

# O Level

# Biology

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**Session:** 1984 June  
**Type:** Question paper  
**Code:** 5090

**BIOLOGY**

5090/1

## ORDINARY LEVEL

## PAPER 1

(Two hours)

Answer all questions in Section 1 and four questions from Section 2 (including the compulsory question).

Answer to Section 1 should be written in the spaces provided on the question paper.

Answers to Section 2 should be written on the sheets available from the supervisor.

Additional sheets should be attached securely, and in the correct order, to the back of the question paper; they should be tied so that the pages will lie flat when opened and can be turned over easily by the examiner.

Candidates are advised to spend one hour on Section 1 and one hour on Section 2.

The intended marks for questions or parts of questions are given in brackets [ ].

**Section 1**

Answer all questions in this section.

**1** Three main classes of foodstuff are present in a slice of bread and butter, which is digested as it passes along the alimentary canal of a mammal. Complete the columns in Table 1 below.

(a)	Food	Food class	Region of the canal where digestion begins	Final products of digestion
	Bread	..... .....	..... stomach .....	glucose ..... .....
	Butter	.....	.....	..... .....

Table 1

(b) Define the term *digestion*.

.....

.....

- (c) Name the secretion poured into the alimentary canal that contains no enzyme but helps in the digestion of fats.
- .....

- (d) Name the region of the alimentary canal where digested food is absorbed.
- .....

[9]

- 2 Fig. 1 A and B shown below represents the front view of the human eye.

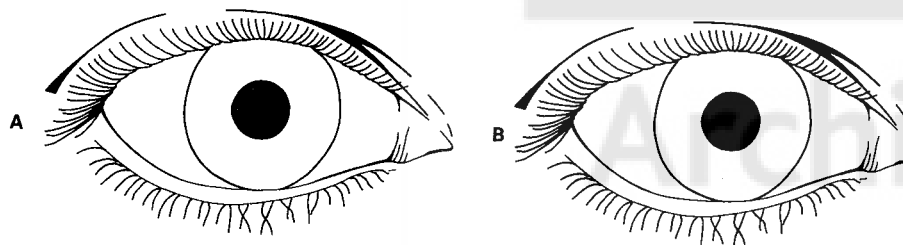


Fig. 1

- (a) On Fig. 1 A draw lines to show the position of the muscles which, on contracting, constrict the pupil.
- (b) On Fig. 1 B draw lines to show the position of the muscles which, on contracting, dilate the pupil.
- (c) Involuntary muscle is found in the iris of the eye, the gut walls and in the walls of blood vessels.
- (i) Explain briefly how this muscle moves food along the gut.

.....

.....

.....

- (ii) Explain briefly how this muscle in the small arteries of the skin helps to control body temperature.

.....

.....

.....

[6]

3 Fig. 2 shows a growth of *Mucor* (or *Rhizopus*) on starch-agar jelly.

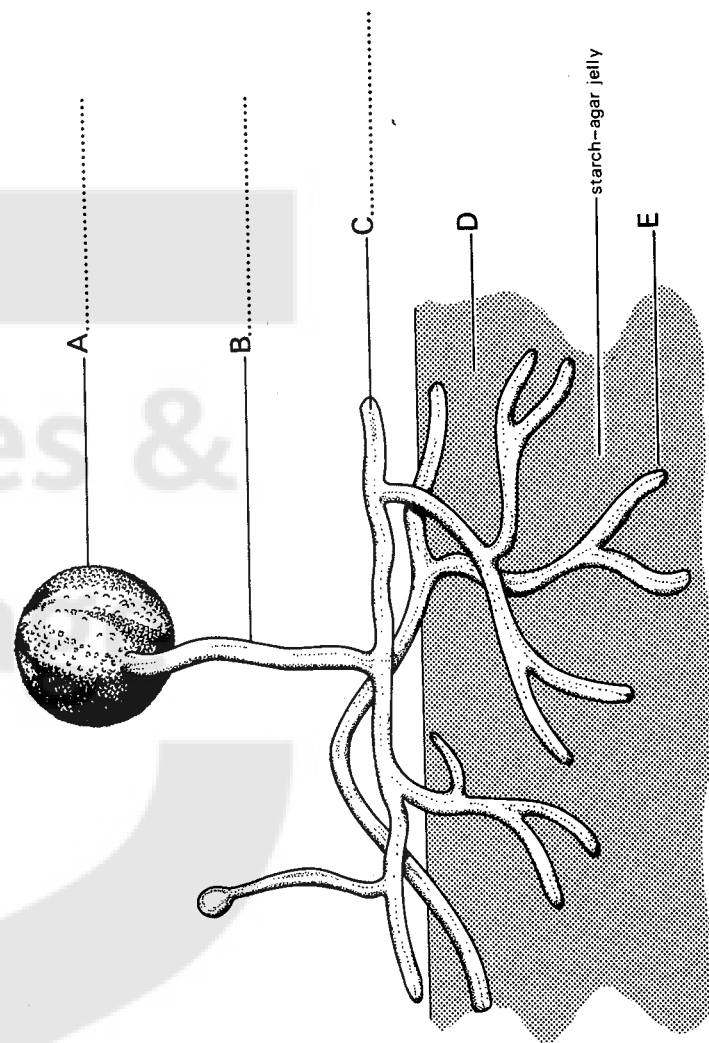


Fig. 2

- (a) Name structures A, B and C on the dotted lines of the diagram.
- (b) The starch-agar jelly is flooded with iodine solution.
- (i) What colour would you expect to develop at

D .....

E? .....

- (ii) Explain what has happened at E to result in the colour stated in (b)(i) above.

.....  
 .....

- (c) (i) What structures are produced from A? .....

- (ii) What type of reproduction is associated with A? .....

[5]

- 4 A to E below show five pathways in the nervous system of a mammal.

- A forebrain → motor neurone → effector (muscle)  
 B sense organ → sensory neurone → spinal cord → motor neurone → effector (muscle)  
 C sense organ → sensory neurone → brain → motor neurone → gland → chemical secretion into blood stream → effector (muscle)  
 D sense organ → sensory neurone → brain → motor neurone → effector (muscle)  
 E sense organ → sensory neurone → brain → motor neurone → effector (gland)

Using the appropriate letter A to E, indicate which of the actions below are brought about by the pathways above. (Each letter may be used once, more than once or not at all)

- (a) A student smells an onion and his eyes water. ....  
 (b) A student walks from the dark into a lighted room and his pupils constrict. ....  
 (c) A student sits on a drawing pin and leaps up from the chair. ....  
 (d) A student sees a swinging branch approaching his eye and blinks. ....  
 (e) A student decides to lift his arm. ....  
 (f) A student notices a large dog running towards him, his heart starts to beat faster. ....  
 (g) Using the appropriate letters A to E indicate which of these nervous pathways represent:

(i) voluntary action.....

(ii) spinal reflex action .....

(iii) cranial reflex action.....

[9]

- 5 State **one** reason in **each** case why the following practices are carried out by farmers or gardeners:

- (a) digging in the spring,

.....  
 .....

- (b) adding compost or manure to the soil whilst digging,

.....  
 .....

- (c) adding lime to a clay soil,

.....  
 .....

- (d) planting out seedlings in damp weather.

.....  
 ..... [4]

6 Fig. 3 below shows the graphs obtained from an investigation into an enzyme controlled reaction. Each represents an experiment performed to study the time taken for the enzyme to break down the substrate. Graph 1 shows the time taken under different temperature conditions with the reaction at a constant pH of 6.7. Graph 2 shows the time taken under different pH conditions at a constant temperature of 40°C.

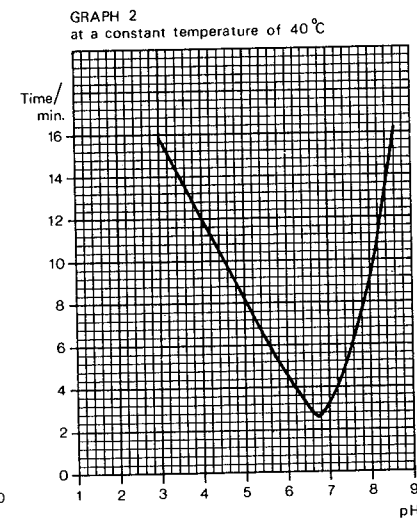
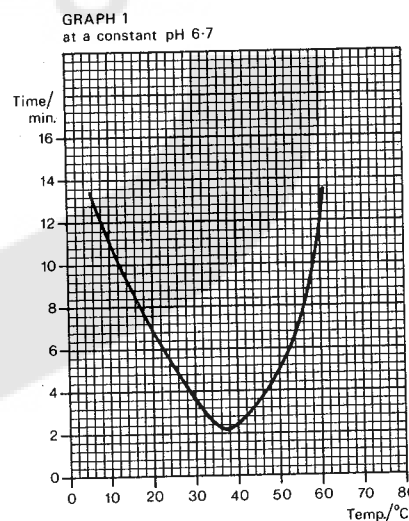


Fig. 3

Study the graphs and answer the following:

- (a) (i) At what temperature did the reaction occur in the shortest time? .....
- (ii) At what pH did the reaction occur in the shortest time? .....
- (b) In graph 1:
- (i) Why did the reaction slow down at higher temperatures?
- .....
- .....
- (ii) What effect on the reaction rates is shown by a steady increase from low to medium temperatures?
- .....
- .....
- (c) In graph 2, what effect did increasing acidity have on the reaction rates?
- .....
- .....
- (d) In what part of the alimentary canal do enzymes react in very acid conditions?
- .....
- .....
- (e) Under conditions of pH 7.0, the temperature of the enzyme and substrate was raised to 100°C for 5 minutes. The temperature was then lowered to 40°C. Suggest what would happen if this enzyme was pepsin and the substrate was protein.
- .....
- .....
- .....
- .....
- [7]

## Section 2

Answer **question 7** and any **three** other questions, using the lined sheets which are available from the Supervisor.

Large labelled diagrams should be given only where they make the answer clearer.

- 7** Write an essay on growth and development in plants and animals. [10]

(When your essay is marked the examiner will look to see how well you write about a biological subject. You will be given credit for expressing relevant ideas clearly and in a sensible order.)

- 8** (a) In a natural environment what do you understand by the terms (i) *producers* (ii) *consumers* and (iii) *biological equilibrium*? [3]

- (b) If the balance of nature is disturbed by removing a link in a food chain serious consequences may result. Describe an example of this happening due to the action of Man. [7]

- 9** Give a **brief** illustrated account of mitosis and meiosis stating where each occurs in plants and animals. [10]

- 10** Give a biological explanation for **three** of the following:

- (a) The production of urine decreases in hot weather.
- (b) Moulds form on bread stored in a closed bread bin.
- (c) Some bacteria cause unpleasant symptoms called disease.
- (d) An insect cannot be drowned by holding its head under water.
- (e) On a frosty morning exhaled breath is visible. [10]

- 11** (a) What do you understand by the term *tropic response* in plants? [2]

- (b) Describe **two** experiments to demonstrate the responses of plants, one to gravity and the other to light. (Include a description of a control in **each** experiment.) [8]

- 12** There is a type of poor vision in humans called 'night blindness' due to a single dominant gene. A man suffering from this eye defect marries a woman whose sight is normal. The couple have five children three of whom have normal vision and two have 'night blindness'. Using the symbol **B** for the dominant gene and **b** for the recessive gene answer the following:

- (a) Draw a genetic diagram indicating the genotypes and phenotypes for each generation. [5]
- (b) One of the sons who suffered from 'night blindness' married a woman who also suffered from the eye defect. They had only one child. Draw the genetic diagrams for this family indicating the possible genotypes and phenotypes for this one child. [5]

## BIOLOGY

5090/2

ORDINARY LEVEL

PAPER 2

(½ hour)

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

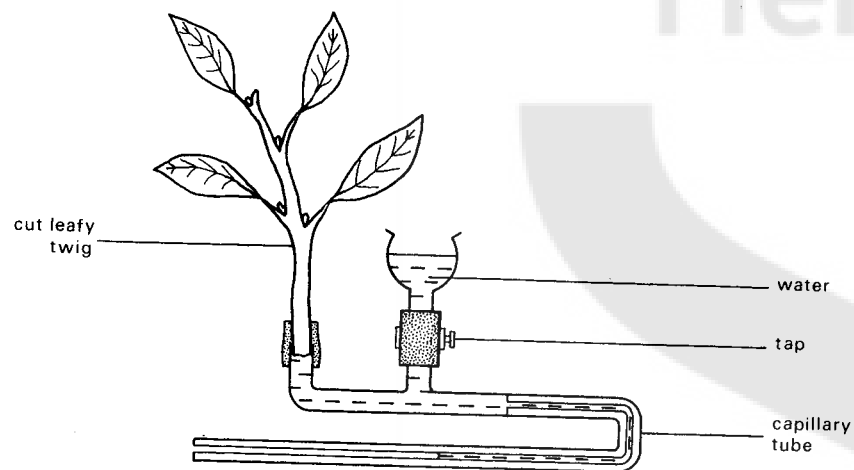
**Read these notes carefully**

There are thirty questions in this test. For each question four suggested answers are given: you are to choose the most appropriate one and indicate it on the separate answer sheet.

Read the instructions on the separate answer sheet very carefully.

Attempt **all** the questions. Marks will **not** be deducted for wrong answers: your total score on this test will be the number of correct answers you give.

- 1 The diagram below shows apparatus used to investigate water uptake by a cut leafy twig.



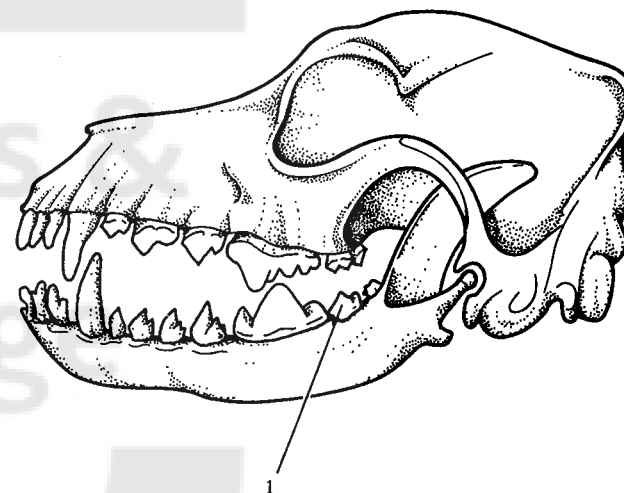
In which one of the following sets of conditions would the tap need to be used most often?

- A light, still, humid
- B light, windy, dry
- C dark, still, humid
- D dark, windy, dry

- 2 Which one of the following is a function of blood platelets?

- A transport of oxygen
- B transport of carbon dioxide
- C production of antibodies
- D formation of clots

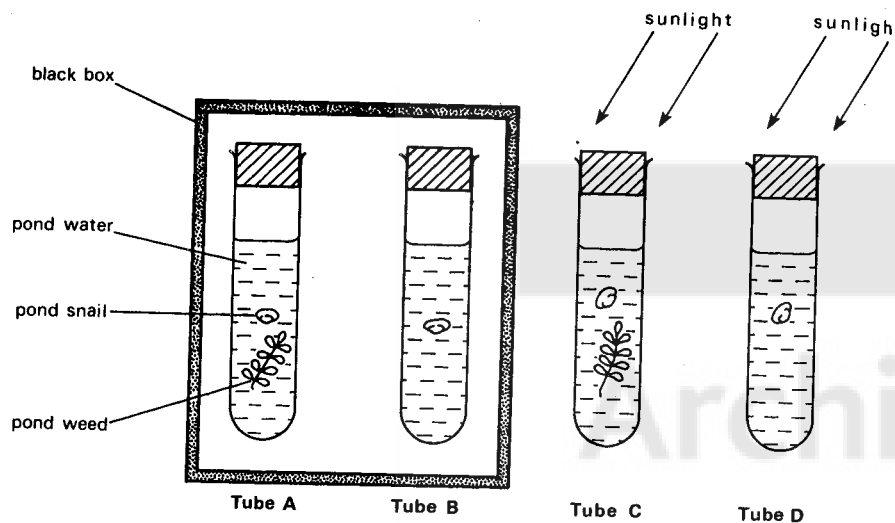
- 3 The diagram below shows the skull of a mammal.



Which one of the following correctly identifies the single tooth labelled 1?

- A carnassial
  - B incisor
  - C molar
  - D premolar
- 4 The acidic liquid in the stomach contains
- A bile and pepsinogen.
  - B lipase and trypsin.
  - C maltase and pepsin.
  - D pepsin and mucus.

5 Four boiling tubes were set up as illustrated below.

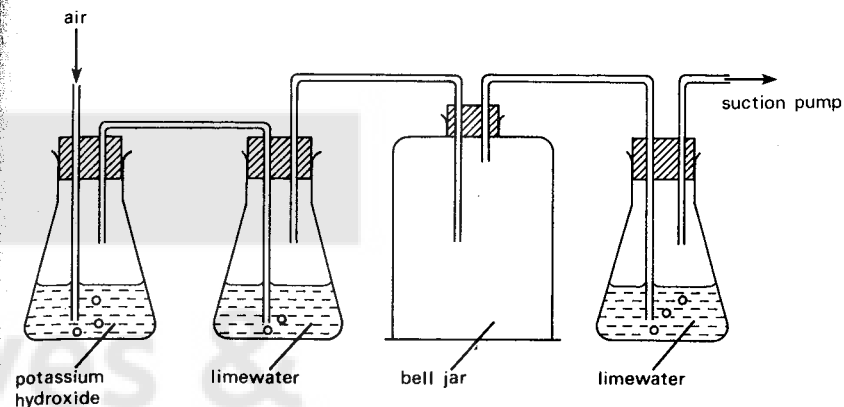


In which one of the tubes, A, B, C or D, would the concentration of carbon dioxide increase most rapidly?

6 A certain diet contains equal masses of four different food substances. Which substance will release the most energy if it is used up completely in respiration?

- A fat
- B protein
- C starch
- D sugar

7 The diagram below shows apparatus that can be used to investigate whether carbon dioxide is given off by a potted green plant during respiration.



Which one of the following precautions would **not** be necessary?

- A placing the plant overnight in the dark before the experiment
- B enclosing the soil and the pot in a sealed plastic bag
- C putting a light-proof cover over the plant during the experiment
- D drawing air through the apparatus very slowly

8 When high pressure filtration occurs in Bowman's capsules of a kidney, liquid leaves the blood stream through the walls of

- A capillaries.
- B convoluted (coiled) tubules.
- C small arteries.
- D small veins.

9 In which one of the following ways does a freshwater *Amoeba* get rid of the soluble waste products of protein metabolism?

- A expulsion from the contractile vacuole
- B expulsion from the food vacuoles
- C osmosis through the cell membrane
- D diffusion through the cell membrane

10 In which one of the following veins does the blood have the highest temperature and the greatest carbon dioxide concentration?

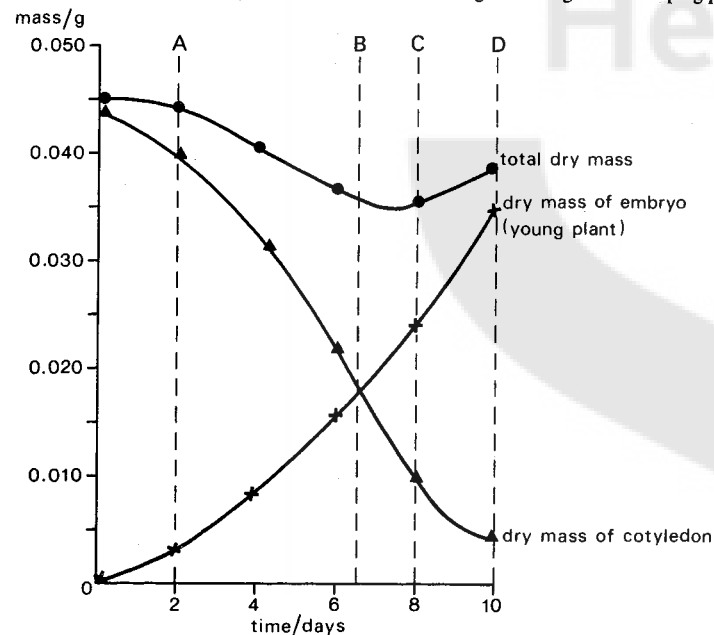
- A hepatic portal vein
- B hepatic vein
- C pulmonary vein
- D renal vein

11 In many plants and animals growth involves cell division. The new cells are at first identical to one another but later they develop into tissues.

What is this process of change called?

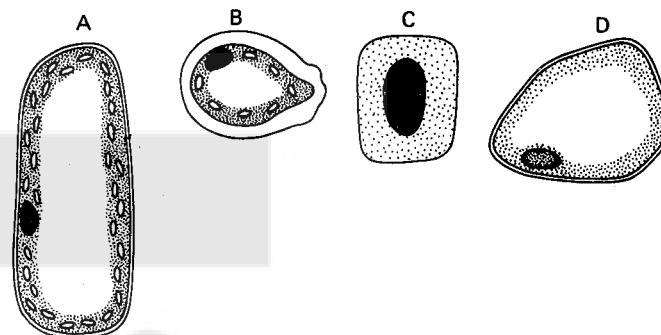
- A differentiation
- B elongation
- C metamorphosis
- D vacuolation

12 The graph below shows the dry masses of the structures of germinating and developing peas.



At which time, A, B, C or D, does the rate of photosynthesis first exceed the rate of respiration?

13 Which one of the cells below, A, B, C or D, has come from the region of cell division in a root?



14 In any reflex arc, the following events occur:

- 1 activation of a receptor
- 2 activation of an effector
- 3 passage of impulses along a motor neurone
- 4 passage of impulses along a sensory neurone

Which one of the following sequences is correct?

- A 1 3 2 4
- B 1 4 3 2
- C 4 1 2 3
- D 4 2 3 1

15 What is the term used to describe the process in which a new individual gradually grows from the parent and eventually separates?

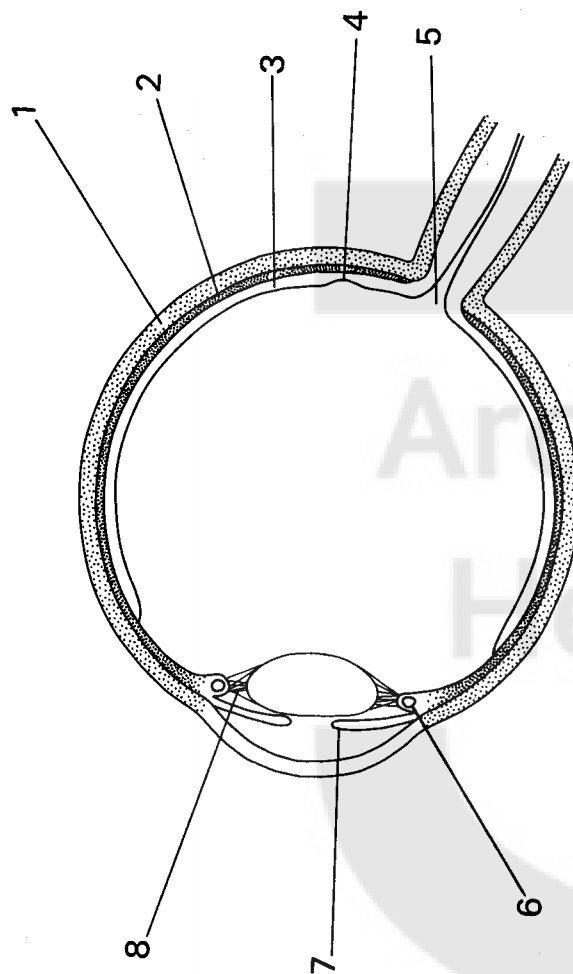
- A binary fission
- B external fertilisation
- C spore formation
- D vegetative reproduction

16 In which one of the following parts of a flowering plant would meiosis take place?

- A anthers
- B germinating seeds
- C pollen tube
- D stigma



Questions 17 and 18 refer to the diagram below which shows a horizontal section through an eye.



17 In which labelled part is there the greatest concentration of cones?

- A 2
- B 3
- C 4
- D 5

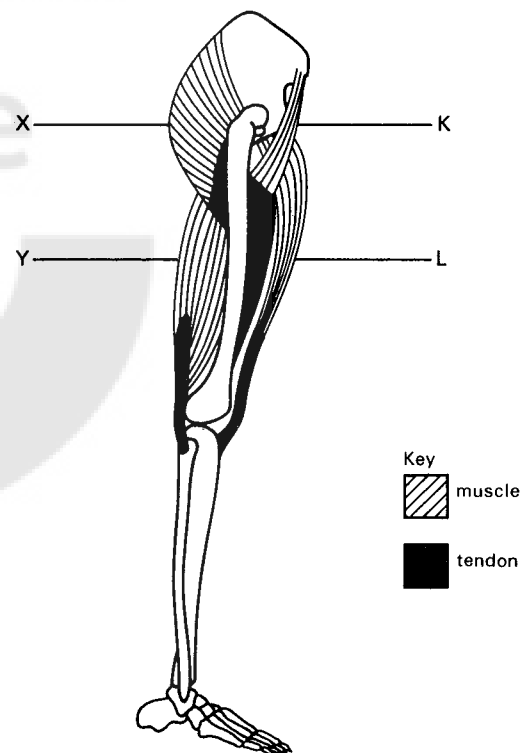
18 Which labelled part is the muscle that controls the process of accommodation in the eye?



- A 1
- B 6
- C 7
- D 8

19 Which one of the following statements is true of the leg of an arthropod?

- A It grows at a constant rate.
- B It has synovial joints.
- C It has an endoskeleton of bone.
- D It is moved by antagonistic muscles.

20 The simplified diagram below shows four muscles of the human leg.



Key  
 muscle  
 tendon

Which one of the following pairs of muscles would contract simultaneously to lift and straighten the leg?

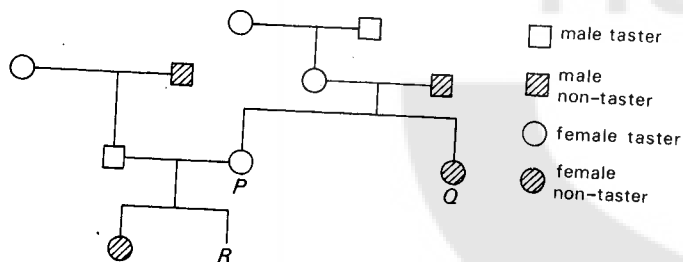
- A K and L  
B K and Y  
C X and Y  
D X and L

21 Which one of the following parts of a vertebra resists compression?

- A centrum  
B neural arch  
C neural spine  
D transverse process

Questions 22 and 23 refer to the following information.

Only people who have a dominant gene, T, have the ability to taste certain chemicals. The pedigree chart below shows the transmission of this gene in a family.



22 What are the genotypes of females P and Q?

- P Q  
A tt Tt  
B TT tt  
C Tt Tt  
D Tt tt

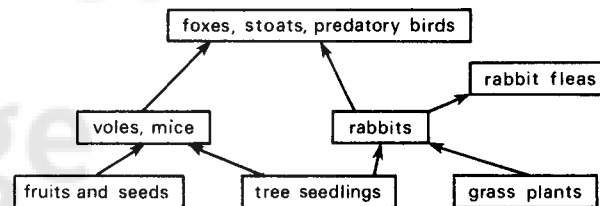
23 What is the chance that child R will be a taster?

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

24 Which one of the following features applies to allelic genes?

- A They occur on one chromosome.  
B They occupy equivalent positions on homologous chromosomes.  
C They are homozygous in diploid organisms.  
D They are heterozygous in diploid organisms.

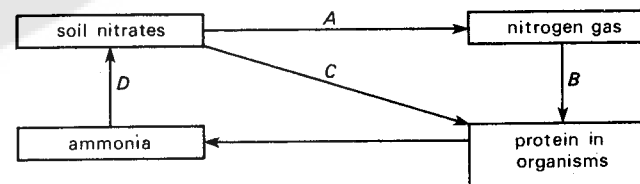
25 The diagram below shows a simple food web.



Which one of the following organisms is a primary consumer?

- A fox  
B grass plant  
C rabbit  
D rabbit flea

26 The diagram below illustrates a simple form of the nitrogen cycle.



Which one of the stages shown, A, B, C or D, occurs more rapidly in water-logged soil than in well-drained soil?

27 Parasitic organisms belonging to a certain group, are filamentous in structure, largely parasitic on plants and are usually transmitted by wind-blown structures.

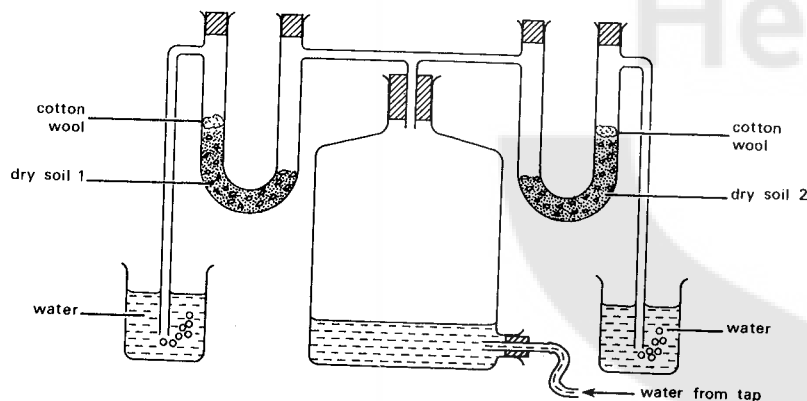
What are these organisms called?

- A bacteria
- B fungi
- C protozoa
- D viruses

28 During pregnancy, a mother is frequently given iron tablets. What is the reason for this treatment?

- A to replace the iron lost during previous menstrual periods
- B to provide adequate iron for mother and foetus
- C to ensure that there will be adequate iron in the mother's milk when she is suckling the baby
- D to make blood plasma during pregnancy

Questions 29 and 30 refer to the diagram below which shows an experiment to investigate the properties of two soils.



29 Which one of the following properties of soil 1 and soil 2 is the apparatus designed to compare?

- A organic matter content
- B permeability to air
- C permeability to water
- D solubility

30 What is the function of the cotton wool?

- A to prevent air from passing into the soil samples
- B to prevent air from passing out of the soil samples
- C to prevent soil particles from entering the beakers
- D to prevent the escape of soil micro organisms

## BIOLOGY

### ORDINARY LEVEL

### PRACTICAL BIOLOGY

(One hour)

Written answers should be kept to the lines.

Drawings should be made in the spaces provided.

Use sharp pencils for your drawings.

Coloured pencils or crayons should not be used.

No additional sheets of writing paper are to be inserted in this book.

Work on additional sheets will not be marked.

The intended marks for questions or parts of questions are given in brackets [ ].

- 1 (a) Examine **D 31** carefully and in the space below make labelled drawings to show its external features.

[5]

- (b) (i) Remove the outer coat of **one** of the specimens and separate the two halves internal to the coat. In the space below make large labelled drawings of all the structures that you can see in the two halves.

- (ii) State the function of **each** structure in the table below.

Name of structure	Function

[8]

- (c) Using **one** of the halves prepared in part (b) above, cut and crush the material on the watch glass provided. Test this material to determine the food reserves present.

Reagent	Treatment of reagent	Observation	Deduction

[6]

- (d) Which of the above reserves is used to provide the energy for the initial stages of growth?.....[1]

2

- (a) Examine **D 32**, using a hand lens.

- (i) Describe the animal as seen from the **dorsal** surface.

.....

.....

.....

- (ii) Describe the shape of the animal as seen from the side, and suggest how this shape could be related to its habitat.

.....

.....

.....[4]

- (b) (i) How many pairs of legs does **D 32** possess? .....
- (ii) Carefully remove a hind leg from **D 32** and make a large drawing of the leg (no labels are required). Measure the length of the leg and from this calculate the magnification of your drawing.

Length of leg ..... Magnification .....

- (iii) From your observations of the leg during drawing, deduce **two** functions of the legs and give your reasons.

Function .....

Reason.....

Function .....

Reason.....

.....[10]

- (c) Fig. 1 below shows a drawing of the foreleg and scapula of a mammal (rabbit).

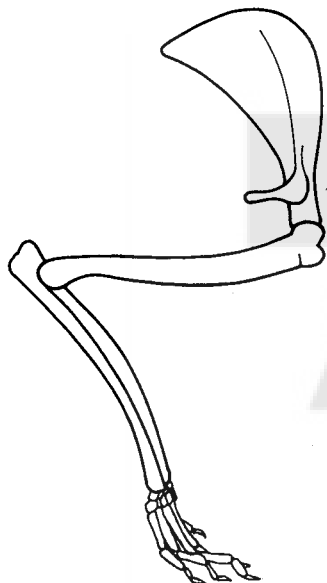


Fig. 1

- (i) State three features of the leg shown in Fig. 1 and the leg of D 32 that are similar.

1 .....

2 .....

3 .....

- (ii) State three features of the leg shown in Fig. 1 and the leg of D 32 that are different.

Arthropod

Mammal

1	.....	.....
	.....	.....
2	.....	.....
	.....	.....
3	.....	.....
	.....	.....

[6]

## PRACTICAL BIOLOGY INSTRUCTIONS

PAPER 5090/3

Each candidate taking the examination should be provided with the following:

- (a) Labelled by code only:

**D 31** Two Broad Bean seeds (*Vicia faba*) previously soaked in water for twenty four hours.

**D 32** A preserved adult wood louse with ventral surface exposed and intact.

(D 32 will not be complete at the end of the practical examination.)

The following apparatus is also required by each candidate:

- (b) (i) hand lens, scalpel or razor blade, forceps, glass rod, watch glass, ruler (cm and mm),
- (ii) Fehling's or Benedict's solution, Iodine solution, reagents for Biuret test,
- (iii) three test tubes, test tube rack or holder, means of heating reagents.

## BIOLOGY

5090/6

ORDINARY LEVEL

ALTERNATIVE TO PRACTICAL BIOLOGY

(One hour)

Answer **all** questions.

Written answers should be kept to the lines.

Drawings should be made in the spaces provided.

Use sharp pencils for your drawings.

Coloured pencils or crayons should not be used.

No additional sheets of writing paper are to be inserted in this book.

Work on additional sheets **will not be marked**.

The intended marks for questions or parts of questions are given in brackets [ ].

1 Fig. 1 below shows an experiment set up to find the volume of oxygen absorbed by germinating seeds.

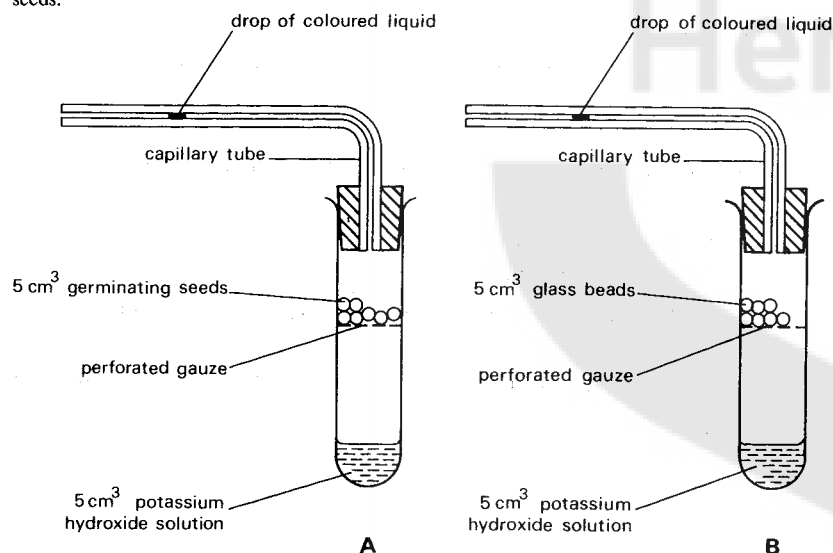


Fig. 1

The two sets of apparatus are identical in internal volume, and the cross-sectional bore of the capillary tube has an area of  $2 \text{ mm}^2$ . After two hours the indicator drop in the capillary tube of apparatus **B** had moved towards the open end a distance of 1 cm. During the same period the indicator drop in the capillary tube of apparatus **A** had moved 6 cm away from the open end.

- (a) (i) What function is performed by the potassium hydroxide solution?

[1]

- (ii) How is this function related to the aim of the experiment, i.e. to measure the uptake of oxygen by the seeds?

[1]

- (b) (i) What is the function of apparatus **B**?

[1]

- (ii) Give reasons for the presence of  $5 \text{ cm}^3$  of glass beads in apparatus **B**.

[1]

- (c) State **two** possible reasons why the indicator drop in apparatus **B** moved towards the open end of the capillary tube.

(i) .....

(ii) ..... [2]

- (d) Taking into account what happened in apparatus **B** and in apparatus **A**, calculate the volume of oxygen ( $\text{mm}^3$ ) absorbed by the peas in one hour. (Show your working together with units involved).

[2]

- (e) Suggest **one** way in which you could improve the apparatus so as to eliminate one of the problems given in your answer in part (c) above.

[1]

2 Fig. 2 below shows the apparatus used in a plant physiology experiment.

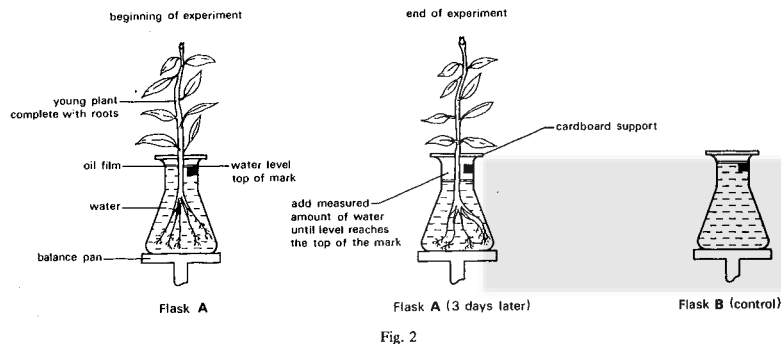


Fig. 2

(a) What physiological process is under investigation in the experiment shown in Fig. 2?

[1]

(b) The mass of the flask and the plant at the beginning of the experiment and the mass after 3 days are given below.

Mass of apparatus at the beginning of the experiment = 756 g

Mass of apparatus at the end of the experiment = 740 g

(i) What can you deduce from these results?

[2]

(ii) After three days water is added to flask A to return the level to the original mark (shown as a black rectangle).

Mass of apparatus after adding water to reach the top of the mark = 758 g

Give an explanation of the increase in mass of the apparatus.

[2]

(c) What is the function of the control flask, B?

[1]

3 Fig. 3 below shows two leaves which have been destarched. Both leaves are still attached to the parent plant. The variegated leaf A was shielded on both sides by black paper and the green leaf B was partly enclosed in a flask. Leaves A and B were both exposed to sunlight for 8 hours. Each leaf was then decolourised and tested for starch.

Diagrams C and D show the same leaves after removal from the apparatus and after testing for starch. The dotted lines represent the position of the black paper in leaf C and the split stopper in leaf D.

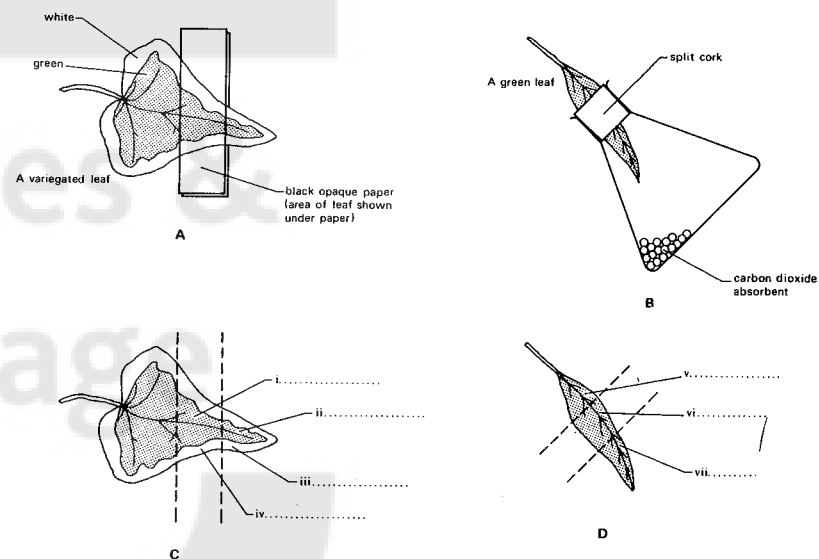


Fig. 3

(a) On the dotted lines in Fig. 3 (C and D) state the colours shown in the different areas (i to vii) of the leaves after the starch test.

[4]

(b) How do you account for your result in

Leaf C (i) .....

(iii) .....

Leaf D (vii)? .....

[6]

- (c) Name the factors essential for starch formation that have been studied in

Leaf A. ....  
 .....[2]

- (d) In what way is a control incorporated in

Leaf A .....  
 .....

Leaf B? .....  
 .....[2]

- (e) In leaf A starch formation could have been reduced because the paper was too close to the leaf surface. Explain how the closeness of the paper may have affected the formation of starch.

.....  
 .....  
 .....[1]

- 4 Fig. 4 below shows a photograph of the leg of an arthropod.

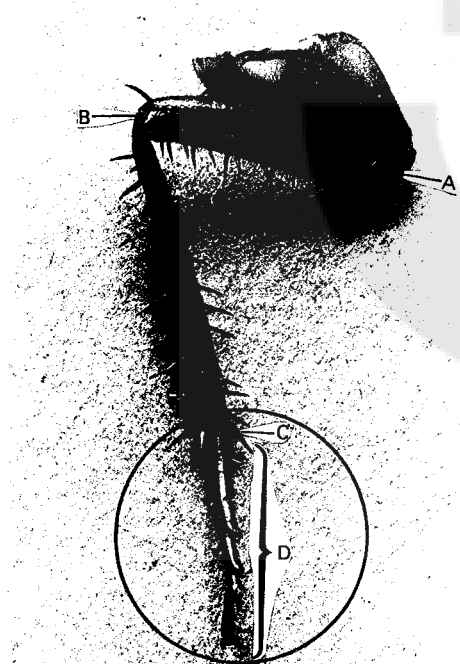


Fig. 4

- (a) Make a drawing of the encircled portion of this leg in the space below.  
 (b) What type of joint is present at A, B and C? .....  
 (c) What is the function of the pads and claws in region D? .....

- (d) What is the function of the spikes on the limb? .....

.....[4]

Fig. 5 below shows a drawing of the foreleg and scapula of a mammal (rabbit). The drawing is not to the same scale as Fig. 4.

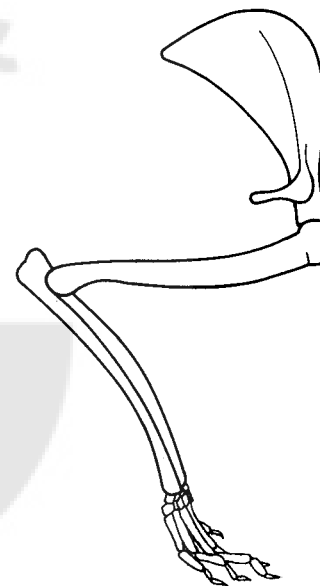


Fig. 5

- (e) State **three** features of the limbs shown in Figures 4 and 5 that are **similar**.

(i) .....  
 (ii) .....  
 (iii) ..... [3]



(f) State **three** features of the limbs shown in Figs 4 and 5 which are **different**.

*Arthropod*

*Mammal*

- (i) .....  
.....
- (ii) .....  
.....
- (iii) .....  
.....
- ..... [3]