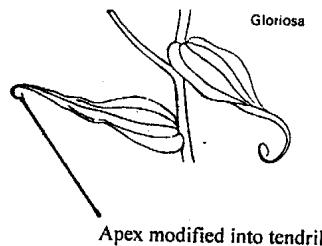
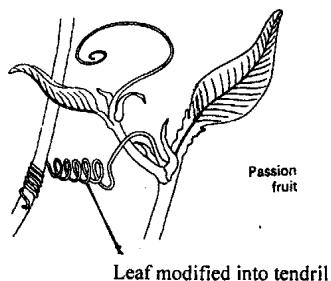
Compound leaf can also be classified as follows depending on the number of leaflets;

- Digitate
- Pinnate
- Bipinnate
- Trifoliate

Modification of leaves and their adaptive features to survive in their environment.

Leaf with tendril. The tendril provides support to the plant by attaching on the support for the plant to reach sunlight for photosynthesis.

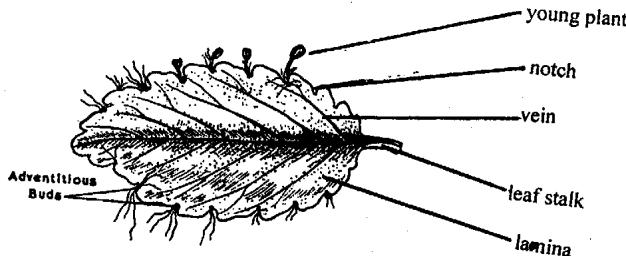
Diagrammatic illustration



Leaf with thorns. Thorns protect the leaf against herbivorous / predation. Thorns can be on the leaf stalk, on lamina or on margin.

Bryophyllum leaf: it has thick / fleshy lamina, and buds at the margin.

Diagram of Bryophyllum leaf



Uses of Bryophyllum leaf

- Vegetative propagation
- Storage of water and food,
- Photosynthesis.

Adaptation to its function.

- Thick / fleshy to store food and water to withstand drought.
- Buds for vegetative propagation to give rise to mature plant for continuity of species.
- Has chlorophyll for photosynthesis.

Other General adaptations of leaves to their functions.

- Have veins to distribute manufactured food and other materials.
- Broad lamina to increase surface area to trap more light for photosynthesis.
- Thin lamina for easy gaseous exchange.

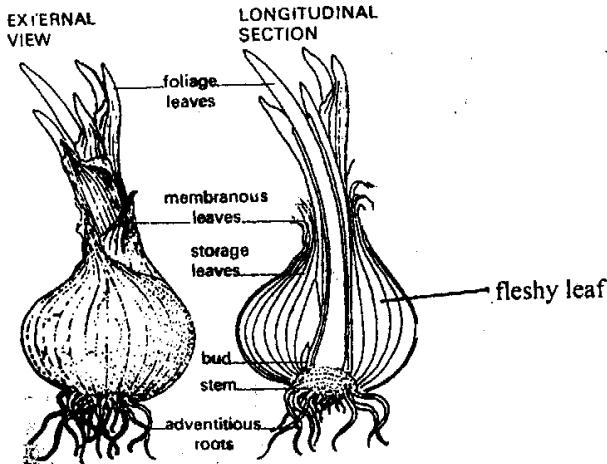
Modified leaves of the bulb (onion):

Are thick fleshy and store food and water.

Onion is a bulb due to possession of

- Scale leaves
- Stout stem
- Adventitious roots

L. S of a bulb



Crush one of the sections of the onion / bulb to obtain the extract. Use it to test for various food substances.

Note - What are uses/ importance of the bulb?

- How is it adapted to its functions or survive in its environment

Stems and Roots

Stems are identified as so, due to possessions of:

- Adventitious roots
- Buds .
- Leaves / leaf scar / scale leaf
- Internodes / nodes

Modification of the stems.

Stem tuber: Are fleshy / succulent / thick stems that store food and water. E.g. sugar cane, yams, and Irish potato.

- Make drawings of each stem mentioned above.
- Obtain an extract from each above and test for food substances in each.
- Outline the use of each stem and explain how each is adapted to its function or to survive successfully in its environment.

Rhizomes: Are under ground horizontal thick stems. Their distinguishing characteristics are;

- Have adventitious roots ;
- Thick / flesh. /

- Have scale leaves I

E.g. Ginger stems, spear grass stems, couch grass stem.

N.B: State the use / importance of the rhizomes and how they are adapted air function.

- Explain the features that make them survive in their environment.
- Make drawings of stems (rhizomes)
- Carry out the food tests to confirm the food substances in the rhizomes.

It the following stems as above

- **Creeping stem:** e.g. commelina stems; pasparum etc.
- **Climbing stems:** E.g. rose stemmed and Bougainvillea stem they are identified by possession of;
- Thorns or tendrils for anchorage / attachment on the support to reach sun light for photosynthesis.

ROOTS

At roots have root hairs. There two types of roots systems i.e.

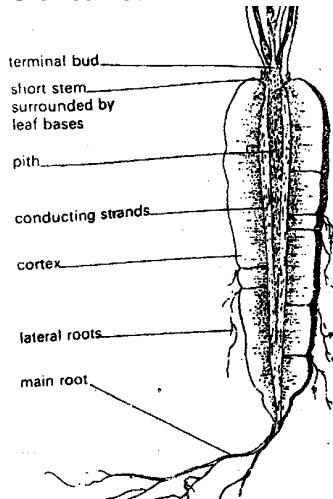
- Tap root system
- Fibrous root system.

Describe the characteristics of the above types. Make a drawing of each.

Modified roots.

- Root tubers e.g. cassava and carrots. Carrot is a modified taproot because it has lateral roots and root hairs.

L. S of carrot



Note cortex consists of fleshy cells that store food. Root hairs absorb water and salts.

Crush the modified roots to obtain the extract. Use it to test food substances contained by each root.

- State the importance of the roots and their adaptations.

FLOWERS

A flower is a reproductive organ of a plant with the following characteristics;

Essential parts i.e. the pistil and stamen.

- Pistil consists of stigma, style and ovary.
- The stamen consists of the anthers and the filament

Non-essential parts i.e. the calyx (sepals) and corolla (petals), epicalyx and flower stalk. Thus in studying the common flowers e.g. crotalaria, hibiscus, morning glory, Bougainvillea etc. the following guidelines should be considered.

The description of the following structures.

Corolla and calyx

Look at their colour, are they fused (gamopetalous) or gamo sepalous respectively) or free (polypetalous). Are they hairy or smooth?

- Their shapes and numbers.

Stamen

- Are the stamens filaments fused into stamen tube or are free?
- Are they attached to the petals at the base?
- Are they longer than the stigma and state their numbers.
- Are the anther heads lobed?

Pistil

The stigma can be lobed or not. Number of the lobes indicates the carpels of the ovary. It can also be hairy to trap pollen grains. N.B:-The style length

- The shapes of the ovary e.g. pod shaped like that of the crotalaria (acacia) or conical shaped like that of the hibiscus.
- Some ovaries are inferior if are below if they are below the receptacle or superior if they are above the receptacle.

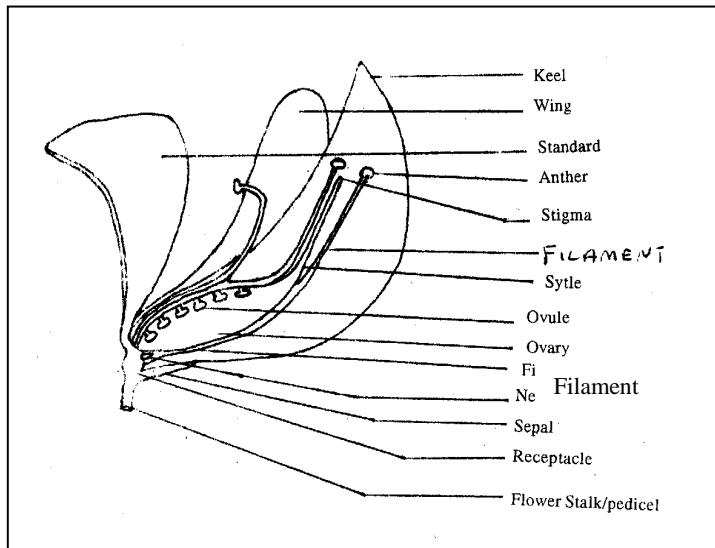
By basing on the observable features you can state the Pollinating agents and how the specimen is adapted to it. I.e. the agent is wind and the adaptations include;

- have Dull colour,
- are small
- and have dusty pollen grains
- Dangling anthers for easy spread (blown away).

Or the agent may be **an insect** and the adaptations include:

- Have Bright coloured petals to attract insects.
- Nectar to attract insects.
- Conspicuous or large to be seen by insects.
- Have short stamen compared to stigma.

Its type of pollination and its adaptations i.e. cross-pollination or self-pollination and hence adaptations to either of the above stated type of pollination.



Note: mode of pollination, describes how the agent carries out the pollination.

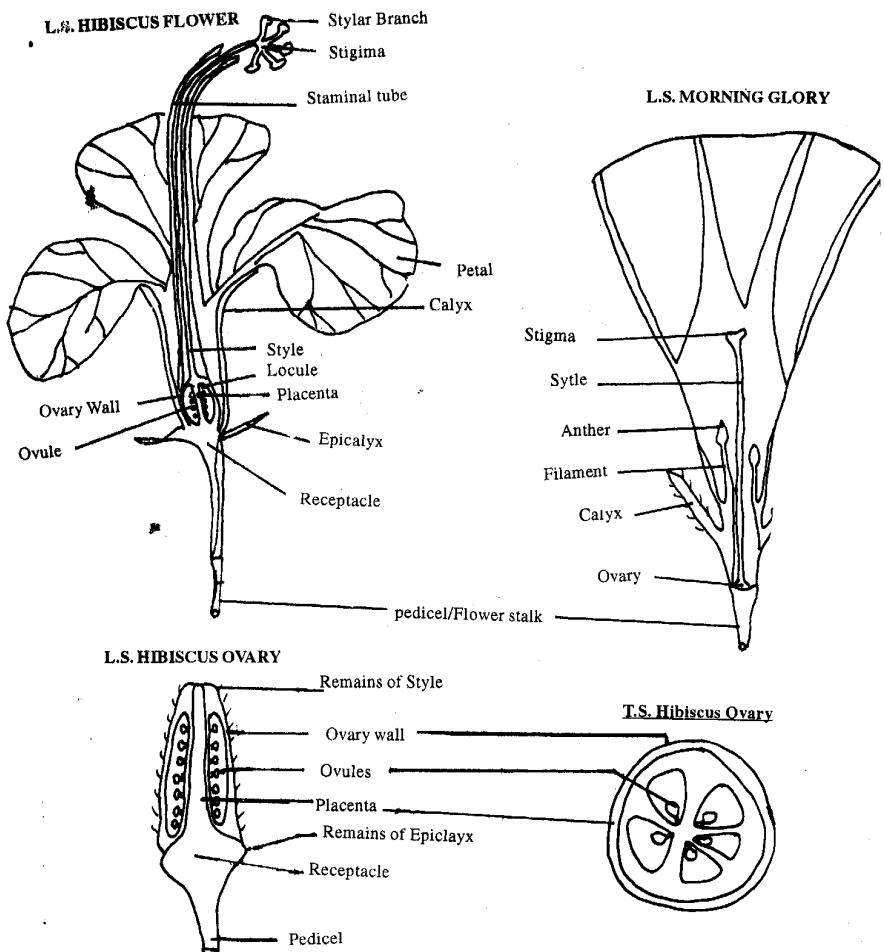
- Make drawings of both external features and longitudinal sections.
- Importance of the flower to a plant.

A TABLE OF SUMMERISED CHARACTERISTICS OF SOME FLOWERS

Flower	Sepals	Petals	Stamen filament	Anthers	Stigma	Ovary
Crotalaria	5 fused sepals and hypogynous	Five bee bright coloured petals	10, nine fused into stamen tube	Bilobed	Hairy and not lobed	Pod shaped and superior, and monocarpous
Hibiscus Flower (regular)	Five and fused	Bright coloured five and tree	Many and fused into stamen tube	One lobe	Five lobes	Superior with five fused carpels.

Morning glory	Five, free and pointed	Five, fused and bright coloured	Five, attached to base corolla tube	Bilobed	Bilobed	Superior with two fused carpels (nectar) at its base
Sougain ilea (Regular)	Five fused	Five fused	7 to 8 filaments fused at base		Hairy and not lobeo	Superior and monocarpous (one carpel)

Note Bougainvillea are three florets on one peduncle thus its an inflorescence. Each floret has a broad bright coloured bract. Its sepals and petals are fused together and indistinguishable thus it's a perianth.



FRUITS

A fruit is a mature fertilized ovary. It has the following characteristics;

- Two scars i.e. style and stalk scar
- A pericarp (Fruit wall) which is composed of three layers;
 - **Epicarp** (outer layer)
 - **Mesocarp** (middle layer)
 - **Endocarp** (inner layer)

These layers are not distinct in dry fruits and seed (s). Fruits are classified into two major groups i.e.

- **False fruits** that develops from the receptacle and ovary.
- **True fruits** that develop from the ovary only e.g. mango. True fruits are divided into three groups;
 - (i) Multiple fruits
 - (ii) Aggregate fruits
 - (iii) Simple fruits. That develops from a single flower / ovary e.g. avocado, tomato. *Bidens pilosa* and maize grain.

Simple fruits are classified into two major groups depending on the nature of the pericarp. i.e. Either dry fruits or Succulent fruits.

Succulent fruits: Have fleshy /juicy pericarp e.g tomato and mango fruits. They are divided into two types basing on the number of seeds contained. i.e

- Berry fruit: Is the succulent fruit with many seeds e.g tomatoes and oranges.
- Drupe: Is the succulent fruit with one seed e.g. avocado, mango etc. Animals disperse succulent fruits. The animals eat the fleshy pericarp and cast the seeds.

General adaptations of succulent fruits to their type of dispersal (animal dispersed).

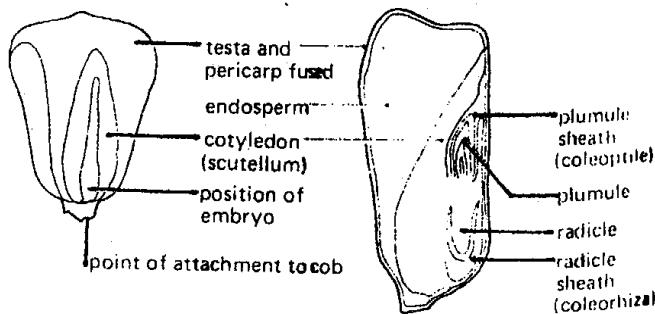
- Having juicy / fleshy pericarp that is eaten by the animals
- Having bright coloured fruit wall when ripe to attract the animals
- Having seeds with hard testa to resist animal digestion.
- Having hard endocarp for the drupe; to protect the seed.

Dry fruits: Are the fruits with dry pericarp. They are divided into two groups, i.e. indehiscent fruits and Dehiscent fruits.

Indehiscent fruits: do not have sutures in their pericarp i.e. their pericarp cannot break / split to release the seeds when dry. They are divided into various groups, **Schizocarp.** They break transversely when dry into one-seeded parts with hairy pericarp.e.g desmodium.

Caryopsis. Its testa is fused with the pericarp. e.g. maize grain

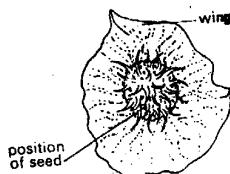
External feature of a maize grain longitudinal section of the maize grain



Cypsela. It has pappus / persisting hairy calyx e.g. tridax.



Achene. Has one seed with a pericarp not fused with the seed coat. A samara. Its pericarp is modified into a wing structure.



Dehiscent fruits

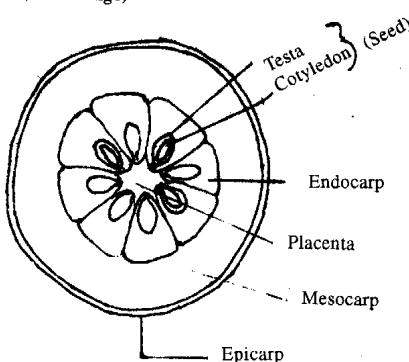
Are the dry fruits with sutures along which they split when dry to cast the seeds. They are divided into various groups depending on the number of sutures in their pericarp i.e.

- **Follicle.** Dry fruits with one suture
- **Legume.** Dry fruit with two sutures e.g. bean pod
- **Capsule.** Dry fruit with more than two sutures e.g. Dutch man's pipe.

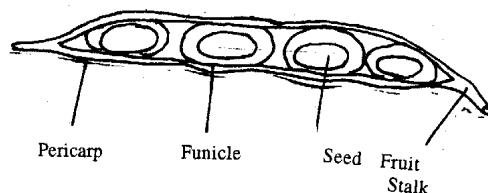
Placentation: This is the arrangement of ovules or seeds within the ovary or fruit. Placentation can take any of the following forms:

Axile placentation; here the ovules or seeds are arranged around a common axis in the centre of the ovary. The ovary is divided into chambers by septa. Examples of fruits with it include: lemons, oranges, tomatoes etc

**AXILE PLACENTATION
(T.S. orange)**



**MARGINAL PLACENTATION
(Beans pod)**



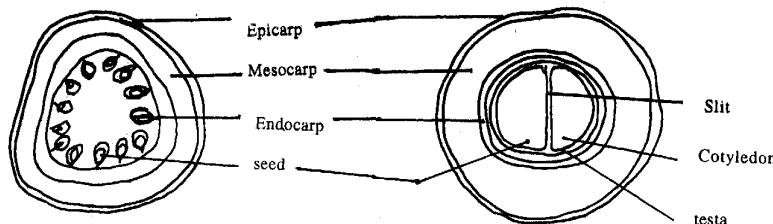
Marginal placentation; here the ovary is one chambered. The ovules or seeds develop along the junction of the two margins of the carpel. Examples of the fruit with it include; beans, pea's, cassia, etc

Parietal placentation; here ovules or seeds develop on the inner walls of the ovary or fruit chambers e.g. in pawpaw, cucumber, passion fruits etc.

Free central or central placentation; here the seeds or ovules are borne around a central column arising from the base of the one chambered-ovary. Since the column lies freeing the centre of the chamber the placentation is called free central. Fruits with it include: green pepper, primrose.

PLACENTATION OF FRUITS

- **parietal placentation
(T.S. Passion fruit)**
- **Free central
(T.S. Avocado Fruit)**

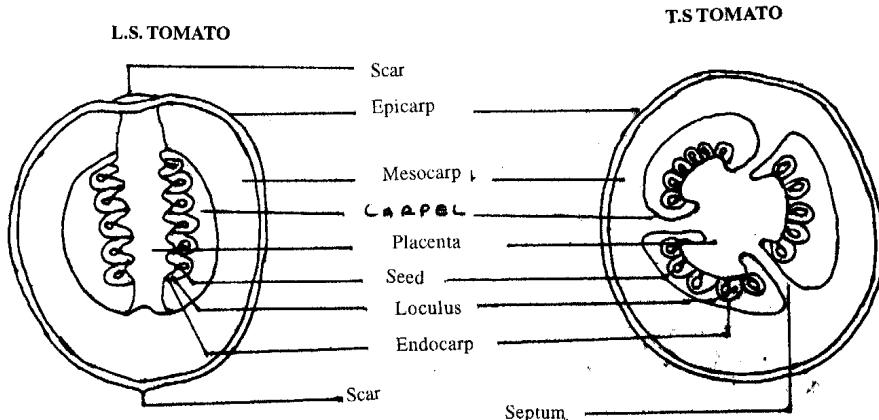


NB: some fruits such as the avocado have only one seed that has no attachment to the ovary wall and lies free in the centre of the locule. Its placentation is thus free central.

Basal placentation; the ovary is one chambered and the ovules or seeds are attached at the base of the ovary. Fruits with such include; mango, sun flower etc

In the practical study of the fruits the following guidelines should be exhaustively examined.

- Identify the fruit and the characteristics used in identification.
- The external and internal structure, take cross and longitudinal sections of the fruit.
- Description of the placentation, its type and arrangement of the seeds.
- The type and mode of dispersal of the fruit
- Mode of dispersal is the precise description of how the agent e.g. animal / wind disperse the fruit or how the fruit for the case of indehiscent ones disperses its seeds.
- How the fruit is adapted to its mode and type of dispersal. For adaptations, state the adaptive features / structures and its significance in the process of dispersal. E.g. Having sticky hairs that attach on the hairy body of the animal in case of schizocarp (desmodium).
- Having hooked calyx that attach on the hairy / cloth of the animal for the case of Achene's (*bidens pilosa*).
- Having sutures along which it splits when dry to release the seeds away in case of the dry dehiscent ones. E.g. capsule (Dutch man's pipe), legume (bean pod) etc.
- Having bright coloured pericarps that attract the animals.
- The importance of the fruit to plant e.g. storing food, protecting the seeds, excretion etc. State and describe clearly how it is adapted to the importance given.
- Carry out the food tests to confirm the types and content of food substances stored by the fruit.



Guide questions about plants.

1. You are provided with specimen F, H, J, K, L, and M, which are parts a plant.
 (a) Observe specimens K, L and M and record their characteristics features in reference to veins, surface and petiole.

Specimen	Characteristic features
(1) K	Veins:..... Surface:..... Petiole:
(2) L	Veins:..... Surface:..... Petiole:
(3) M	Veins:..... Surface:..... Petiole:

(b) Observe Specimen F and K. For each specimen, state one way in which the specimens are adapted for the habitats in which they grow.
 (i) Adaptations of F.....

(ii) Adaptations of K.....
 (c) Observe specimen F, H, J, K, and M and construct a dichotomous key to identify the specimens.....

2. You are provided with specimen S.

(a) Describe the sepals and petals of the specimen

- (i) Sepals.....
- (ii) Petals.....

- 14
- (b) Suggest with five reasons the agent of pollination of specimen S
(i) Agent of pollination.....
(ii) Reasons.....
.....
- (c) Observe specimens S and suggest with two reasons the type of pollination of the specimen.
(i) Type of pollination.....
(ii) Reasons.....
.....
- (d) Using a razor blade, cut specimen S longitudinally. Draw and label one half of the specimen. State your magnification.

3. You are provided with specimen K, L, and M, which are plant parts.
(a) Giving two reasons in each case, identify which part of the plant each specimen K and L is

K:.....

Reasons:.....

L:

Reasons:.....

- (b) All the specimens K, L, and M are modified to perform other functions. Using observable features. State what each specimen is modified to do. Record the observable features and the function each specimen is modified to perform in table below.

Specimen	Features on the specimen	Function
K		
L		
M		

- (c) Cut a small piece of specimen K and squeeze the piece between your fingers. **(Do not damage the specimen it will be required in part (e)).**

From your observation of specimen K. State all the functions performed by the specimen.....

- (d) Explain how the features on specimen:

- (i) K enables the specimen to live successfully in its habitat.

-
(ii) M enable the plant from which the specimen was obtained to live successfully in its habitat.

-
(e) Draw and label specimen K in the space below.

4. You are provided with specimen K, L and M, which are flowers.
(a) From two observable features in each case, suggest the mode of pollination of each specimen L and M.

(i) Mode of pollination of L

Features:.....

(ii) Mode of pollination of M

Features:.....

- (b) Give four observable features between the structure of specimen K and L.

K	L
(i)	
(ii)	
(iii)	
(iv)	

- (c) Give one advantages of specimen K and L over specimen M.

-
(d) Remove the petals and sepals from L. Draw and label the remaining part of the specimen. State the magnification of your drawing.

5. (a) You are provided with specimens D₁ and D₂. Cut D₁ vertically in half make a well-labeled drawing of one of the cut haves. State the magnification.

- (b) Give five similarities between D₁ and D₂

(i).....

(ii).....

(iii).....

(iv).....

(v).....

- (c) Give three differences between D₁ and D₂ (except colour and size)

D₁

D₂

(i)

(ii).....

(iii).....

- (d) State three features of D_{1t} which make it adapted to its type of pollination,
(i).....
(ii)

7. You are provided with specimen labelled A, B, C, D and E which are fruits
(a). State

- (i) The type of fruit each one is
(ii) The mode of dispersal for each specimen
(iii) The observable feature on each specimen to support your choice of mode of dispersal, in the table below:

Specimen	Type of fruit	Mode of dispersal	Observable feature to support choice of mode of dispersal
A			
B			
C			
D			
E			

b).Open up specimen A and cut B, both longitudinally. Compare the sections and state three observable differences between the specimens.

Specimen A	Specimen B
(i)	
(ii)	
(iii)	

(e) Draw and label one section of specimen B.

8. You are provided with specimen E, F and G.

(a). Examine specimen E and F and state five differences between them

Specimen E	Specimen F
(i)	
(ii)	

(iii)	
(iv)	
(v)	

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- b). Using a hand lens, examine one flower of specimen Q and specimen F. Explain one advantage that specimen F has over specimen G.
- c). How are specimen F and G adapted for pollination?
- (i) F:
(ii) G:
- d). (i) Open up one flower of specimen G to expose the inside structures. Draw and label in the space below.

(ii) Cut specimen E longitudinally then draw and label

9. You are provided with specimen **C1, C2, C3** and **C4**.

- a). Observe each specimen carefully and record the observable features of each Specimen.

C1:.....

C2:.....

C3:.....

C4:.....

- b). Using the characteristic features of each specimen you have observed. Construct a simple biological key to identify each specimen.

.....
.....
.....

Arthropods

These are animals in phylum Arthropoda with the following distinguishing characteristics.

- Have exoskeleton
- Have joined legs
- Have segmented body
- Have antennae.

The common arthropods for practical purpose at 'O' - level are;-

1. Bee
2. Termite,
3. Housefly,

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4. Tick,
 5. Cockroach,
 6. Grasshopper,
 7. Spider and
 8. Sugar ant.

Classify the above arthropods under the following taxa.

Arthropods	Phylum	Class	Order
Bee			
Soldier termite			
Housefly			
Tick			
Cockroach			
Grasshopper			
Spider			
Sugar ant			

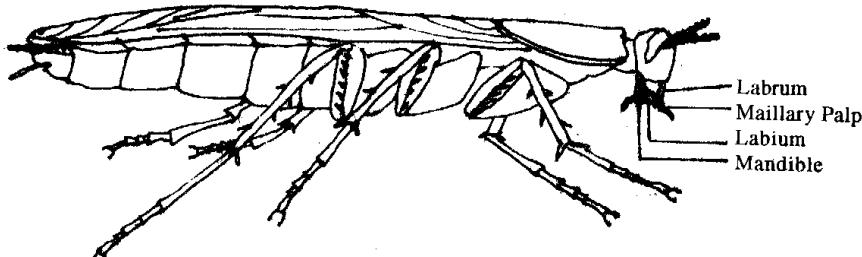
- Give reasons for the class given for each arthropod in the table above.
- With reasons state the habitat of each arthropod.

In studying arthropods for practical UCE, UNEB examinations the description of the following parts of the animals should be mastered. This can also help you to generate differences and similarities among them. A few examples of arthropods have been selected for illustration i.e.

(1) Cockroach

Mouthparts: - Has strong/hard serrated sharp mandibles for chewing /cutting food materials.

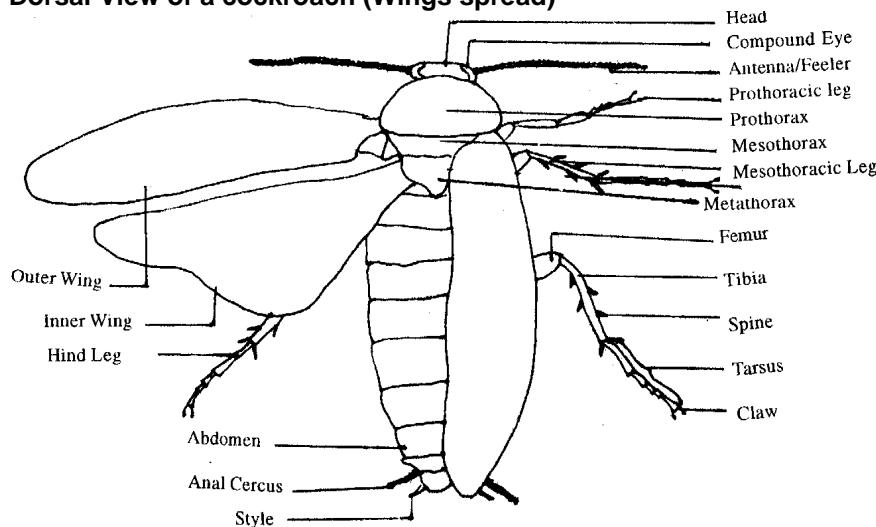
It also has segmented hairy maxillae for holding and directing food into the mouth and the hairs for sensitivity to the taste of the food.



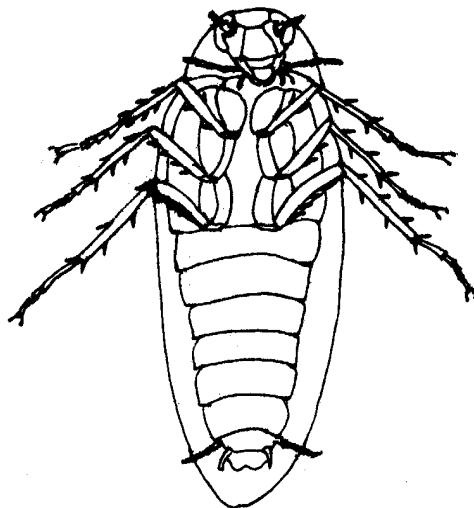
The body:

- Dorso-ventrally flattened for easy passage into the cracks.
- It is also segmented (abdomen) for flexibility during movement.
- It is brown or dull coloured for camouflage.
- It has smooth / oily surface for swift movement or easy escape from enemies.
- It is covered by cuticle or exoskeleton for protection

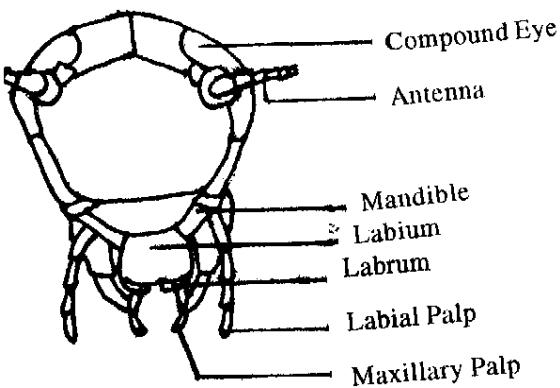
Dorsal View of a cockroach (Wings spread)



VENTRAL VIEW



Head (Anterior View)



Wings

Have two pairs of wings.

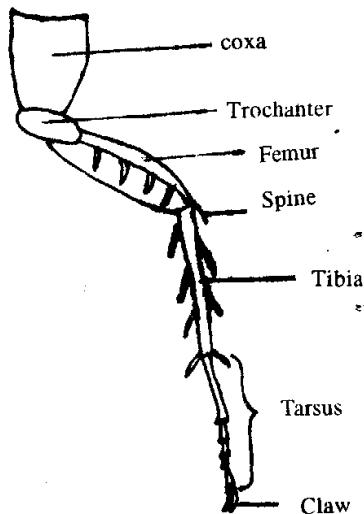
- The outer pair of wings is hard / stiff for protection. They are also dull / dark coloured for camouflage.
- The inner pair of wings is folded and membranous to provide a large surface area for flight and flexibility respectively.
- Wings have network of veins for circulation of gases and strengthening of the wings.

Note: make well-labelled drawing of outer and inner wing.

Legs

- It has 3 pairs of the legs; each pair is attached to one segment of the thorax. i.e. pro meso and meta-thorax segments.

Leg of Cockroach

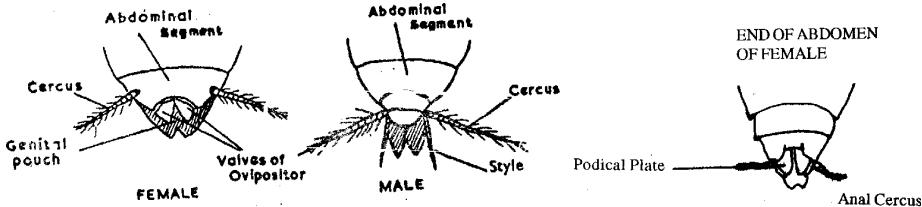


- The legs are segmented for flexibility during movement.
- The legs are long for quick movement
- The hind legs are Z- shaped for leaping /jumping or taking off during flight. The hind legs have spines for protection; it also has curved claws for gripping on to the object / surface.
- Note: Make a well-labelled drawing of the hind leg

Antennae

It has very long pair of antennae measuring at almost the length of the whole body. i.e. the ratio of the Antennae to the whole body is 1:1. The significance of that ratio is to sense the environmental changes in a large area around the body.

The structure at the apex of the abdomen used to identify the sex of the animal i.e. the female has only a pair while a male has both, a pair of cerci and styles.



Note: explain how the cockroach is adapted to living successfully in environment.

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2. BEE:

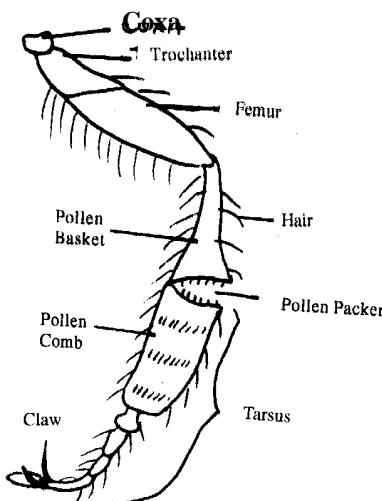
Mouthpart: - It has blunt mandibles for moulding wax and pollen grain.

- It has curved or spoon like tongue or proboscis for sucking or lapping nectar or fluid materials.

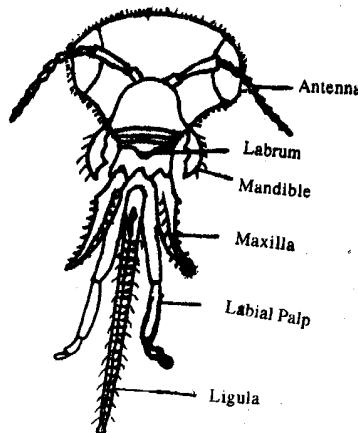
Body: - It has a segmented or jointed body for flexibility

- Its body is also hairy for trapping pollen grains.
- It is covered by hard cuticle or exoskeleton for protection.
- It has a short cylindrical abdomen.

Hind leg



Head and mouth parts
(Proscis extended)



Wings: - They are two pairs of membranous wings for flight and flexibility.

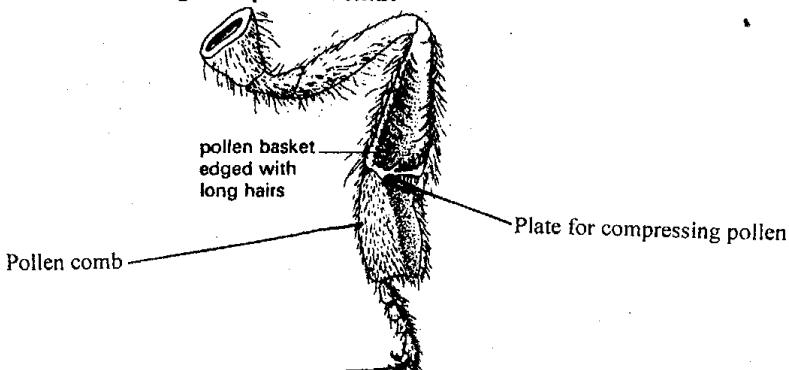
Note: wings have network of veins for gaseous circulation and for strengthening of the wings.

- Legs: - legs are hairy and segmented for trapping pollen grains and flexibility during movement respectively.
- The 1st pair of legs has a comb for clearing antennae and mouthparts.

- The middle pair of legs has prongs for removing pollen grains from pollen basket
- Hind pair of legs has pollen basket and brushes / stiff hair for carrying pollen grains or brushing off pollen from the body respectively.

Diagrammatic illustration of a comb, prong and pollen basket.

Worker fore-leg with pollen comb.



Note: Explain how the Bees are adapted to living successfully in their habitat.

House fly

Mouth parts: - It has tubular proboscis expanded at apex for sucking fluid materials

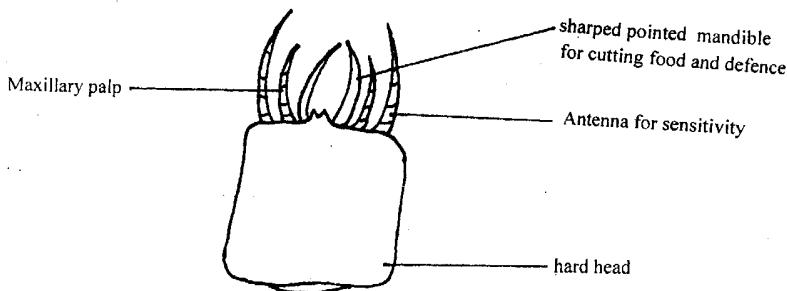
Body: its body is hairy and segmented for carrying the materials and flexibility respectively.

Wings: It has one pair of transparent membranous wings for flight. The second pair of wings is modified into haltere (balancers)

Legs: Are hairy and jointed for carrying materials and flexibility respectively. It has claws and an aroluim for moving on rough and smooth surfaces respectively.

Soldier termite

Head of soldier termite



Spiders:

- Have 4 pairs of legs.
- Some varieties of spiders have hairy and short legs.
- Other varieties have long, smooth legs for fast / quick movement.
- Spiders have two-body parts i.e. Abdomen and cephalo thorax (head fused with thorax)
- They are predators.

Guide questions about insects:

1. You are provided with specimen R.

(a) Giving two reasons, in each case, state the phylum and class of the specimen,
(i) Phylum.....

Reasons.....

(ii) Class:

Reasons.....

(b) Give two adaptations of each of the wings and limbs for their functions,

(i) Adaptations of wings.....

(ii) Adaptation of limbs:.....

(c) Use a razor blade cut off one hind limb and one fore-limb from the points of attachment to the body of the specimen. Stretch the limbs and by the help of a thread, measure their lengths.

(i) Record the lengths in the space provided

Length of fore limbcm

Length of hind limb.....cm

(ii) Work out the ratio of;

Length of fore limb: length of hind limb.

- (iii) What is the importance of this ratio in the life of the specimen?
- (d) Cut off the remaining hind limb at the point of attachment to the body.
Draw and label. State the magnification of your drawing.
- (e) Cut off one outer wing from the point of attachment to the body. Draw but do not label. State magnification

2. You are provided with specimens A and B which are animals living in a different habitats.

- a). Using a hand lens, observe the specimens. For each specimen, describe the structural appearance of the mouthparts, body wings, and legs and state how each of these parts are suited for the mode of life of the animal, by completing the table below.

Specimen	Body parts		
A	Mouth parts		
	Body		
	Wings		
	Legs		
B	Mouth parts		
	Body		
	Wings		
	Legs		

(f) Draw the inner wings of specimen A. Do not label.

3. You are provided with specimen C, D, E and F. Using a hand lens examine the specimen and answer the questions that follow.

- (g) Describe the mouthparts, wings and legs of each specimen.

Specimen	Mouth parts	Wings	Legs
C			
D			

E			
F			

- (h) State how the;
 (i) Mouth parts of specimens E and F are suited for the mode of life of the specimens.
 Mouthparts of E.
- Mouthparts of F;

 (ii) Wings of specimens C and D are suited for the mode of life of the specimens.
 Wings of C;
 Wings of D;
 (iii) Legs of specimens D and F are suited for the mode of life of the specimens
 Legs of D;
 Legs of E;
 (i) Remove the inner wing of specimen D. Draw and label the wing, stating your magnification
4. You are provided with specimens W, X, Y and Z which are animals. Using a hand lens where necessary, examine the specimens and answer the questions that follow.
 (a) State the class of each specimen
 W.....
 X.....
 Y.....

(b) Observe the specimen and complete the table below.

Specimen	Number of legs	Number of wings.
W		
X		
Y		
Z		

- (c). Using only the characteristics of the specimens in (b) above, construct a dichotomous key to identify the specimens.

.....

- (d). Describe how Y is adapted to its habitat

.....

- (e). Draw one inner and one outer wing of specimen Y at a magnification of x 2. Do not label.

(i) Inner wing	(ii) Outer wing

5. (a) You are provided with specimens W, X, Y, and Z. Using a hand lens. Carefully observe the head region of each specimen and record the features in the table below.

Specimen	Features of the head region
W	
X	
Y	
Z	

- (b) Using the characteristic feature of the **head region** of each specimen you have observed construct a simple biological key to identify each specimen.
-
.....

6. You are provided with specimen P, Q and R. Examine the mouthparts and wings of each of the specimens with the aid of a hand lens.
(a) Record the differences in mouthparts and wings of specimens.

Parts	Specimen P	Specimen Q	Specimen R
Mouth			
Wings			;

- (b) What special treatment do the mouthparts of each of the specimens have for their functions?
Mouthparts of P:
Mouth parts of Q:
Mouthparts of R:
(c) Remove the right hind leg of specimen Q and make a labelled drawing of it. State your magnification.

7. You are provided with specimen K, L, M and N, which are animals. Using a hand lens observe the specimens and answer the questions that follow.
(a) State the class of each specimen and in each case give two reasons for your classification.

Specimen	Class	Reason
K		
L		
M		
N		

- (b) Give three adaptations each of specimens K and M to their mode of life.

K:

M:

- (c) (i) Describe the wings of specimen N.....
(ii) Explain why the wings are in two sets.

- (d) The body surface of specimen L appears moist in nature. What is the significance of this state of the body surface to the animals?
.....
- (e) Explain the economic importance of specimen L
.....
- (f) Draw specimen L at a magnification of X2. Do not label.
8. You are provided with specimens Q, R, S, T and U. Examine the external features of each of the specimens carefully using a hand lens and answer the following questions.
- (a) List three observable similarities between all the five specimens.
(i).....
(iii).....
- (b) To what phylum do all the specimens belong?
- (c) State, with a reason in each case, the class to which specimen Q and R belong.
Q Class:
Reason:.....
R Class:.....
Reason:.....
- (d) State one observable difference between specimen S and T
(e) State two observable characteristics of specimen U, which distinguish it from the rest of the specimens.
(f) Construct a simple biological key that would help you identify the five specimens.

CHEMICALS OF LIFE

The structural and functional unit of life is a cell. A cell consists of chemical substances that are referred to as chemicals of life e.g.

- Carbohydrates
- Proteins
- Lipids
- Vitamins

Carbohydrates: There is a variety of carbohydrates classified based on their complexity. i.e.

- Simple sugars / reducing sugars
- Non-reducing sugars.

- Starch.

Simple / reducing sugars.

These are sugars which when heated with Benedict's or Fehling solutions, it changes from blue-green - yellow to orange. The more the reducing sugars in the solution the more bright the colours of the solution.

Very little sugars changes to only green and a lot of sugars changes to orange or red. Examples of reducing sugars are;

All monosaccharides like glucose, galactose and fructose.

And maltose (disaccharide) commonly found in germinating seeds. These carbohydrates are called reducing sugars because they reduce blue Cu^{2+} in Benedict's or Fehling red Cu^+ ions oxide.

Chemical test

- (i) To a known volume of food solution (e.g 1 cm^3) add equal volume of Benedict's and heat,
- (ii) The colour of Benedict's changes from blue to green, to yellow and finally orange.
- (iii) Avoid the describing using adjectives like the colour turns reddish or yellowish.
- (iv) If the reducing sugars are not present the colour of Benedict's remains blue.

Note: Reducing sugars are commonly found in sweet tasting foods e.g. fruits, germinating seeds etc.

Non-reducing sugars

Heating of non-reducing sugars with Benedict's does remain blue. Its presence is confirmed by hydrolysing it first into reducing sugars by;

- (i) Heating it with dilute HCl
I.e. Non-reducing $\xrightarrow[\text{(Dil. HCl heat)}]{\text{hydrolysis}}$ reducing sugars
Sugars
- (ii) Incubating the non-reducing sugar; with invertase enzyme to hydrolyse it to reducing sugars.
Non-reducing sugar $\xrightarrow[\text{Maintain temp, at } 35^\circ\text{C}]{\text{invertase solution}}$ reducing sugars.

Chemical test for non-reducing sugars.

To a known volume of Non-reducing sugars, add dil. HCl and heat / boil. Cool it by dipping in cold water, add NaOH; add equal volume of Benedict's and heat.

The solution changes from blue to green, yellow, orange and finally to red. If Non-reducing sugars are absent the Benedict's / solution remains blue.

Note: - The purpose of dil. HCl is to hydrolyse Non-reducing to reducing sugars,
- The purpose of NaOH is to neutralise the acids. Benedict's solution cannot be reduced to red in acidic medium.

- The purpose of cooling is to have clear observation of all colour changes.

Example of non-reducing sugars is Sucrose.

Starch

Is the polysaccharide or complex carbohydrates. It is tested for by using iodine solution. Iodine is always used in drops, 1-2 drops.

E.g. to 2 cm^3 of food solution or solid food substance add 2 drops of iodine solution. If starch is present it changes to **blue - black**. But if is absent it turns **yellow / brown or iodine colour**.

Starch can be hydrolysed into reducing sugars using enzymes like amylase found naturally in saliva of man and cockroach or chemical amylase or diastase enzyme in solution. These enzymes working neutral or slightly alkaline medium'.

i.e starch $\xrightarrow[\text{Alkaline / neutral}]{\text{amylase / diastase}}$ reducing sugars
incubate at 35°C

Incubating with an enzyme at higher temperatures of 50°C cannot hydrolyse the starch or Non reducing sugars into reducing sugars because high temperatures denature the enzymes.

When a plant extract is used, add iodine and let it stand for 5 minutes to obtain a clear observation.

PROTEINS

Proteins are tested for by using; -

1. Burette test (using CuSO_4 (aq) and NaOH).

E.g. to 2 cm^3 of food solution, add 5 drops of NaOH (aq) followed by 2 drops of blue copper II sulphate solution (CuSO_4 (aq)) and shake.

- A purple colour is a confirmation of presence of proteins.
- A blue solution is an indication of absence of proteins.

Note: Avoid using / running CuSO_4 (aq) into food solution because it gives blue colour even when protein is present if CuSO_4 (aq) is in excess.

2. Million's Test;

1. If an equal volume of millon's reagent is added to a protein solution and the mixture is boiled for 2 minutes.
2. A pink or red coagulated mass or a precipitate depending on quantity of protein is an indication of presence of proteins.
3. The absence of a red coagulant is an indication of absence of proteins,
Note: if an extract of plant material e.g. onion or peas is used a pink or brown suspension is obtained to show the presence of protein.

LIPIDS;

Test for lipids

The translucent spot / mark. If a piece of foodstuff is rubbed on a paper (filter paper) and gently dried, a translucent spot or mark is a confirmation of lipids. Absence of a spot - means absence of lipids.

The methylated spirit / alcohol test: If an equal volume of ethanol is added to a solution of fats / oil and mixture shaken vigorously;

A cloudy appearance or an oil emulsion is observed and confirms the presence of lipids.

- The absence of lipids is confirmed when it remains clear.

VITAMIN C (ASCORBIC ACID)

This vitamin is more common in the fruits and more so in citrus fruits.

Ascorbic acid readily decolourises DCPIP (blue dye) on addition.

The higher the concentration of vitamin C in a solution, the greater the rates of decolourising i.e. few drops of vitamin C are needed to decolourise the same quantity of vitamin C.

General sources of error during the test:

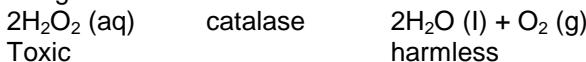
Adding too little DCPIP. In this case the solution changes slightly to purple (sometimes brown) and not to colourless as expected in the presence of DCPIP.

Heating the Vitamin C solution (specimen solution). This has the effect of reducing the Vitamin C content of the solution and therefore, the number of drops of vitamin C added are more for complete reaction. Therefore, where the number of drops of Vitamin C is specifically stated in the procedure a complete result may not be seen.

Using unclean (dirty) apparatus. DCPIP is very sensitive and will detect any trace of ascorbic acid (Vitamin C) In test tubes which have been used before In a similar test.

The enzyme catalase:

This enzyme is found in all living tissues. It speeds up metabolism of, for example toxic wastes into harmless products. E.g. Hydrogen peroxide (H_2O_2) is a toxic product of metabolism in tissues, it breaks down slowly into water and oxygen without catalyse enzyme. H_2O_2 would accumulate in tissues to the levels that would damage tissues.



Evolution of O₂ leads to bubbling in the solution

Note: When the catalase is heated, bubbling is not formed.

The rate of bubbling increases with increase in catalase concentration or surface area of the substance containing catalase. E.g. less bubbling is given off when pieces of liver or chips of Irish potato are immersed into H_2O_2 .

But when the same pieces of liver or Irish potato are crushed and added to more bubbling is formed.

General sources of error during the test

Heating: The solution separates into two layers; an upper and the lower milky solution.

Forgetting to shake: The emulsion does not come out properly.

Forgetting to add water: Again this has the effect of not producing a good emulsion remember water and lipids are immiscible.

Mixing the reagents the wrong way e.g. alcohol first then water then lipid.

Forgetting to add the alcohol This test entirely depends on alcohol.

Guide questions about physiology: (Food tests) (Chemicals of life)

1. You are provided with solutions: C, D and E

(a) Carry out the following tests to identify the food substances in solutions C and D and identify the nature of solution E.

Record your observation and deductions In the table provided.

Tests	Observation	Deduction
(i) To 1 cm ³ of solution C in a test tube, add 3 drops of iodine		
(ii) Repeat test (i) using solution D.		
(iii) To 1 cm ³ of solution C in a test tube add 1 cm ³ of Benedict's solution and boil		
(iv) Repeat test (iii) using Solution D		
(v) To 1 cm ³ of solution C in a test tube add 1 cm ³ of dilute sodium hydroxide followed by 4 drops of copper sulphate solution		
(vi) Repeat test (v) using solution D		

(vii) To 1cm ³ of solution C in a test tube, add 1 cm ³ of solution E. Boil the mixture for 2 minutes and cool. Then add 1 cm ³ of dilute sodium hydroxide solution followed by 1cm ³ of Benedict's solution and boil.		
--	--	--

- (b) Explain the results in test(vii)
 (c) From the results suggest what solution E could be

2. You are provided with suspension S and solution P.

(a) Carry out the following tests to identify the food substances in suspension S and identify the nature of P. Record your observations and deductions in the table below.

Tests	Observation	Deduction
(i) To 1cm ³ of S in a test tube, add 3 drops of iodine, solution		
(ii) To 1cm ³ of S in test tube, add 1cm ³ of Benedict's solution and boil.		
(iii) To 1cm ³ of S in a test tube, add 1cm ³ of dilute sodium hydroxide solution followed by 4 drops of copper sulphate solution.		
(iv) To 1 cm ³ of S in a test tube. Add 1cm ³ of ethanol and shake thoroughly. Leave to settle then pour, off 1cm ³ of the mixture into a test tube containing 1cm ³ of water.		
(v) To 1cm ³ of DCPIP in a test tube add S drop by drop to 10 drops.		

b) Put 2 cm³ of S in a test tube and add an equal amount of P. Incubate the mixture in a water bath maintained at 40°C for 20 minutes. (You may continue with other work in the meantime). After the 20 minutes. Carry out the following tests and record your observation and deductions in the table below.

Test	Observation	Deduction
(i) To 1cm ³ of the mixture add 3 drops of iodine		
(ii) To 1cm ³ of the mixture, add 1 cm ³ of dilute sodium hydroxide solution followed by 4 drops of copper sulphate solution.		

(b) From your results in (a) and (b)

(i) Suggest with a reason, the identity of solution P.

.....
State with a reason, one property of solution P.

3. You are provided with specimens, A₁ and B₁, which are storage organs.

(a) What type of storage organ is each specimen? Give two reasons for your answer in each case.

(i) A₁.....

Reasons.....

(ii) B₁.....

Reasons:.....

(d) Solution A₂ is an extract from specimen A₁ and solution B₂ is an extract from specimen B₁. Carry the following tests to determine the food substances contained in each specimen. Record your observations and deductions in the table 1.

Test	Observation	Deduction
(i) To 1cm ³ of A ₂ in a test tube, add 3 drops of iodine solution.		
(ii) Repeat test (i) using solution B ₂ instead of A ₂		

(iii) To 1cm^3 of A_2 in a test tube, add 5 drops of dilute sodium hydroxide solution followed by a solution of copper sulphate drop by drop.		
(iv) Repeat test (iii) using solution B_2 instead of A_2		
(v) To 1cm^3 of A_2 in a test cube, add 1cm^3 of Benedict's solution and boil		
(v) To 1cm^3 of A_2 in a test tubs, add 1cm^3 of Benedict's solution and boil		
(vi) Repeat test (v) using solution B_2 instead of A_2		

- (vii) Giving a reason which of the specimens A_1 and B_1 would sprout first if favourable conditions for growth were provided.
-

3. You are provided with solution A and B.

(a) Identify solution A by carry out the following tests. Record your observations and deductions in the table below.

Test	Observation	Deduction
(i) To 2cm^3 of solution A add 3 drops of iodine solution		
(ii) To 2cm^3 of solution A add 2cm^3 of Benedict's solution and boil.		
(iii) To 2cm^3 of solution A add 5 drops of dilute sodium hydroxide solution followed by 5 drops of copper sulphate solution.		

- (b) (i) Mix 1cm^3 A with 1cm^3 of B and 3 drops of dilute hydrochloric acid. Observe and record the appearance of the mixture.

-
(ii) Put the test tube of the mixture in (b) above in warm water maintained at about 35-40°C and leave for 15 minutes. After 15 , minutes observe and record the appearance of the resulting mixture.
.....
(c) What was the purpose of maintaining the mixture of A and B at 40°C?
.....
(d) What conclusion can you draw about the effect of solution B on solution A?
(e) Giving two reasons, suggest the name of solution B.
.....
- 39
4. You are provided with specimen T. Which is a plant structure,
(a) (i) Identify plant structure T.
.....
(ii) Give reasons for your answer in (a) (i) above.
.....
(iii) State two functions of structure T to the plant

- (b) Cut specimen T longitudinally into two halves. Crush one half in a mortar, add 10cm³ of water and stir. Decant the liquid part of the mixture into a test tube and label it solution T. Using reagents provided carry out the following test on solution T and record your observations - . and deduction in the table below.

Test	Observation	Deduction
(i) To 1cm ³ of solution T add 2 drops of iodine solution		
(ii) To 1cm ³ of solution T add 1cm ³ of Benedict's solution and boil.		
(Hi) To 1cm ³ of solution T add 3 drops of DCPIP		
(iv) To 1cm ³ of solution T add 3 drops of millions reagent and boil		

- (c) Make a well-labelled drawing of the remaining half of specimen T in the space below.

5. You are provided with solution T.

(a) Carry out tests on it and record observations and deductions in the table below.

Test	Observation	Deduction
(i) To 1 cm ³ of T in test tube add 1cm ³ of your own saliva. Allow to stand for 10 minutes. (Meanwhile proceed with other tests) then add 2 drops of iodine.		
(ii) To 1cm ³ of T add 1cm ³ of Benedict's solution and boil		
(iii) To 1 cm ³ of T add 1cm ³ of dilute HCl add 1cm ³ of dilute sodium hydroxide solution followed by 1cm ³ of Benedict's solution and boil		
(iv) To 1cm ³ of T add 1 cm ³ of dilute Hydrochloric acid. Boil and cool. Add 2 drops of iodine solution.		
(v) To 1 cm ³ of T add 1cm ³ of dilute sodium hydroxide solution. Boil and cool. Add 2 drops of iodine solution.		
(vi) To 1cm ³ of T add 2 drops of iodine solution.		

(b) What effect do the following substances below have on solution T?

(i) Sodium hydroxide?.....

(ii) Hydrochloric acid.....

(c) Explain the effect of saliva on solution T.

.....

(d) Carry out a test for protein on solution T. Record your procedure, observation and conclusion below.

Procedure	Observation	Conclusion

6. You are provided with four seeds M, N₁, N₂, and N₃ at different stages of A germination.

(a) State the large group of seed - bearing plants to which M and belong.

M.....

N.....

(b) State five observable differences between M and N₁

M	N ₁
(i)	
(ii)	
(iii)	
(iv)	
(v)	

(c) Draw and label specimens M and N₁ in the space provided below.

(d) Crush N_a in a clean piece of paper, transfer it into test tube, add about 2 cm³ of water-to it and shake. Pour off the liquid part into another test tube and divide the liquid into two parts. To the first part, add 3 drops of iodine solution. To the second part add 3-4 drops of Benedict's solution and heat. Record your observation and conclusion in the table below. Repeat the above experiment using N₃.

Specimen	Solution used	Observation	Conclusion
N ₂	Iodine		
	Benedict's solution		
N ₃	Iodine		
	Benedict's solution		

(e) From the tests above, did you notice any differences between N₂ and N₃? Explain your answer.

.....

.....

7. You are provided with the following;

- Hydrogen peroxide solution
- Solution x
- Solution z
- 4 pieces of liver tissue.

- Litmus paper
- Dropper.
- 4 test tube.

Label 4 test tubes 1, 2, 3, and 4. Place a piece of the liver tissue provided into each test tube.

- (a) Carry out the following tests and record your observations and deductions in the table below.

Test tube	tests	Observation	Deduction
1	(i) Add solution X to completely cover the pieces of liver tissue. Add 1cm ³ of hydrogen peroxide (ii) Test the mixture with red and blue litmus.		
2	(i) Add solution 2 to completely cover the pieces of liver tissue. Add 1cm ³ of hydrogen peroxide (ii) Test the mixture with red and blue litmus.		
3	(i) Add distilled water to cover the piece of liver tissue. Add 1cm ³ of hydrogen peroxide. (ii) Test the mixture with blue and red litmus		
4	(i) Add distilled water to cover the piece of liver tissue. Boil. Add 1cm ³ of hydroxide peroxide, (ii) Test the mixture with red and blue litmus paper.		

- (b) In which test tube was the reaction most vigorous?
- (c) What is the nature of
 (i) Solution x ;.....
 (ii) Solution z ;.....
- (d) In what medium is the active substance in the liver tissue most reactive?

- (e) What is the effect of heat on the active substance in the liver tissue?

- (f) Identify the active substance in the liver tissue, Give reasons for your answer.

(g) Name the factors being investigated in this experiment

8. You are provided with substance X.

Label five test tubes 1, 2, 3, 4 and 5. Rinse your mouth with clean water to remove food residue, and collect about 5 cm^3 of saliva in test tube - 1. To each of test tube 2 to 5 add 2cm^3 of substance x and then add 2cm^3 of saliva in each of test tube 3 and 4. Allow all four test tubes to stand for 10 minutes. Shake the test tubes periodically.

Carry out the following tests and record your observations and deductions in the table below.

Test	Observation	Deduction.
(i) To test tube 2 and 3 add 3 drops of iodine.		
(ii) Repeat the test with test tube 3		
(iii) To test tube 4 add 3 cm^3 of Benedict's solution and boil for 1 minute.		
(iv) Repeat the test with test tube 5		

- (b) What do you conclude ^about the nature of substance X?

- (c) How do you explain the reaction of substance?

(i) With iodine in test tube 3?

(ii) With Benedict's solution in test tube 4?

- (d) What chemical change could have taken place in tubes 3 and 4 upon addition of saliva?

- (e) Briefly explain the role saliva could have played in the change in (d) above.

- (f) Why is there no change in test tubes 2 and 5?

9. You are provided with four unboiled pieces and one boiled piece of liver and solution P, X, Y and Z.

Carry out the following tests using the liver and solutions. Record your observations and deductions in the following table.

Test	Observation	Deduction
(i) To 3 cm ³ of solution P in test tube add one piece of unboiled liver.		
(ii) To 2 cm ³ of solution P in a test tube, add 1 cm ³ of solution X and test the mixture with litmus paper then add one piece of unboiled liver.		
(iii) To 2 cm ³ of solution P in a test tube, add 1 cm ³ of solution Y, test with litmus paper then add one piece of unboiled liver		
(iv) To 2 cm ³ of solution P in a test tube, add 1 cm ³ of solution Z, test with litmus paper then add one piece of unboiled liver.		
(v) To 3 cm ³ of solution P in a test tube, add one piece of boiled liver.		

(b) From your results, suggest the nature of solution P.

.....

(c) What conclusion can you make from the results of tests (ii), (iii) and (iv)?

.....

(d) What was the importance of test (i)?.....

(d) Explain the results in test (5)......

OSMOSIS AND DIFFUSION

Osmosis is the movement of solvent molecules (water) from a region of low concentration to a region of high concentration through a semi permeable membrane.

A low concentrated region (solution) is a dilute solution with more water and less dissolved solute,

A highly concentrated solution is the one with more dissolved solute and less water. In terms of water concentration (amounts), water is highly concentrated in a low concentrated (dilute) solution than in a highly concentrated one.

Thus osmosis is as well defined, as the movement of water molecules from where is highly concentrated to its low concentration through a semi permeable membrane.

OR Osmosis is the diffusion of water molecules through a semi permeable membrane.

Semi permeable membrane is the one that allows only small molecules to pass through and prevent large ones. E.g. cell membrane, visking tube etc.

Diffusion is the movement of solute molecules from a high to a low concentrated region. Both osmosis and diffusion are passive process, since they do not require any energy for them to take place.

In diffusion, only solute molecules move. It can occur with or without the semi permeable membrane.

However, in osmosis, it is only solvent molecules that move and must be through a semi permeable membrane.

There are various 'O' level Biology practicals concerning osmosis and diffusion, some of which are illustrated below.

Determination of osmotic pressure / potential of a plant tissue using standard solutions by basing on;

(1) Change in length of plant tissues:

Osmotic pressure: is the concentration of the plant tissue.

Standard solutions: are the ones whose concentration is known.

Procedure;

Prepare three solutions of different concentrations. Cut out six cylinders of a plant tissue. Trim them to the same length; dip two cylinders in each solution. Let the experiments standard for 30 minutes. Then take the measurements accurately to obtain the length of the cylinders in each *solution* after the 30 minutes.

The solution, whose cylinders increased in length, is less concentrated compared to that of the plant tissue. Thus the plant tissue (cylinders), absorbed water by osmosis from the solution and its cells expanded (became turgid) leading to increase in total length of the cylinders.

The solution, whose cylinders decreased in length, is highly concentrated compared to that of the plant tissue. Thus the plant tissue (the cylinder) lost water by osmosis to the highly concentrated solution and its cells became flaccid (flabby) leading to a decrease in length.

The solution, whose cylinders almost remained with the same length, shows that the solution and plant tissue concentrations are the same (isotonic)

(2) Curling of the strips of the plant tissue.

Obtain along internode of a young plant stem of a young plant stem e.g. commelina stem. Cut it into four (longitudinal strips. Dip one strip into each of the three solutions of known different concentrations,

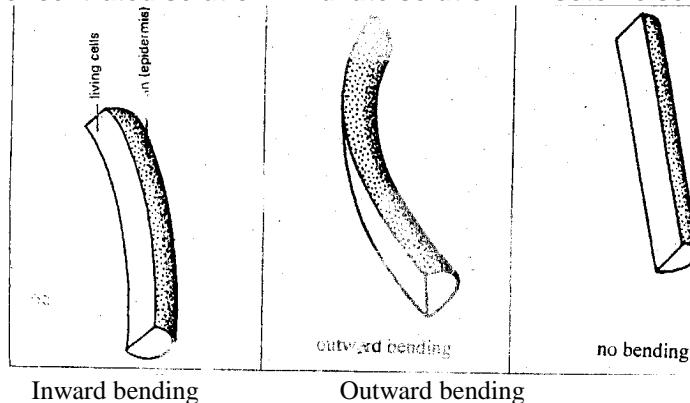
Observe the strips after 20 minutes. The strip in the dilute solution compared the plant tissue; absorb water by osmosis into its fleshy inner cells and they (curling) of the strip with its outer layer (epidermis) on the inside of the curve.

The strip in concentrated solution compared to that of the plant tissue, losses water by osmosis to the solution, its fleshy cells become flaccid and the whole strip bends inwards.

The strip in the isotonic solution (similar concentration) does not curl (bend) due to absence of a net loss or gain water.

Illustration of the bending (curling) of the strips in different concentrations.

In concentrated solution dilute solution Isotonic solution



Osmosis via a semi-permeable membrane

In such an experiment the student is required to arrange the apparatus as shown below:

A mixture of substances of different sizes e.g. starch and glucose is placed inside the cellophane bag / tubing and tied very tightly after which it is lowered into a beaker of distilled water and the experiment is allowed to stand for sometime e.g. 1 hour.

After this till the water is tested for presence of a reducing sugar using Benedict's solution and starch using Iodine. As expected starch has larger molecules than glucose (starch is actually made up of glucose units).

It is found that only glucose has diffused through due to this and therefore, the cellophane bag / tubing acts as a semi-permeable membrane. The student should take great care in such an experiment to tie both ends of the cellophane bag / tubing firmly as failure to do so would lead to leakage and therefore, wrong results. In such a case even starch is detected in the external solution.

A common question after such an experiment is about the nature / structure of the cellophane bag / tubing. The student should be able to state that it acts or is a semi-permeable/selectively permeable membrane.

A common question based on the results of experiments of the kind discussed in C (i) - (iii) above is the physiological (or biological) process involved which should be stated to be osmosis. Any other functions of such a process if asked for should be answered from a theoretical point of view e.g. absorption and movement of water across the root, maintenance of turgidity and hence support in stems of herbaceous plants etc.

Demonstration of diffusion and osmosis using a semi permeable membrane for example visking tube.

Using a piece of thread tie one end of the risking tube tightly. 'Hour some starch and glucose solution into the visking tube and then tie the open end tightly. Wash the visking tube under a running tap to avoid contamination. Dip the visking tube into the test tube containing distilled water for 30 minutes. After 30 minutes carry out a chemical test for both starch and reducing sugar (glucose) on distilled water in the test tube.

The distilled water tests positive for reducing sugars and negative for starch. This shows that glucose being small molecules diffused through the walls of the visking tube into the distilled water. But starch cannot diffuse through the small pores of the visking tube because of its large molecules. Thus visking tube is a semi permeable membrane.

Note: Osmosis also occurs by movement of water molecules from the test tube through the walls of visking tube into the glucose solution, causing expansion of the visking tube. This also shows that solution in visking tube is more concentrated than the distilled water.

General sources of error during experiments on osmosis

Failure to label the solutions, test tubes (or experiments) appropriately (or sometimes not at all. Usually many solutions are used and the student after

getting the results records them in the wrong places due to this. Always endeavour to label your test tubes, solutions etc.

In the change in length method failure to make vertical cuts on the potato cylinders. The potato cylinder if cut obliquely (i.e. at an angle) has two lengths and errors may result if after the experiment a length different from the one originally measured is taken.

Again in the change in length method failure to measure exactly is a common problem. Students fail to do so firstly because they do not practice measuring to exactness and secondly because some have faulty rulers with the marks for the measurements worn out. (This is common with plastic rulers). Students should practice measuring to nearest mm and also to ensure they have good rulers with all calibrations well marked.

For experiment C (iii) failure to tie tightly both ends of the cellophane tubing leads to leakage and wrong results. Also failure to allow the experiment enough time may produce wrong results.

GUIDE QUESTIONS ABOUT OSMOSIS AND DIFFUSION

1. You are provided with solutions A and B.

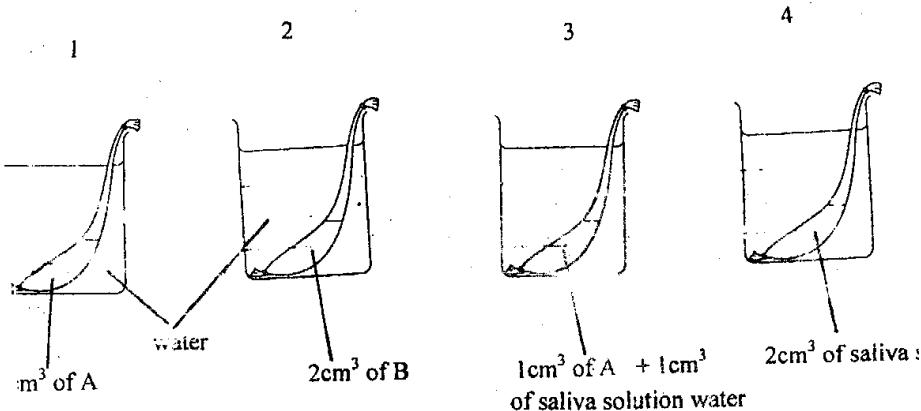
(a) Carry out the following tests to identify the food substances in the solutions and record your observation and deductions in the table below.

Tests	Observation	Deduction
(i) To 1cm ³ of solution A in the test tube add 3 drops of iodine solution		
(ii) Repeat test (i) using solution on B		
(iii) To 1cm ³ of solution A in a test tube add 1cm ³ of Benedict's solution and boil		
(iv) Repeat test (iii) using solution B.		

(b) After identifying solution A and B, use them in the following tests following the procedure below;

- Rinse your mouth and spit 2cm³ of saliva in a test tube and dilute it with an equal amount of water.
- Label four test tubes 1, 2, 3 and 4 and half fill each tube with water.

- Tie one end of each of the four visking tubes provided using a thread, add different contents to each visking tube and tie the second end of the each visking tube as shown in figure. 1
- Wash the outside of the visking tubes and place them into the test tubes half filled with water as shown in the set up in figure 1. Leave the set up for 30 minutes. (You may proceed with other work in the mean time)



After 30 minutes, remove the visking tubes and carry out the following tes* on the water in each test tube. Record your observation and deduction in the table.

Tests	Observation	Deduction
(i) Put 1cm ³ of water from test tube 1 into a test tube and add 3 drops of iodine solution		
(ii) To 1 cm ³ of water from the test tube of water from test tube 2 in a test tube, add 3 drops of iodine		
(iii) To 1 cm of water from test tube 3 in a test tube, add 3 drops of iodine		
(iv) To 1cm of water from test tube 4 in a test tube, add 3 drops of iodine solution.		
(v) To 1 cm ³ of water from test tube 1 in a test tube,		

add 1 cm ³ of Benedict's solution and boil!		
(vi) To 1 cm ³ of water from test tube 2 in a test tube, add 1cm ³ of Benedict's solution and boil.		
(vii) To 1cm ³ of water from test tube 3 in a test tube, add 1cm ³ of Benedict's solution and boil.		
(viii) To 1cm ³ of water from test tube 4 in a test tube, add 1cm ³ of Benedict's solution and boil		

(c) Explain your results in:

(i) Test tube 2:

(ii) Test tube 3

(iii) What do the test in (b) demonstrate?

.....

You are provided with specimen P, which is plant material and sugar solutions of concentration 25%, **20%**, **15%**, 10%, 5%, 1% and 0%.

(a) Peel the specimen and cut seven strips of the material each measuring **0.5cm x 0.5cm**. Drop a strip of material in each test tube and leave to stand for 20 minutes. (In the meantime continue with other work)

(i) After 20 minutes, remove the strips and measure their length. Record the results in the table below.

	Concentration of sugar %						
	25	20	15	10	5	1	0
Initial length of strip (cm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Final length of strip (cm)							
Difference in length (cm)							

(ii) Subtract the length of each strip after 20 minutes from its initial length. Record the results in the table above.

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- (b) Plot a graph of concentration against difference in length on a graph paper.
- (c) Explain the meaning of the following;
- A difference in length of less than 0.0cm
 - A difference in length of more than 0.0cm.
 - No difference in length
3. You are provided with specimens Z and T, Which are plant organs
 (A) Using a cork borer cut two long cylinders from specimen 2, trim them to 4 cm long. Place one cylinder in solution A and the other in solution B. Let the experiment stand for 30 minutes, take the second measurements and record in the table below.

Cylinder	Original length	Final length	Change in length	% Change in length	Feel it and state whether in hard or flabby.
Cylinder A					
Cylinder B					

- With a reason (s) state the cylinder that;
- (i) Increased in length:
 Cylinder
 Reason:
- (ii) Decreased in length;
 Cylinder:
 Reason:.....
- (B) With a reason state cylinder that is
 (i) Hard.....
 Reason(s).....

- (C) Select the longest internode of specimen t and cut it out Slice the internode longitudinally with a razor blade to obtain four strips. Select two equal slices place one of the slices in solution A and the other in solution B. Let the experiment stand for 20 minutes.
- (i) Make a drawing of each strip after 20 minutes in spaces below. Shade the epidermal layer.

Slice A	Slice B

- (ii) Describe the shape (bending) of the strip with a reason Strip A.....
 Reason:

B.....

Reason:

- (iii) From the two experiments above (experiment A and C) outline importance of osmosis to the plants.

4. You are provided with solution X and Y; visking tubing, three and beaker
(a) Identify solution X and Y by carrying out the following tests. Record your observations and deductions in the table 1

Tests	Observation	Deduction
(i) To 1 cm ³ of solution X add 3 drops of iodine solution		
(ii) To 1cm ³ of solution X add 1cm ³ of Benedict's solution and boil.		
(iii) To 1 cm ³ of solution Y add 3 drags of iodine solution		
(iv) to 1cm ³ of solution Y add 1cm ³ of Benedict's solution and boil		

Securely tie one end of the visking tubing provided using the thread, Mix 2cm² of each solution of X and Y and pour the mixture into the visking tubing. Firmly tie the free end of the visking tube wash the outside with water. Suspend the visking tubing in a beaker of distilled water as shown in figure 2.)

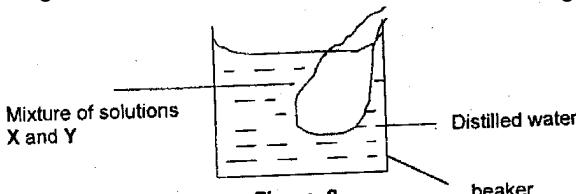


Figure. 2

Immediately after setting up the experiment, carry out the following tests in table II on the water in the beaker. Record your observations and deductions in table II.

Table 11

Tests	Observation	Deduction
(i) Using a dropper, withdraw 1cm ³ of water from the beaker into a test tube and add 3 drops of iodine solution		

(ii) Withdraw 1cm ³ of water from the beaker into a test tube as in (i) above. Then add 1cm ³ of Benedict's solution and boil		
---	--	--

- (c) Leave the apparatus to stand for 25 minutes. After 25 minutes carry out tests on the water in the beaker again as indicated in table III and record your observations and deductions in the table.

Table III

Test	Observation	Deduction
(i) Withdraw 1cm ³ of water from the beaker into a test tube and add 3 drops of iodine solution		
(ii) Withdraw 1cm ³ of water from the beaker into a test tube, add 1cm ³ of Benedict's and boil.		

- (d) Explain your results in table III

.....

- (e) (i) State the process that leads to the results obtained in the experiment above.

- (ii) What is the importance of this process in the human body?

.....

5. You are provided with specimen D, which is a plant part and solution X, and Y.

a). Peel the specimen and cut two strips each measuring; 0.5cm x 0.5cm x 4.0cm. Place one strip in a petri dish labelled A add solution X to cover the strip. Place the other strip in a petri dish labelled B; add solution Y to cover the strip. Leave both dishes to stand for 25 minutes.

- (i) After 26 minutes remove the strips from the petri dishes and measure the length of each.

Record your results below,

Length of strip in solution Xcm

Length of strip in solution Ycm

- (ii) Write down observable changes that have taken place in the strip placed in;

Solution X:.....

- 54
- Solution Y;.....
- b). From your results state with a reason the nature of;
(i) Solution X:.....
(ii) Solution Y:.....
- c). Cut two other strips each measuring 1cm x 1cm x 1cm, Leave one piece whole and cut the second piece into six smaller pieces. Label two test tubes A and B and in each add 2cm of hydrogen peroxide. In test tube A, add the whole piece and in test tube B add the six smaller pieces together ;
(i) Record your observations.
Test tube A
(ii) Explain your observation in c (i) above.

SOILS

Basically soils are classified into three types depending on their nature, i.e. Clay, Sand and Loam.

Identifying observable characteristics of each soil type.

Loam - Is spongy by feeling it

- Is dark in colour
- Is sticky
- Has big crumbs.

Sand soil - Is gritty (has tiny hard stones)

- Is coarse

Is rough

- Is so light coloured

Clay soil - Is smooth

- Is sticky

- Is grey in colour

The properties of soil that are practically examined are;

- i. Water retention capacity
- ii. Permeability
- iii. Soil aeration
- iv. Moisture content of soils

Water retention capacity

This measures the ability of soils to retain water. It depends on the structure of the soils. Usually soils with small closely packed particles e.g. clay has poor drainage and hence retain a lot of water. And soils with big spaced particles e.g. sand soil

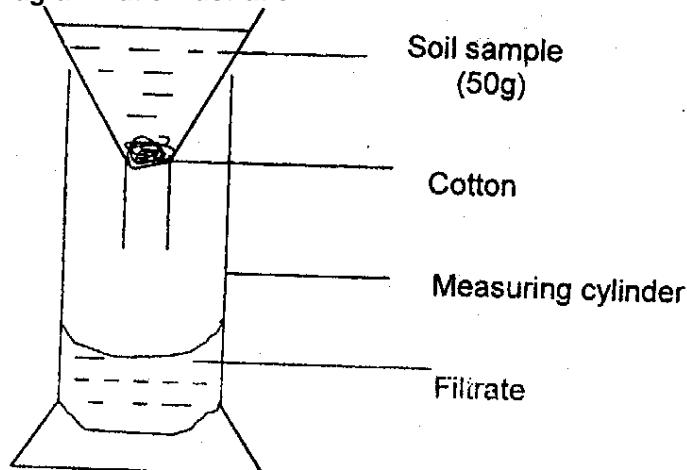
retain very little water.

Experimentary water retention capacity of soils is determined by;

- Plugging the filter funnel with either cotton wool or filter paper.

- Put a known amount of soil sample in the funnel
- Stand the funnel in the measuring cylinder.
- Pour a known volume of water on the soil sample.
- Collect the filtrate into the measuring cylinder and note the volume when dripping has stopped.

Diagrammatic illustration



To obtain the amount of water retained, subtract the filtrate from the amount water poured.

The percentage of water retained.

$$= \frac{\text{Water retained}}{\text{Water poured}} \times 100$$

Do the above experiment on the three types of soils to compare their water retention capacities.

Note: Good soil for plant growth and seed germination must retain moderate amount of water.

Soils that retain excess water are always poorly aerated and hence are not suitable for plant growth and seed germination.

Soil permeability

This is the amount of water that drains through a given amount of soil sample within a given time.

A similar set up of the apparatus as above (for water retention) is used to determine the permeability of soils.

To compare the permeability of different soil types, collect the amount of water then drain through the same amount of each soil type for the same period of time (e.g. 5 minutes).

The soil type with the highest volume of filtrate has the greatest permeability and hence cannot retain enough water for plant growth. Such soils have spaced soil particles.

The soil type with the lowest volume of the filtrate has the lowest permeability and hence retains excess water. Such soil has closely packed particles leaving very small pores for drainage.

The soil sample with moderate filtrate has moderate permeability and hence retains enough water for the plant growth such soil has moderately packed soil particles.

Note: Soil samples used In both water retention and permeability experiments must be completely dry for accuracy.

Soil Aeration

Is the amount of air contained by a soil sample. A soil type with spaced particles is well-aerated e.g. sand soil but the clay soil with closely packed particles is poorly aerated. Loam soil is moderately aerated.

The amount of air contained by a given soft sample is experimentally measured by;

- Pouring a known volume of water into the measuring cylinder..... .(a)
- Obtaining a known volume of soil sample.... .-.,(b)
- Adding the soil sample Into the water in the measuring cylinder and stir well, note the volume of the mixture, ... (c)

The volume of air in that volume of soil used = $(a + c) - c$

The percentage of air in the soil sample used = $\frac{(a+b)-c}{b} \times 100$

Note: As the soil mixes with the water, air is driven out of the soil *air* spaces leading to the drop (lowering) in the volume of the mixture of watered soil.

Do the above experiment on the three types of the soil to compare their aeration.

POPULAR QUESTIONS

1. You are provided with soil samples X, Y and Z. Put soil sample X into a measuring cylinder up to 100cm^3 mark. Measure 100cm^3 of water and add it to the soil in the cylinder. Stir the mixture with a glass rod and leave to settle. Read and record the volume of the resulting mixture in the table below. Repeat the experiment with soil samples Y and Z.

Soil samples			
Volume of soil	X	Y	Z
Volume of water			
Volume of mixture			

- (f) From the table calculate;

(i) The volume of air in

Sample X:.....

Sample Y:.....

Sample Z:.....

- (ii) The percentage of air in; Sample X:.....

Sample Y:.....

Sample Z:.....

- (g) From your results in (a) what can you say about the particles of the three soil samples?

X:.....

Y:.....

Z:.....

- (h) (i) Plug a funnel with a piece of cotton woof, Measure 100cm^3 of sample X and carefully pour it onto the funnel. Place the funnel on a measuring cylinder and add 100cm^3 of water onto the soil sample- Start a time clock when the first drop appears out of the funnel. After five minutes remove the funnel, read and record the volume of water collected, in the space below. Repeat the experiment with soil samples Y and Z.

Soil sample	Volume of water after 5 minutes.
X	
Y	
Z	

(ii) From your results in C (i) calculate the percentage of water retained by each soil sample.

X:.....

Y:.....

Z:.....

(i) (i) From your results, which of the three son samples is best for farming?

(ii) Give two reasons for your answer in d (i) above

2. You are provided with the following specimens L, Y and K. Use them to answer the following questions.

(A) Feel the specimens in your hands and describe their texture.

Specimen L:.....

Specimen Y:.....

Specimen K:.....

(B) From your description above which specimen has;

(i) Highest water retention capacity.....

(ii) The lowest porosity.....

(iii) The highest capillarity.....

(c) With reasons, which specimen is preferred for;

(i) Agriculture:

Specimen:.....

Reason:.....

(ii) Wet land cropping.

Specimen:.....

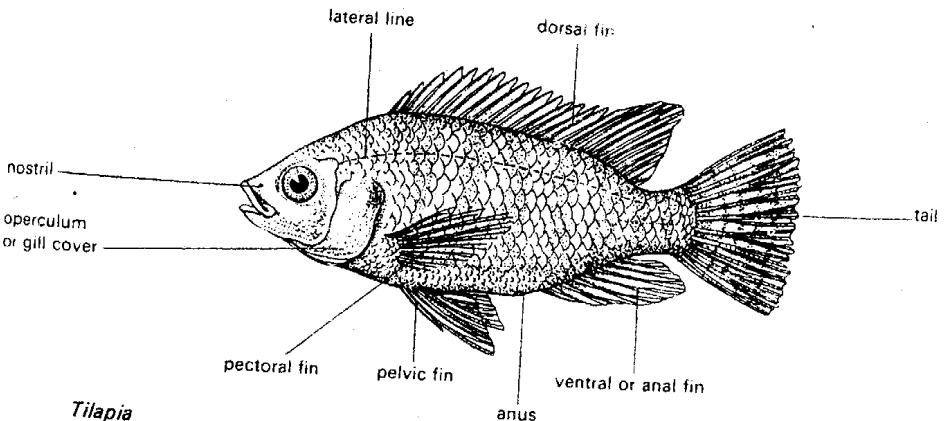
Reason:.....

(d) Mix equal Volume of L and Y, and pour the mixture to $\frac{1}{4}$ level of the boiling tube. Add water up to $\frac{3}{4}$ of the boiling tube. Close the tube with your thumb and shake it, let it stand for 10 minutes.

After 10 minutes draw the diagram showing the settlement of soil particles without labelling.

FISH

Fish can be identified by presence of scales on the body, having gills covered by the opeculum, having fins, etc. You can study the structure of typical fish by examining a tilapia drawn in the figure below.



Uses of fish structures;

The skin is covered with scales which overlap each other like tiles on the roof of a house. They protect the fish and prevent water passing through the skin.

On either side of the head there is a flap of skin which is stiffened by bones. This is called the operculum. The operculum covers and protects the gills. The operculum also is essential in gaseous exchange.

Underneath the operculum there are four feathery structures side by side. These are the gills which are used for breathing. A gill is composed of the gill rakers, gill bar, and the gill filaments. The gill rakers filter off any large particles taken in with water.

At various points there are fins. Each fin consists of a thin flap of skin supported by slender spines. Some of the fins are arranged in pairs and stick out from the sides of the body. These are referred to as the paired fins which include the pectoral fins just behind the head, and the pelvic fins /We farther back.

The other fins are single and attached to the mid fine of the fish and are referred to as the *median* fins which include the dorsal, ventral and tail fins. All these are necessary for locomotion.

Fish have good sense organs which include: the nostrils used for smelling, but they do not play any part in breathing.

- The eyes that can see very well under water.
- Running along each side of body is a faint lateral **line**. This is a canal just beneath the surface of the skin. It contains sense organs which detect movements of the water.

General questions about fish

- 60
1. You are provided with specimen K.
- (a) Classify K as far as possible.
Kingdom:
Phylum:
Class:
- b (i) name the type of habitat of K
(ii) On the basis of observable **external** features **only** give 3 ways in which specimen K is suited to its habitat as named in b above.
1.....
2.....
3.....
- c. (i) identify the structures covering the body?
(ii) Carefully remove one of these structures and with the help of the hand lens make a large drawing of it.
.....
.....
(iii) How is the structure in c above suited to its function?
.....,.....,.....
d (i) which part of the body are the structures in C(ii) facing
.....,.....,.....
(iii) Remove the operculum of the left side and draw the head region showing the structures exposed.

2. You are provided with specimen D.
- (a) (i) identify the specimen.....
(ii) Remove one operculum in the left side, draw and name the structures seen inside as well as the whole specimen.
- (ii) What is the function of the structures seen under the operculum?
.....
(iii) Give five adaptations of the structures to its functions.
1.....
2.....
3.
- b. with the help of razor blade carefully cut off one of the filaments from the structures seen under the operculum. Draw the structure and state the magnification.

(iii) Examine the fins and identify each type of the fin and list the functions of the fins in locomotion, in the table below.

	Name of fin	Use in locomotion
Paired		
Unpaired		

3. You are provided with specimen E, examine it carefully.

(a). Classify the organism into phylum and class giving two reasons in each case,
Phylum;.....

Reason:

1.....

2.

Class:.....

Reason:

1.....

2.

(b). make a large labelled drawing of the trunk region only as seen from the side.

State your magnification.

C (i). Measure in (cm) the total length of the specimen from the tip of the head to the tip of the tail.....

(ii) Measure the length of the tail in cm.....

(iii) Express the tail length as a percentage of the total length of the body.

(d) Give 5 different adaptations that enable this specimen to live successfully in its habitat. Explain your answer in each case.

4. You are provided with freshly killed specimen.

(a). make a large well labelled drawing of the specimen from the **lateral** view.
On your drawing indicate the **head**, trunk, and tail using **horizontal bracket**

B (i). describe the body shape of specimen.

.....

- 62
- (ii). of what advantage is the shape you have described in b(i) above to the organism.....
- C (i). Rub your finger along the body of specimen from head to tail and then from tail to head. Record the difference in the feel and describe the arrangement of the scales as seen on the specimen.
-
.....
.....
- (ii) Of what advantage to the organism is the arrangement of scales described in d (i) above.
5. You are provided with specimen F.
a. suggest the class of the animal from which the specimen was obtained.....
- b (i). State one function of specimen F to the organism.
-
- c. remove one scale from specimen F. Examine, bend try to tear it.
(i) Describe its structure.....
(ii) from your observations in c (i) state how the structure of specimen F is suited for its function in (b).
- d (i). Draw a portion of specimen F with at least five scales, in the space below. Indicate with an arrow which side of your drawing would be nearest the head of the organism from which specimen F was obtained.
- (ii). of what advantage to the organism is the arrangement of scales as shown on your drawing?
6. You are provided with specimen S. Examine its external features carefully,
(a) (i) Make a large labelled drawing of the trunk region as seen from the side
- (ii) State the magnification.....
(iii) Measure the length of the trunk region of the specimen in (cm)
.....(b)
- (i) What is the ratio of the length of the trunk to the whole specimen?
.....
- (ii) What is the significance of the above ratio to the specimen S?
.....

- 63 (d) Name any five adaptations that enable this specimen to live successfully in its habitat.

Structure	Adaptations
(i)	
(ii)	
(iii)	
(iv)	
(v)	

- (iii) Supposing this specimen was to live in other environment other than aquatic, suggest any modifications it would make to enable it survive in that environment.

.....

.....

7. Carefully examine specimen W provided.

- (i) List the characteristic feature of specimen W.

.....

- (ii) Using the characteristic features you have listed in a (i) above suggest the phylum and class to which the specimen W belongs.

Phylum:

Class:

- (iii) In what kind of habitat would you find specimen W

.....

- (iv) What is the role of specimen W in its habitat?

.....

- (v) State one observable adaptation, which suits the specimen's role in its habitat.....

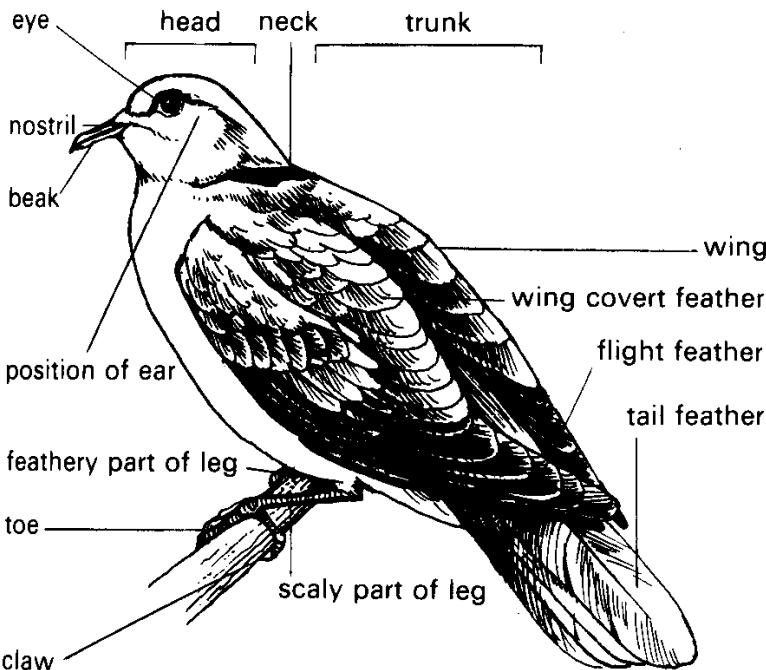
- (b) (i) Open one operculum remove one gill and draw a labelled diagram in the space below. State your magnification.

- (ii) Cut off the caudal fin and draw a well labelled diagram with a magnification of x1

BIRDS

Birds are described as 'feathered reptiles' that have evolved the power of flight. The skin of the body is covered by feathers but the legs have scales. Birds have four different types of feathers which include:

The wing/ quill feather: this consists of a central rod called the shaft which bears a flat expanded part called the vane. The lower part of the shaft is hollow and forms the quill with a hole at the base called the inferior umbilicus.



The vane is made up of the many fine processes called barbs which are arranged obliquely on either side of the shaft. These grow on the wing and the tail.

Characteristic features:

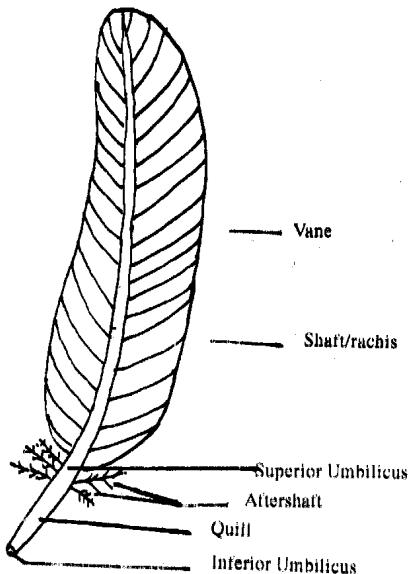
- Abroad flat vane spreads from central axis.
- Have a small after shaft
- Have vane with interlocking hooks
- Have two holes i.e. the superior and inferior umbilicus.
- Have a strong solid rachis.
- Have a stiff, hollow lower region (quill)

These feathers are well designed to provide the lift force necessary for flight and for balance and steering in flight. Other functions include:

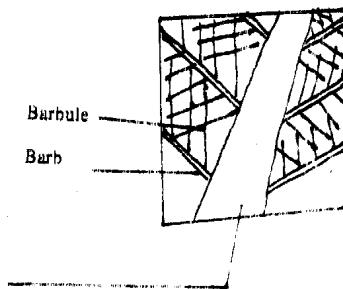
- protection of body skin and defending of the bird when the wing is fully stretched.
- Insulation of the body against heat loss.
- Help in individual special recognition.

Diagram of the quill feather

Quill/Flight feathers



Drawing of a magnified section of a feather



Contour feathers: these are similar in structure to the quill feathers. They cover the body and round out the angles giving the bird a smooth outline.

They also form an effective shield against injury and provided the coloration so important in the life of a bird.

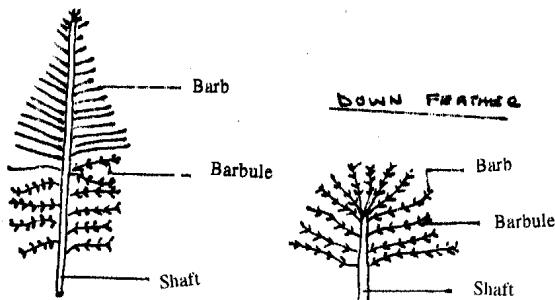
Also help in temperature regulation by forming a warm, light covering over the body, Characteristic:

Have a large after shaft,

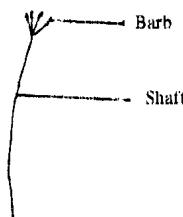
Have a short vane.

have a soft quill.

CONTOUR/COVERT FEATHER



FILoplume FEATHER



Down feather: These form the plumage of newly hatched birds. In older birds, they form an insulation close to the skin.

Characteristics:

- Lack a central rachis.
- They are soft and fluffy.
- Have a short and small quill.
- Have a vane that consists of many free barbs.
- They are evenly distributed all over the body.

Filoplumes: these are slender hair like feathers with tufts on the ends.

Characteristic: (see the diagram above)

- have a long rachis and no quill.
- have many barbs.
- Have thread - like shape.
- Found all over the body and provide the bird with sense of touch to determine location of flight feather.
- help the bird judge its air speed by a take feedback as contours and down feather are moved in the air.
- Sense of touch during plumage as small hats on the skin.

Guiding questions about birds:

1. You are provided with specimens X₁, X₂, and X₃.

(a) identify specimens X₁, X₂, and X₃ giving reasons for your answer.

X₁.....

REASON.....

X₂.....

REASON.....

X₃.....

REASON.....

b. suggest the function of each of the specimens above to the animal from which they were obtained.

X₁.....

X₂.....

X₃.....

(ii). Where would you find each specimen in a bird?

X₁.....

X₂.....

X₃.....

c. state the similarities and differences between X₁ and X₃.

similarities

differences:

d. pour water on the specimen X₂ and observe carefully. Describe what happens.

(iv) Of what significance is the property of specimen X₂ shown in d (i) above to the animal from which it was obtained.

e. Make a well labelled diagram of specimen X_i State the magnification

(f) How is specimen X₁ adapted to its functions?

2. You are provided with specimen W, X and Y. Carefully examine the specimen and answer the following questions.

(a) Identify each of the specimens

W:

X:

Y:

(b) Give observable features of specimen W that make it suitable for its functions.

.....

.....

(c) Make a fully labelled drawing of specimen W in the space provided below.

(d) (i) Where would you find each specimen on a bird?

.....

.....

(ii) State four differences between specimen W and X.

W	Y
(i)	
(ii)	

(iii)	
(iv)	

Mammalian Skeleton

General functions of the skeleton

- It forms a rigid framework to support the body and serves to give the body a definite shape,
- It protects the delicate organs, for example skull protects the brain.
- It consists of joints that enhance movement
- It consists of bones that provide a large surface area for attachment of muscles.
- It consists of long bones whose bone marrow produces blood cells,
- It stores minerals like calcium and phosphorus.

Mammalian skeleton is divided into two major parts.

The axial skeleton: This is the central part of the skeleton consisting of the skull, 5 jaws and the vertebral column.

The appendicular skeleton: These are the hanging parts of the skeleton attached to the axial skeleton. It consists of the limbs and limb girdles.

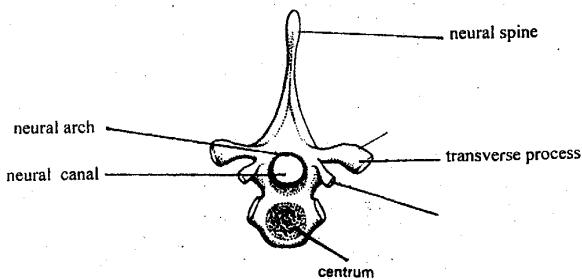
Axial skeleton.

For practical purposes, vertebral column is critically considered. Vertebral column consists of small bones called vertebrae that together make a long hollow tube in which the spinal cord passes.

Vertebrae are joined together by soft discs of cartilage called vertebral discs that:

- Absorb the shock
- And allow flexibility of the vertebral column.

General structure of a vertebra bone.



Vertebra bone consists of five parts:

- **Centrum:** It supports the weight of the body. The Centrum of the vertebrae enlarges down the vertebral column to provide more support.
- **Neural arch:** It is the wall of the bone that encloses the neural canal.
- **Neural spine:** It protects the spinal cord, which passes through it.
- **Facets:** are the smooth surfaces of the vertebrae that allow articulation between the vertebrae.

Vertebral column is divided into three regions i.e.

- Cervical vertebrae
- Thoracic vertebrae
- Lumbar vertebrae.

Cervical vertebrae:

These are neck-bones with the following distinguishing characteristics

- a. Have vertebral canal
- b. Have short neural spine.
- c. Have very small Centrum.

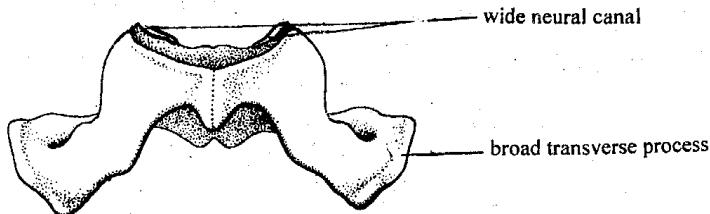
Cervical vertebrae are classified into three groups; i.e.

Atlas: It is only one and the first cervical bone.

It is identified by the following characteristics; -

- Has no Centrum.
- Has flat broad transverse process.
- Has grooved front facets to allow articulation with condyls of the skull.
- Has very small neural spine (like ridge).

Front view of Atlas bone:

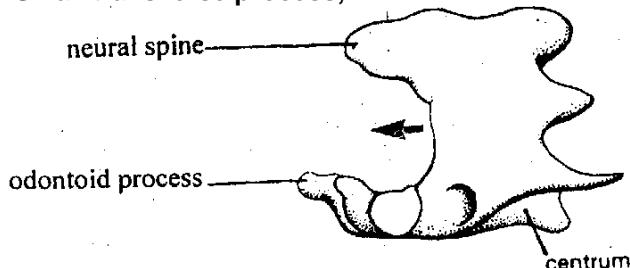


Its specific function is to allow nodding of the head.

Axis: It is the second cervical bone. It is distinctively identified by:-

- Having Centrum prolonged forward into an odontoid peg.
- Laterally flattened neural spine.

Small transverse process,



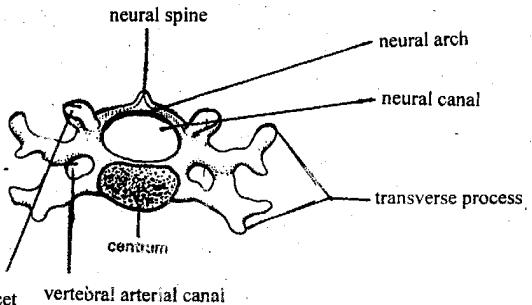
Odontoid peg. Articulate with the atlas to allow the rotating of the head.

Ordinarily cervical vertebrae: There are many cervical vertebrae. Their numbers varies between species of mammals - but are usually five (5) in man and rabbits.

Distinguishing characteristics of ordinarily bone:

- Have divided transverse process
- Short neural spine.
- Have flat Centrum.

Front view of ordinarily bones.



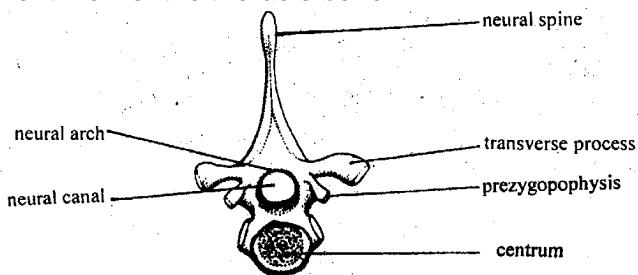
71

Thoracic vertebrae: These bones are found in thoracic region of the vertebral column. They have facets for attachment (facets) for the ribs.

Distinguishing features of the thoracic bones;

1. Have very long neural spine.
2. Have notch for spinal nerves to pass through.
3. Have short undivided transverse process.
4. Have extra facets for articulation with/the ribs.

Front view of the thoracic bone

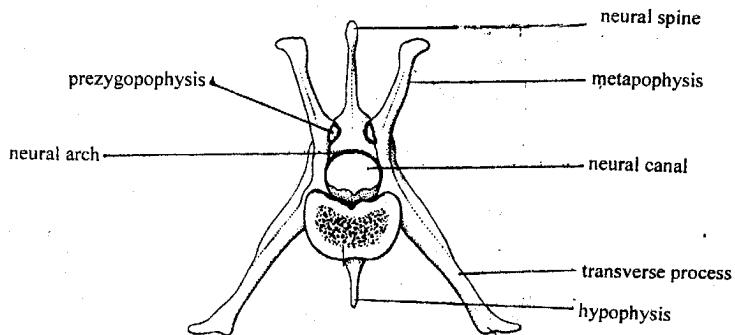


Thoracic bones have many facets because they articulate with many bones.i.e the ribs and the vertebra bones.

Lumbar vertebrae: These bones are found in lower abdominal region of the vertebral column. They have the following distinguishing characteristics

- Long divided transverse process.
- Large and thick Centrum.
- Broad and prominent neural spine.

Front view of lumbar bone:



Read about the following bones

1. The teeth i.e. incisor, molar and carnassial.

- Their structural features (drawings)
- Adaptations to their functions.
- Differences and similarities between the teeth above.

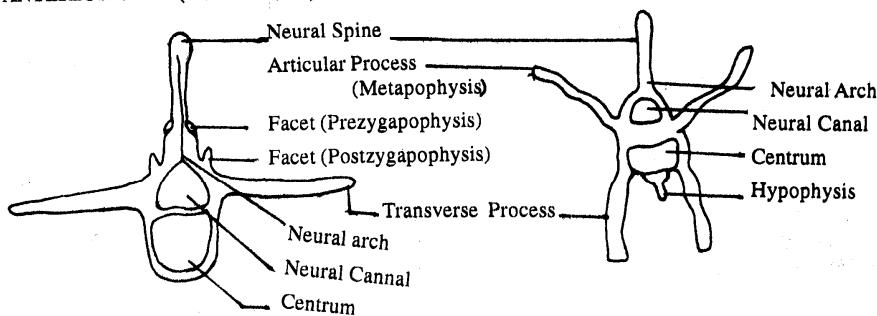
2. **Long bones** i.e. the humerus and femur

- Should be able to identify the side of the leg and arm from which they are obtained.
- Their structural features (drawings)
- Their differences and similarities,

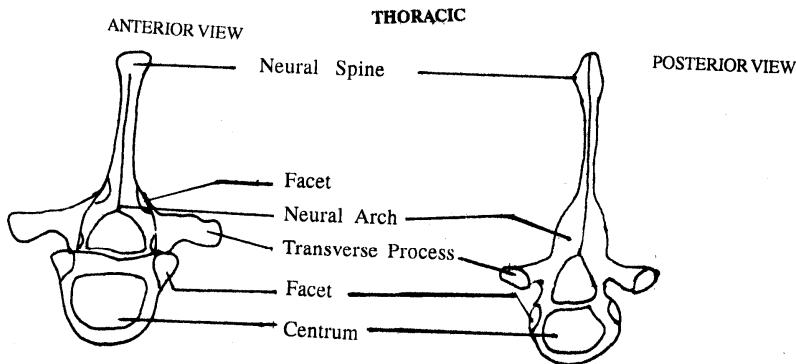
3. **The scapula.**

- Its structural features
- Should be able to identify whether is right or left scapular.
- Its function and adaptations.

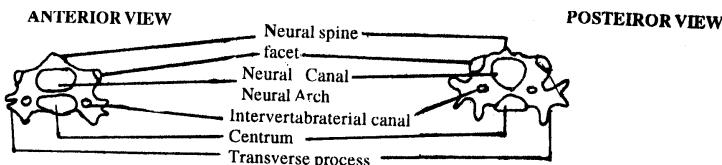
VERTEBRA
ANTERIOR VIEW (GOAT/SHEEP)



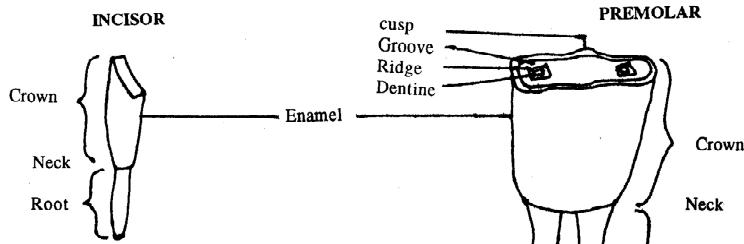
LUMBAR
(RABBIT)



CERVICAL



TEETH



GUIDE QUESTIONS ABOUT BONES.

1. You are provided with Y and Z, which are structures from the same animal,
(a) Identify each specimen

Y.....

Z.....

- (a) State four structural differences and similarities between the specimens

Differences

Y	Z
(i)	
(ii)	
(iii)	
(iv)	

Similarities

- (i)
 (ii).....
 (iii).....
 (iv).....

(b) Give three functions of the specimens to the animals.

- (i)
 (ii).....

(c) Draw and label specimen Y in the space below. State the view from which you have made the drawing.

2. You are provided with specimen F. and G. Which were obtained **from a bird**.

(i) State the name of each specimen

F:

G:.....

(ii) From which of the body was each specimen obtained?

F:

G:

(b) State names of the bones with which each specimen articulates, at each of its ends.

(i) Bones that articulate with specimen F.....

(ii) Bone that articulate with specimen G.....

(c) Using observable features, suggest the type of joint formed at each end of each specimen -;

(i) Types of joints at ends of specimen F.....

(ii) Types of joints at ends of specimen G.....

(d) (i) State two functions of the specimens.....

(ii) How are the structures suited for the functions mentioned in (d) (i) above.

.....
 (iii) State three observable differences between specimen F and G.

F	G
(i)	
(ii)	
(iii)	

3. You are provided with specimens A1 and **A2** that are from different mammals.

(i) Suggest the identities of the specimens.

A1

A2

(ii) Give the observable similarities and differences between these specimens.

Similarities:

Differences:

(iii) Suggest the feeding habitats of the mammals from which the specimens are obtained:

A2 ,

(iv) How are the specimens adapted to the feeding habits of the mammals?

A1

A2

(b) Make a labelled drawing of specimen **A₁**

4. You are provided with specimen F, G and H. Examine them and answer the following questions:

(a) Identify each specimen

F:

G:

H:

(b)(i) Give one characteristic feature of each specimen.

F:

G:

H:

(ii) State the function of each of the characteristic you have named for each specimen,

F:

G:

H:

c). Make a labelled drawing of the posterior view of specimen H.

5. You are provided with A, B, C and D. Observe the specimens and answer the questions that follow:

A:.....
B:.....
C:.....
D:.....

(b) State the two bones that each of the specimens A and B articulate with, and the types of joint formed at each articulate.

Specimen	Bone	Joints
A	(i)	(i)
	(ii)	(ii)
B	(i).....,	(i).....
	(ii).	ii)

(c) State four structural differences between C and D.

Specimen C	Specimen D
(i)	
(ii)	
(iii)	
(iv)	

(i) Draw a and label the interior view of specimen C. State your magnification.

6. You are provided with specimens S, V and W. Which are from the same mammals.

(d) Giving a reason in each case, identify the specimens

(i) V.....

Reasons.....

(ii) W:.....

Reason:.....

(e) State three structural similarities between and W.

(i).....

(ii).....

(iii).....

(f) State three structural differences between V and W.

V	W
(i)	
(ii)	

(iii)

(g) State the functions of specimens V and W giving two observable structural adaptations of each specimen to its functions.

(i) Functions of V.....

Adaptations.....

(ii) Functions of W.....

Adaptations:.....

(a) Using observable features on L, suggest the diet of the animal from which the specimens were obtained.

Features:.....

Diet:.....

(h) Draw and label specimen W in the space provided. State your magnification.

7. You are provided with specimens C and D

(i) Identify specimen C

(ii) Draw and label the anterior view of specimen C fully

(iii) Which region of the **vertebrate** column does it come from.....

(iv) Name the bones with which it articulates

(b)(i) Identify specimen D

(ii) What is its precise function in the organisms from which it was extracted

.....
(iii) How is it adapted for its function?

8. Specimens R and S are bones from a mammal,

(i) Identify each specimen

R:.....

S:.....

(i) List four observable differences between specimen R and S.

R	S
(i)	

(ii)	
(iii)	
(iv)	

(k) (i) State three functions of specimen S in the body

.....

(l) Draw and label specimen S from the anterior view.

GENERAL PRACTICAL QUESTIONS

Practical 1

1. You are provided with specimen labelled **A₁** and **A₂**, **B** and **C** which are fruits,
(a), cut specimen **A_i** and specimen **B** transversely.

Compare the sections and state the similarities and differences between the specimens.

Similarities

- (i) :
(ii) :
(iii) :
(iv) :

Differences

	A	B
(i)		
(ii)		
(iii)		
(iv)		

b). draw and label one section of specimen **B**.

c). fill in information about specimen **A₂** and **C** in the table below.

Specimen	Type of fruit	Agent of dispersal	Observable features to support choice of agent
A ₂			(i) (ii)
C			(i) (ii)

d). draw a diagram of specimen **C**. don't label it.

e). carry out an experiment to demonstrate the mode of dispersal of specimen **C**. record your experiment below;

.....

2. a). Using specimen A₁ and A₂ carry out comparative tests to find out the food substances present in them using the reagents provided. Record your results in the table below.

NB: to prepare extracts for the question crush A₁ and A₂ separately in a mortar add 5cm³ of each one of them then decant.

Test	Observation	Conclusion
(i) to a cut piece of specimen A ₁ add 3 drops of iodine solution		
(ii) repeat the test in (a) (i) using A ₂		
(iii) to 1cm ³ of extract A ₁ add 1cm ³ of benedict's solution and boil		
(iv) repeat the test in (a) (iii) using A ₂		
(v) To 1cm of extract A ₁ add 1cm ³ of sodium hydroxide solution followed by drops of copper Sulphate solution.		
(vi) repeat the test in (a) (v) using A ₂		
(vii) To 1cm ³ of DCPIP solution add solution 1 drop wise. Count the <u>number of drops added</u> .		
(viii) repeat the test in (a) (vii) using A ₂		

Compare and contrast the relative abundance of food substances present in A₁ and A₂.

3. You are provided with specimen D and E.

(a), giving two reasons in each case state the phylum class and order of specimen E.

Phylum.....

Reasons.....

Class....

Reasons

Order.....

Reasons.....

b). give four adaptations specimen E has for life within its habitat (i)

.....

c). closely observe specimen D and E using a hand lens. Write down the differences between them.

	A	B
(i)		
(ii)		
(iii)		
(iv)		

d). observe the hind limb of specimen D carefully using a hand lens. Cut it off using a razor blade. Draw labelled diagram of it.

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Practical 2 .

1. You are provided with specimens E and F. carry out the following tests using the specimen and record your observations in the table provided

(a) Peel specimen E using a knife and cut out four cubes from it, each measuring 2cm x 2cm x2cm. Label four test tubes; 1, 2, 3 and 4.

Pour 2cm3 of hydrogen peroxide into each of the tubes 1, 2, and 3 and 2cm3 of water into test tube 4.

- (i) Put one cube of specimen E into test tube 1 and record your observations in the table,
- (ii) Grind the second cube of E in a mortar and transfer all the ground material at once into test tube 2, and record your observations in the table,
- (iii) Boil the third cube of E in the test tube for 5 minutes, remove the boiled cube from the water and allow cooling. Transfer the boiled cube into test tube 3 and record your observations in the table.
- (iv) Put the fourth cube of E into the test tube 4 and record your results in the table of results.

(b). repeat the procedure in (a) using specimen F and record your observations in the table of results.

Table of results:

Test tube and contents	Observations using specimen E.	Observations using specimen F.
(1) Whole cube +hydrogen peroxide.		
(2) Ground material + hydrogen peroxide		
(3) boiled cube + hydrogen peroxide		

(4) whole cube + water		
------------------------	--	--

- (c) With reference-to your observations in (a) or (b), explain your answers in
 (i) test tube 1
 (ii) Test tube
 (iii) Test tube
 (iv) Test tube 4
 (d) (i) how do your observations in(a), that is , when using specimen E compare with those in (b) that is ,when using specimen F?
 (ii) From your answer in (d) (i), what conclusion do you make?

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2. You are provided with specimen P. cut it longitudinally.

(a) Draw and label one half of the specimen in the space provided.

(b) Describe the following parts of specimen P.

(i) Sepals

(ii) Petals

(iii) Male parts of the flower

(iv) Female parts of the flower

(c) (i) state the type of pollination 'that occurs in the specimen P.

(ii) Describe how specimen P is adapted to the type of pollination stated in (c) (i) above.

3. You are provided with specimens K and U which are from the same mammal.

(a) Identify each specimen.

(i)K.....

(ii)L;.....

(b) Giving a reason in case, state the body from where each specimen was obtained.

K.....

Reason

L.....

Reason

(c) Using observable features, state two functions of the specimens

(i) Function

Observable feature.....

(ii) Function.....

Observable feature.....

(d) State three structural differences and similarities between specimen K and L.

(i) Differences:

K	L
1.	
2.	

3.	
----	--

(ii) Similarities: 1.

2....

3....

(e) Draw and label specimen L in the space below. State your magnification.

Practical 3

1. You are provided with specimen Z_1 and Z_2 . Examine them carefully,

(a) (i) Identify Z_1 giving two reasons for your identification.

Identity.....

Reasons:.....:

(b) (i) draw a well labelled diagram of the external features of specimen Z_1 .

(ii) Remove the outer cover of specimen Z_1 and open it up into two symmetrical halves. Draw and label the internal features on one half of it.

N.B. do not throw away the halves of Z_1 , you will need them for part c of this question.

(c) Carry out the following tests on Z_1 and Z_2 .

(i) to 5 cm ³ of Y in a test tube, drop one half of specimen Z_1 obtained from (b) (ii)		
(ii) to 5cm3 of Y in the test tube, add the crushed half of specimen Z_1		
(iii) To 5cm3 of Y in the test tube, drop one half of specimen Z_2 .		

(d) (i) suggest the nature of liquid Y.

(ii) Explain your observation in:

(c) (i).

(c) (ii).

(c) (iii).

2. You are provided with specimen K.

Observe it carefully and answer the questions that follow:

(a) Describe the characteristics of specimen K on the table below:

Flower part	characteristic
Corolla	
Calyx	
Pistil	
Stamen	

Cut a longitudinal section of specimen K

- (i) Draw a labelled diagram of one half of it
(c) (i) name one pollinating agent of specimen K.
(ii) What are five adaptations of specimen K for pollination?

3. Observe specimen X, Y and Z carefully.

- (a) Describe three distinguishing characteristics of each specimen:

X.....

Y.....

Z.....

(b) Using the characteristic above, construct a dichotomous key for the identification of specimens X, Y and Z,

(c) What are the functional adaptations of specimen Z?

(d) On the table below, write four differences between specimen X and Z.

	X	Z
(i)		
(ii)		
(iii)		
(iv)		

Practical 4 ,

1. You are provided with five test tubes. Label them A, B, C, D and E respectively.

(a) Carry out the experiments described below in each tube and record your results in the table

Experiment	Observation	Conclusion
(i) test tube A To 1cm ³ of solution B in a test tube, add 1cm ³ of sodium hydroxide solution followed by 1% copper sulphate drop by drop.		
(ii) test tube B To 5cm ³ of solution B in a test tube add 1cm ³ of solution A. Incubate in water bath at 37°C for 8 minutes.	Appearance at the beginning of the experiment	Appearance at the end of the experiment
(iii) test tube C To 5cm ³ of solution B in a test tube, add three drops of dilute hydrochloric acid. Incubate in a water bath as in (a) (ii) above		
(iv) test tube D To 5cm ³ of solution B in a test tube, add 1 cm ³ of solution A then add 3 drops of dilute hydrochloric acid. Incubate in a		

water bath as in (a) (ii) above		
(v) test tube E To 5cm ³ of solution Bin a test tube, add 1cm ³ of boiled solution A then add 3 drops of dilute hydrochloric acid. Incubate in a water bath as in (a) (ii) above		

(b) From the results in the table above, what is the nature of solution A?

(c) Explain your observation in test tube:

- (i) B.....
- (ii) C.....
- (iii) D.....
- (iv) E.....

2. You are provided with specimen F₁ and F₂ that have been soaked in water for varying time intervals.

(a) (i) cut F₁ a long its line of symmetry. Draw and label one half of it.

(b) Using a mortar and a pestle, crush F₁ and add 3cm³ of water to it. Mix and decant off the mixture in a test tube. Carry out the tests in the table below on the mixture.

Test	<u>Observation</u>	<u>Conclusion</u>
(i) To 1 cm ³ of the mixture F ₁ add 3 drops of iodine.		
(ii) To 1 cm ³ of the mixture F ₁ , add 1cm ³ of benedict's solution and boil.		

(c) Crush F₂ in a mortar using a pestle. Add 3cm³ of water to it Decant off the mixture and repeat the tests in the table (b) (i) and (b) (ii) on the mixture of F₂.

(i) test using iodine solution		
(ii) test using benedict's solution		

(c) Explain the difference between F₁ and F₂ observed in the experiment above.

3. You are provided with specimen H. Observe it carefully using a hand lens, (a)

(i) name the phylum to which the organism belongs.

Phylum.....

(ii) To which class does it belong?

Class.....

Give three reasons to support your answer above.....

(iii) Name its order.....

(b) What adaptations does specimen H have for defence within its habitat?

(i).....

(ii).....

(iii).....

(iv).....

(v).....

(c) Draw a labelled diagram of the hind limb of specimen H.

(d) (i) stretch out and measure the length of the front limb of specimen H in cm.

(ii) Repeat the procedure in (d) (i) above for the hind limb.

(iii) What is the ratio of the front to the hind limb?

(iv) What is the significance of this ratio to the organism?

Practical 6

You are provided with solutions X and Y

- Iodine
- Benedict's / Fehling's solution
- Million's reagent.
- 5 test tubas labeled

(a) Carry out the following experiments and record your observations and deductions in tube below.

Experiment	Observation	Deduction
(i) To 1 cm ³ of X in test tube add 2 drops of iodine solution		
(ii) To 1 cm ³ of X in test tube 2 add 2 add 1cm ³ of benedict's solution and boil.		
(iii) To 1cm ³ of X in test tube 3 add 3 drops of million's reagent and heat.		
(iv) To 1 cm ³ of X in test tube 4 add 3 drops of solution Y and 1cm ³ of benedict's solution then boil		
(v) To 1 cm ¹³ of solution X in test tube 5 Add 3 drops of solution Y boil for 1 minute then add 1cm ³ of NaOH followed by 1cm ³ of Benedict's solution. Boil for 1 minutes		

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- (b) From your observations, what type of food substances is contained in solution X:.....
- (c) State two reasons for the answer you have given
- (d) What is solution Y?
- (e) Suggest a further experiment you would perform to prove that solution X . and not solution Y contained the food substance.

2. Specimens E and F are both animals

(iv) Using your biological knowledge identify each specimen as shown below
Specimen E.

Phylum.....,

Class.....

Order.....

Specimen F :

Phylum.....

Class.....

Order.....

(v) Give five structural similarities other than **size** and **sex** and four differences between specimen E and F

Specimen E	Similarities	Specimen F
i.....		
ii.....		
iii.....		
iv.....		
V.....		

Differences

i.....

ii.....

iii.....

iv.....

V.....

(vi) Give two observable adaptive features possessed by both organisms, which are suited to land life.

(vii) Carefully remove one hind leg from specimen F. Using a hand -lens provided. Examine the leg and make an enlarged labeled drawing of leg.

State your magnification.

3. You are provided with 20 black beans and 20 white beans and two large beakers. Put 10 black and 10 white beans into each beaker and mix them thoroughly. Mark three places on your desk BB, BW and WW. Without looking into the beakers pick one bean from each container at the same time. If the beans you have picked are both black, put them at BB. If one is black and the other

white, put them at BW, and if both are white put them at WW. Continue picking until the beans are finished.

Now answer the following questions.

(a) Count the number of pairs of beans at

BB:

BW:

WW:

(b) Calculate the ratios of BB: BW: WW

(c) What genetic characteristics are represented by;

(i) The beans

(ii) The colour of the bean

(iii) The beakers containing the beans:

(d) Why is the ratio in (b) above not 1: 1:1?

(e) What biological principle is illustrated by picking of a pair of beans at the same time?

(f) Why was it necessary to mix the beans thoroughly and to pick without looking?.....

(g) In a natural situation, what genetic terms are used to describe the colour combinations in (b) above?

Practical 6

1. You are provided with solution D. Use it to carry out the following investigations.

(a) Test solution D as indicated in the table below and record your observations and deductions.

Test	Observation	Deduction
(i) To 2cm ³ of D in test tube add 1 drop of iodine solution.		
(ii) To 2cm ³ of D in a test tube add 2cm ³ of Benedict's solution and boil.		
(iii) To 2cm ³ of D in a test tube add 2cm ³ of sodium hydroxide solution and shake well. Add 2 drops of copper (II) sulphate solution and shake		

(b) Rinse your mouth clean water then collect 2cm³ of saliva by spitting in a clean test tube. Add 2cm³ of saliva to 2 cm³ of solution D in a test tube. Leave the mixture to stand in a water bath at 35 - 40°C for 10 minutes.

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- (i) Add 1cm^3 of Benedict's solution to 1cm^3 of the mixture above and boil. Make your observation and conclusion.
- (ii) To 1cm^3 of the mixture in a test tube add 1cm^3 of sodium hydroxide and shake well. Add 2 drops of copper (II) sulphate solution and shake then make your observation and conclusion.
- (iii) Why was the mixture kept at $35 - 40^\circ\text{C}$ and left to stand for 10 minutes?
- (iv) Explain the result obtained experiment (b) (ii)
- (v) What was the role of saliva in this experiment?
- (vi) What physiological process is the experiment demonstrating?

2. You are provided with specimens R, S, T and U. Using a hand lens, study the specimens carefully and answer the following questions.

(i) Identify the classes and orders to which specimen R and S belong and, the order to which T and U belong. In each case give two reasons to support your identification.

(i) Specimen R

Class

Reasons

Specimen R .

Order

Reasons:

(ii) Specimens S

Class

Reason:

Specimen S

Order.....

Reasons:.....

(iii) Specimen U

Class.....

Reasons:.....

Order.....

Reasons:

(n) Remove one fore-wing and one hind wing of specimen T by cutting them from as close to the body as possible,

(i) Using your hand feel the two wings and record your observations.

(i) Fore-wing

(ii) Hind-wing

(o) Measure the surface area of each wing using graph paper tracing round each wing on the graph paper counting the squares covered by each wing to the nearest cm^2

(i) Area of fore wing cm^2

(ii) Area of hind wing cm^2

N.B: Attach the graph paper onto the question paper

(iii) From your observations in C and D what conclusion can you draw regarding the functions of each wing?

3. You are provided with specimens X and W. Carefully observe them and answer the following questions.

(a) Suggest the habitat from which each of these specimens has been obtained giving two reasons for your answer in each case.

Specimen X

Habitat.....

Reasons:.....

Specimen W

Habitat.....

Reasons:.....

(b) Give the differences between X and W

(c) Draw a leaf from specimen X and label it

Practical 7

1. You are provided with

- a. Saturated glucose solution
- b. Soluble starch solution
- c. Iodine solution
- d. Benedict's / fehling solution
- e. Cellophane tubing
- f. Test tubes.
- g. String / piece of thread
- h. Beaker.

- Tie a string very tightly at a point about 1 cm from one end of a piece of cello phone tubing.
- Fill the tube to within 5 cm of the top with starch solution.
- Add 40 drops of glucose solution to same cellophane tubing.
- Tie the top of the cello phone tubing tightly with string and rinse it under running water.
- Place the cello phone tubing in a beaker of water such that the solution in the tubing is beneath the water surrounding it
- After 15 minutes pour 5ml of the water from the beaker into two separate test tubes.

Carry out the following experiment (a)

Experiment	Observation	Deduction
(i) To test 1 add 2 drops of iodine solution.		

(ii) To test tube 2 add an equal volume of benedicts solution and boil.	
---	--

- (b) Explain your observation in the table above.
 (c) Suggest the biological process being investigated in this experiment.
 (d) Give a suggestion as to the structure of the cellophane tubing.

2. Specimens T and W provided are from the same mammal. Examine them carefully and answer the following questions

- (a) (i) Identify specimens T and W

Specimen W.....

Specimen T

- (ii) From which parts of the body were specimens T and W taken?

- (b) Identify four differences between the specimens T and W.

- (c) What features are common to both T and W?

- (d) Suggest why the projections of specimen T are different from those of specimen W.

- (a) Make a labeled drawing of the anterior side of specimen T.

3. Examine specimens E and F provided and answer the following questions:-

- (f) Identify specimens E and F

- (g) State two observable structural differences and two similarities between specimen E and F

Differences

(i).....

(ii).....

Similarities

.....

.....

- (h) Cut a longitudinal section of specimen E. Make a labeled drawing of the section.

- (i) Suggest, with reasons, the mode of dispersal of specimens E and F.

Practical 8

1. You are provided with:-

- 3% hydrogen peroxide solution
- Liver (fresh)
- 5 test tubes
- Mortar and pestle
- Razor blade
- Carry out the following experiments

- (a) Clean out your test tubes and pour 2cm³ of fresh hydrogen peroxide solution into 5 test tubes provided.

- (b) Cut five small pieces of the liver of the **same size**.

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- (i) Place a small piece of liver into test tube 1 and observe for 5 minutes record your results in the table below,
 - (ii) Crush the second piece in a mortar, transfer the ground liver material to the 2 test tube observe for 5 minutes and record your results,
 - (iii) Boil the third piece in boiling water for a few minutes. Remove the piece and place it in the third test tube and observe,
 - (iv) Add 1 cm³ of HCl in the test tube 4 and place the fourth piece in the test tube and observe,
 - (v) Place 1cm³ of NaOH solution in test tube five. Add the fifth piece in this test tube and observe

Test tube	Content	Observation
1.	Hydrogen peroxide + First piece.	
2.	Hydrogen peroxide + Second crushed piece	
3	Hydrogen peroxide + Third piece boiled	

- (c) (i) Compare the reactions occurring in test tube 1 and 2.
- (ii) Explain your observation in c (i) above.
- (d) Make a brief comments on your observation in:
 - (i) Test tube 3
 - (ii) Test tube4
 - (iii) Test tube 5
- (e) (i) Name the possible products of the reaction.
- (ii) Suggest the name of the substance in the liver responsible for reaction.
- (iv) Which function of the liver is being investigated?

2. You are provided with specimen Z

(a) Identify specimen Z giving reasons.

Identity.....

Reason.....

(b) (i) Make a labeled drawing of specimen Z as seen from the ventral side state your magnification

(e) (i) State the habitat for specimen Z.

(ii) State two ways in which specimen Z is adapted to living in its habitat

(f) Estimate the age (in weeks) of specimen Z.

(g) Mention any three changes that are likely to occur in specimen Z as it develops into the adult state the importance of these changes.

3. You are provided with specimens A, B, C, D and E. Which are all one type of plant organ.

(d) Name the plant organ represented by specimens A, B, C, D and E.

(e) (i) What is the main function of the organ you have named in (a) above

(ii) Give three observable structural adaptations in these specimens to carry out the function you have named in (b) (i) above.

(d) Give two similarities and three differences between specimens C and D

Similarities

C

D

Differences

C

D

(h) Using observable external features of the specimens construct a simple dichotomous key that could be used to identify specimens A B C D and E.

Practical 9

1. Substance M is a solution of various food substances. Carry out the following tests to identify its constituents,

(a) (1) To 2cc of M add two drops of iodine solution

Observation.....

Conclusion.....

(2) To 2 cc of M add equal volume of benedict's and boil

Observation.....

Conclusion.....

(3) To 2 cc of M add dilute HCl, heat, cool add NaOH_{aq} followed by 1cc of benedict's and boil.

Observation.....

Conclusion.....

(4) To 2 cc of M add NaOH_{aq} , shake, followed by two drops of $\text{CuSO}_4_{\text{aq}}$.

Observation.....

Conclusion.....

(5) To 2cc of M add equal volume of saliva; let it to stand for 15 minutes.

Divide the mixture into 2 portions (i.e. i and ii)

(i) To portion (i) add 2 drops of iodine solution.

Observation.....

Conclusion.....

(ii) To portion (ii) add equal volume of benedict's solution and heat.

Observation.....

Conclusion.....

- b) (i) Explain the differences in the observation between **tests** (ii) and 2
(ii) What is the importance of NaOHaq in test tube 4 above?
(iii) Name the food substances in M
(iv) Give one importance of each of the food substances named in b(iii) above to infants.
- c) Name one natural source for each of the food substance in M.

Question 2

You are provided with specimens A, B, E and F Carefully study the instructions and answer the questions.

- a) Identify specimens E and F, giving one reason for each.

E-Identification.....

Reason.....

F-Identification.....

Reason.....

- b) Make a transverse section of specimen A and B (i) Draw and label one section of A.

Using observable features

- (ii) Write 4 differences between A and B

(c) Describe the arrangements of seeds in specimen A and E.

- (ii) Describe the mode of dispersal of E

- (iii) Give one importance of specimen B to man.

Qn.3

1. You are provided with three specimens; W, Z and T. Study them and answer the questions that follow.

- (a) (i) With one reason identify the specimens below;

W-Identification.,,.....

A reason.....

2- Identification.....

A reason.....

- (ii) Classify specimen W under the following groups. (Taxa)

Kingdom	
Phylum	
Class	
Order	

- b) Outline 4 differences between W and Z.

Complete the table below using observable features on the specimens.

Specimen	No. of legs	No. of wings	Present or absence of spines

W		4	
Z			
T			Absent

Use the features in the table b (ii) above construct a dichotomous key for the three specimens.

- c) Using razor blade cut one of the inner wings of W as close to the body as possible. With help of a hand lens make a non-labelled drawing of the wing. State the magnification.



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