



GCSE

Biology

Session: 1994 June
Type: Question paper
Code: 1325

SCIENCE : BIOLOGY

PAPER 1

Friday

17 JUNE 1994 Morning

1 hour

Additional materials:

Personalised answer sheet (Form MS4)

Soft Pencil

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TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **fifty** questions on this paper. Attempt **all** questions. For each question there are five possible answers labelled **A, B, C, D** and **E**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

- 1 A student used lime water to see whether some stick insects were producing carbon dioxide. Which **ONE** of the following activities of living things could be demonstrated by this?
- A growth
 - B nutrition
 - C movement
 - D respiration
 - E sensitivity

2 Study Fig. 1.

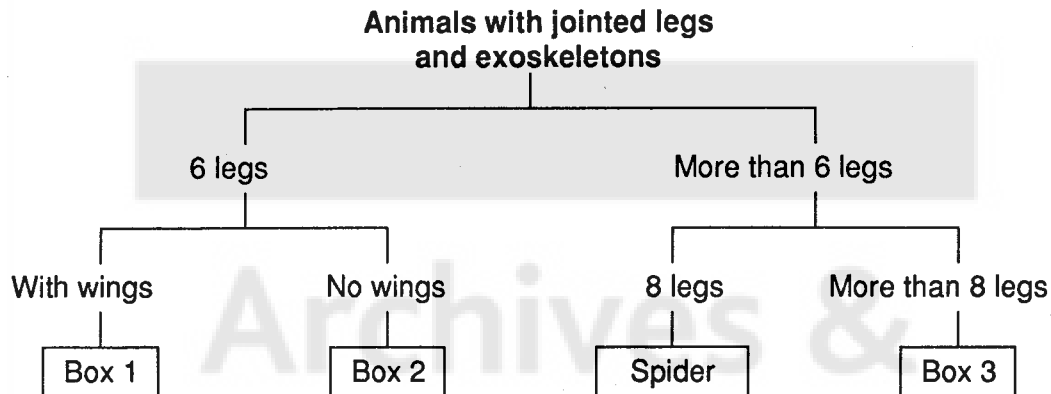


Fig. 1

In the key shown in Fig 1 above, three animals, which all have jointed legs and exoskeletons, can be identified by being placed in the boxes 1, 2 and 3. Which is the correct identification?

	Box 1	Box 2	Box 3
A	centipede	crab	flea
B	locust	centipede	housefly
C	housefly	locust	crab
D	locust	flea	centipede
E	flea	housefly	locust

- 3 Which of the following animals are **NOT** vertebrates?
- A amphibians
 - B fish
 - C insects
 - D mammals
 - E reptiles
- 4 What is the removal of metabolic waste from cells called?
- A absorption
 - B egestion
 - C excretion
 - D respiration
 - E secretion

5 Which statement correctly describes viruses?

- A They are non-cellular and totally parasitic.
- B They have hyphae but no chlorophyll.
- C They produce spores and are decomposers.
- D They consist of a single cell with a nucleus.
- E They have a cell wall but no nucleus.

6 The following list shows some of the ways in which disease-causing organisms can enter the body.

- 1 Through the bite of an infected insect.
- 2 Sharing cutlery with an infected person.
- 3 Sexual intercourse with an infected person.
- 4 Inhaling air from an infected person.
- 5 Sharing a hypodermic needle with an infected person.

By which of these routes is HIV known to be transmitted from person to person?

- A 1 and 2
- B 3 and 4
- C 1 and 5
- D 2 and 4
- E 3 and 5

7 Which **ONE** of the following represents the flow of energy in a food chain?

- A carnivore → herbivore → plant
- B carnivore → plant → herbivore
- C herbivore → plant → carnivore
- D plant → carnivore → herbivore
- E plant → herbivore → carnivore

8 Table 1 shows the numbers of different plants found in a meadow from 1977 to 1982.

Table 1

Plant Species	1977	1978	1979	1980	1981	1982
A	20	80	95	40	18	2
B	1	2	4	5	15	55
C	80	60	20	5	1	3
D	1	3	15	95	75	55
E	20	5	4	1	3	5

Which plant species, A, B, C, D or E, showed the greatest increase in numbers in a single year?

- 9 The process of fermentation can be used on a large scale to produce fizzy drinks. When the products of a fermenter are sealed in bottles before the process of fermentation has completely finished, there is a danger that the bottles will burst because
- A heat of fermentation causes increased pressure.
 - B yeast continues to grow and increase in volume.
 - C the sugar present increases in volume.
 - D carbon dioxide continues to be produced and increases pressure.
 - E micro-organism contamination increases pressure.

10 Study Fig. 2.

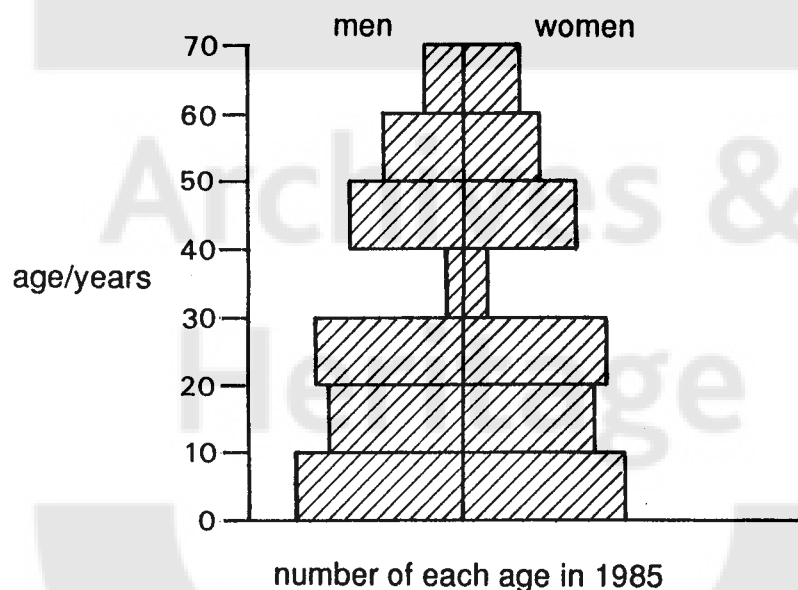


Fig. 2

The population pyramid in Fig. 2 shows the number of people in each age category on a particular island in 1985. Some years earlier a serious epidemic caused the death of the majority of new born babies. In which year did this epidemic occur?

- A 1935
 - B 1945
 - C 1950
 - D 1955
 - E 1960
- 11 Even if a drug were to be found to destroy the HIV parasite in those with AIDS, these people would still face problems because the virus had already damaged their
- A brain and sense organs.
 - B immune system.
 - C red blood cells.
 - D reproductive system.
 - E respiratory organs.

- 12 Fig. 3 shows the changes in the size of a yeast population cultured in a laboratory flask. Which region of the curve **A**, **B**, **C**, **D** or **E** represents the stage at which the rate of reproduction equals the rate of death?

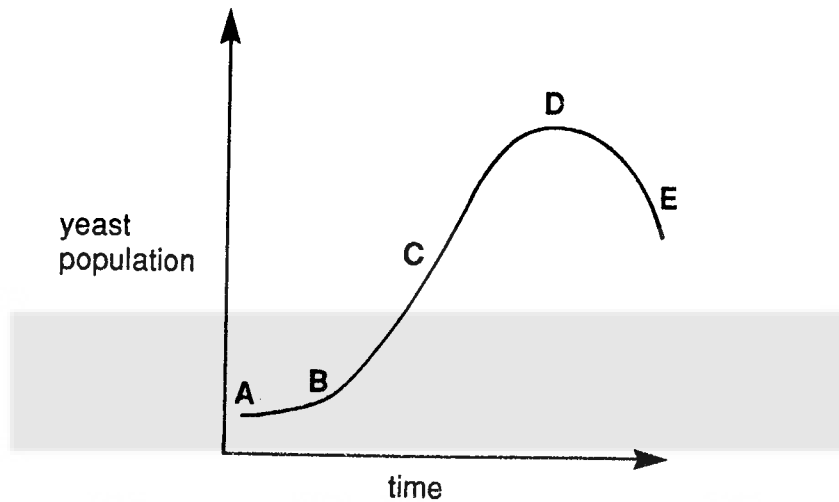


Fig. 3

- 13 Which of the following is a sign that a stream or shallow river is heavily polluted with sewage?

- A many different types of waterweed
- B many different types of animals
- C high concentration of bacteria
- D bottom covered with slimy algae
- E muddy water

- 14 The following procedure was carried out by a student investigating soil.

- 1 Soil was put into a 100 cm³ measuring cylinder up to the 50 cm³ level.
- 2 50 cm³ water was measured in another measuring cylinder and poured onto the soil.
- 3 The soil and water were well mixed.
- 4 The new level was noted.

This procedure could be used to find the volume of

- A air.
- B humus.
- C mineral particles.
- D micro organisms.
- E water.

- 15 Which organism can survive using only inorganic substances?

- A grass plant
- B mouse
- C predatory bird
- D rabbit
- E wasp

[Turn
over

- 16 The shoot of a green plant is said to be positively phototropic. This means that it grows
- A away from light.
 - B away from gravity.
 - C towards water.
 - D towards gravity.
 - E towards light.
- 17 A plant called *Cymbocarpia* is found in Caribbean rain forests. It produces enzymes that can digest fallen leaves and it then absorbs the products. What does this illustrate?
- A combustion
 - B decomposition
 - C parasitism
 - D photosynthesis
 - E respiration
- 18 Adding lime to a clay soil improves it because it
- A increases the humus content of the soil.
 - B decreases the amount of air entering the soil.
 - C destroys bacteria in the soil.
 - D makes soil particles stick together.
 - E reduces the size of soil particles.
- 19 Fig. 4 below represents the water cycle.

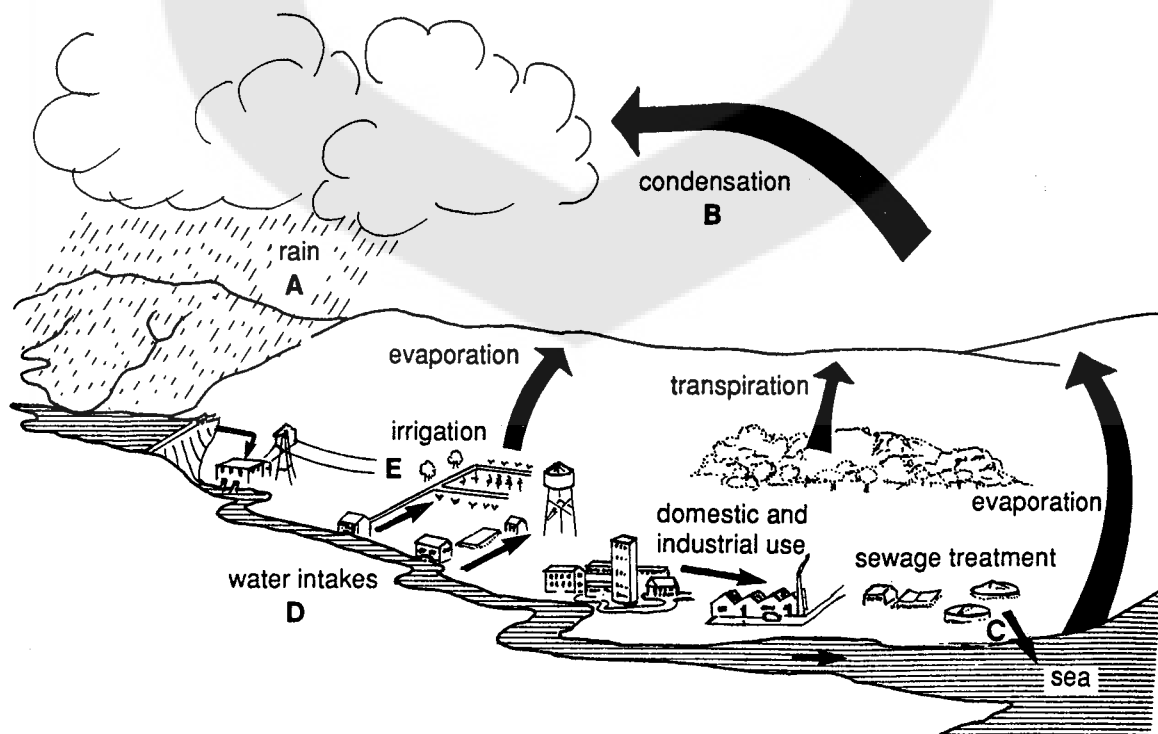


Fig. 4

At which of the points A, B, C, D or E is water most pure?

20 A cell in which the cytoplasm is pressing outwards against the cell wall is said to be

- A flaccid.
- B impermeable.
- C plasmolysed.
- D limp.
- E turgid.

21 The pie charts in Fig. 5 below show the composition of five diets.

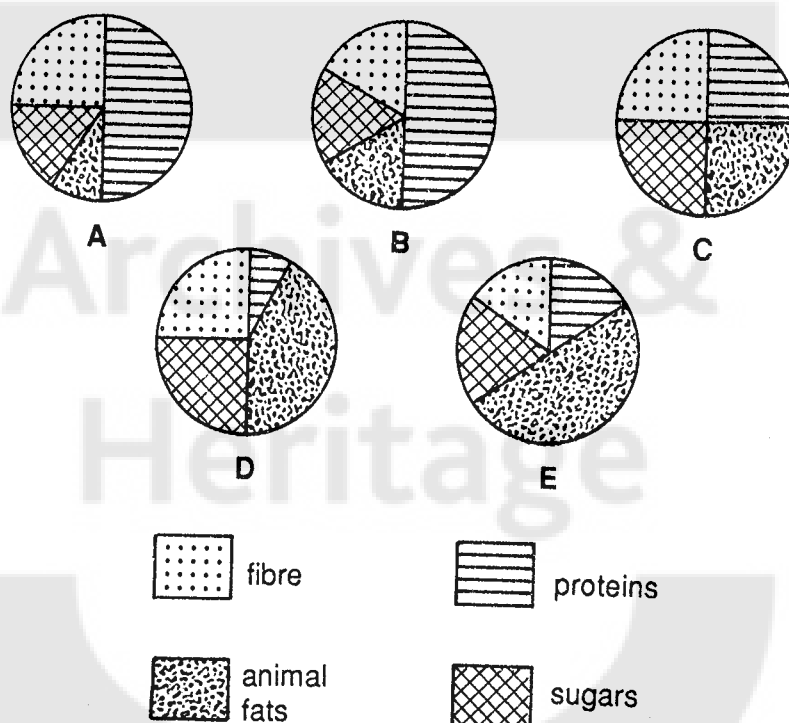


Fig. 5

Which diet, A, B, C, D or E would be most likely to lead to coronary heart disease?

22 Which of the following shows the energy yield and products formed after aerobic respiration?

	Energy Yield	Carbon Dioxide	Alcohol	Water
A	low	✓	✓	✓
B	low	✓	x	✓
C	high	✓	x	✓
D	high	✓	✓	x
E	high	x	✓	✓

23 Table 2 shows the results of Benedict's test on a variety of foods.

Table 2

Food (1 g of each)	Final colour of mixture
A potato	green-yellow
B peanut	blue
C yam	yellow
D bread	green
E parsnip	orange-red

Which food contained most sugar?

24 Which tissue would normally carry sugars through a plant?

- A phloem
- B epidermis
- C xylem
- D cortex
- E cuticle

25 The skin is able to function as a sense organ for the body because it contains

- A blood capillaries.
- B receptor cells.
- C epidermal cells.
- D sweat ducts.
- E oil glands.

26 Which **ONE** of the following describes a response to an environmental change?

- A A boy works harder at something he likes than at something he hates.
- B A girl blinks her eyes when a strong light is shone at them.
- C A boy breathes faster after running to catch a bus.
- D A girl grows more rapidly between the ages of 11 and 15 than between 7 and 11.
- E A boy walks faster if he knows he is late for school.

27 Which structure in the plant cell shown in Fig. 6 is used to absorb light energy?

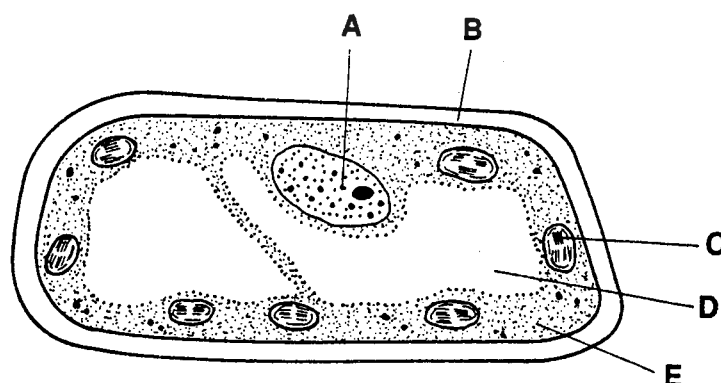


Fig. 6

28 Fig. 7 shows the average blood pressure in five blood vessels as blood circulates in the body.

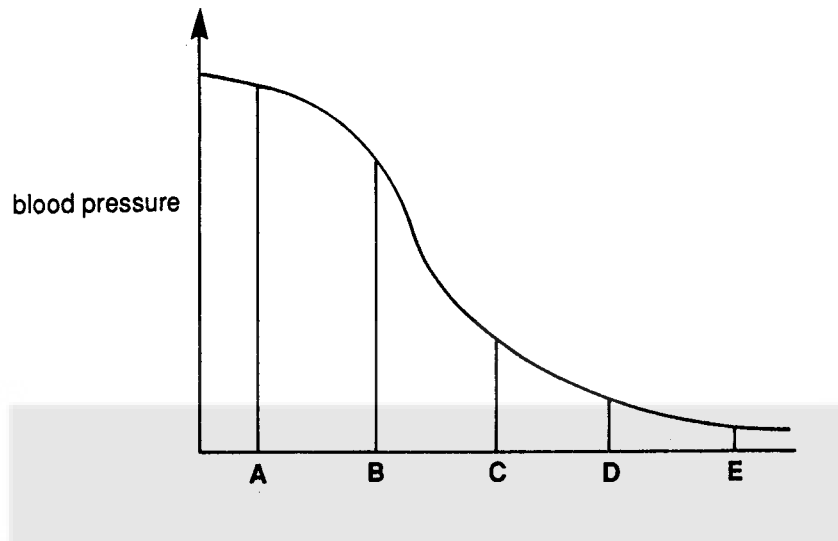


Fig. 7

Which of the letters A, B, C, D or E represents a vein?

29 The bar charts, Fig 8, show the relative levels of some substances in the blood before and after passing through a certain organ in the body.

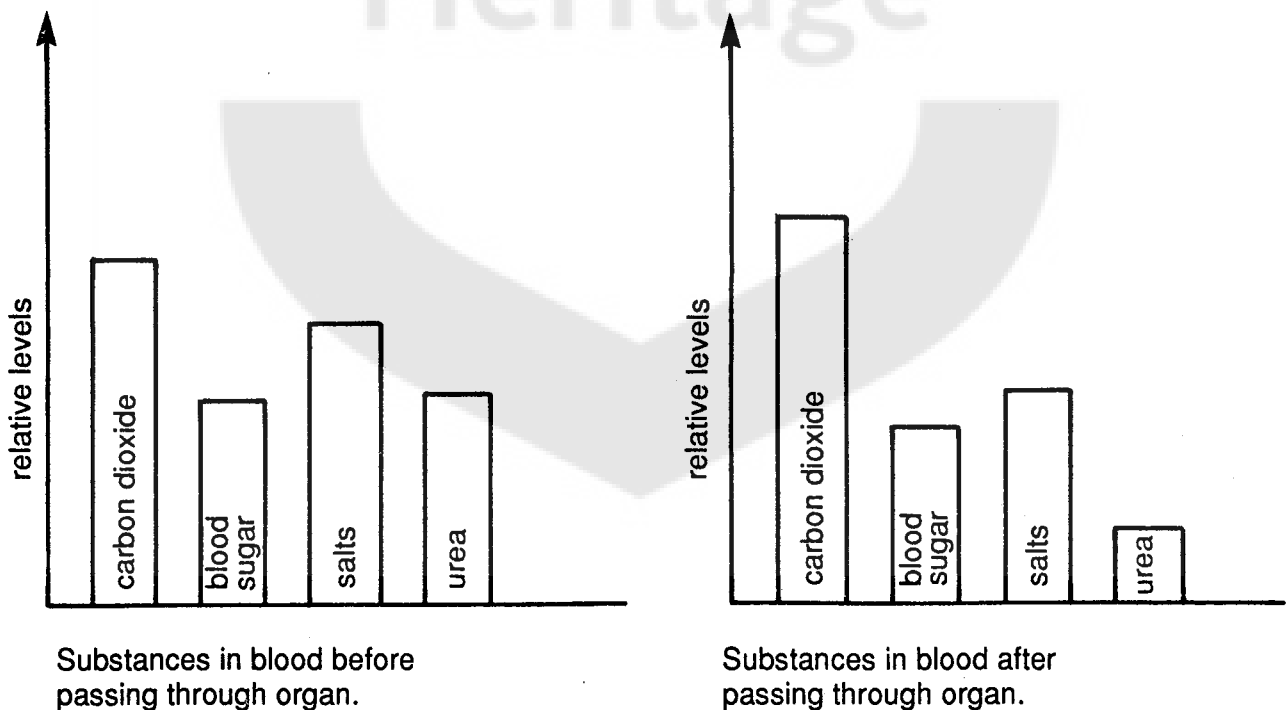


Fig. 8

Through which organ has the blood passed?

- A heart
- B kidney
- C liver
- D lung
- E small intestine

[Turn
over

30 Five types of human cell are listed below. Which type of cell does not contain nuclei?

- A bone cells
- B nerve cells
- C red blood cells
- D skin cells
- E white blood cells

31 Chlorophyll reflects green light. Which of the following would happen if only green light reached the Earth?

The amount of

- A food available to animals would decrease.
- B oxygen in the air would increase.
- C reserve food stored in green plants would increase.
- D carbon dioxide in the air would decrease.
- E chlorophyll in leaves would increase.

32 Fig. 9 shows two states of two guard cells and a stoma.

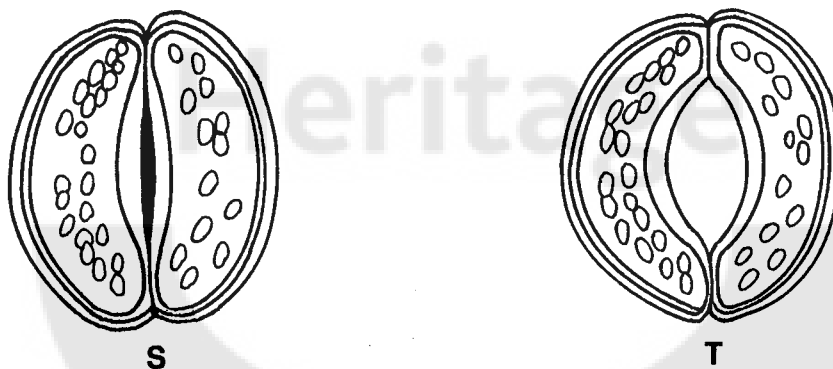


Fig. 9

Which of the following statements about guard cells is true of the change from state S to state T?

- A The cells have taken in water, closing the stoma.
- B The cells have lost water, opening the stoma.
- C The cells have taken in water, opening the stoma.
- D The cells have lost water, closing the stoma.
- E The cells have lost ions, opening the stoma.

33 During an operation, a woman had much of her stomach removed. Which **ONE** of the following is the most likely result of this treatment?

- A Proteins were less easily digested.
- B More pathogens were killed by acid.
- C Fats were not emulsified.
- D Starch was less easily digested.
- E More bile was produced.

34 Fig. 10 represents a dialysis machine.

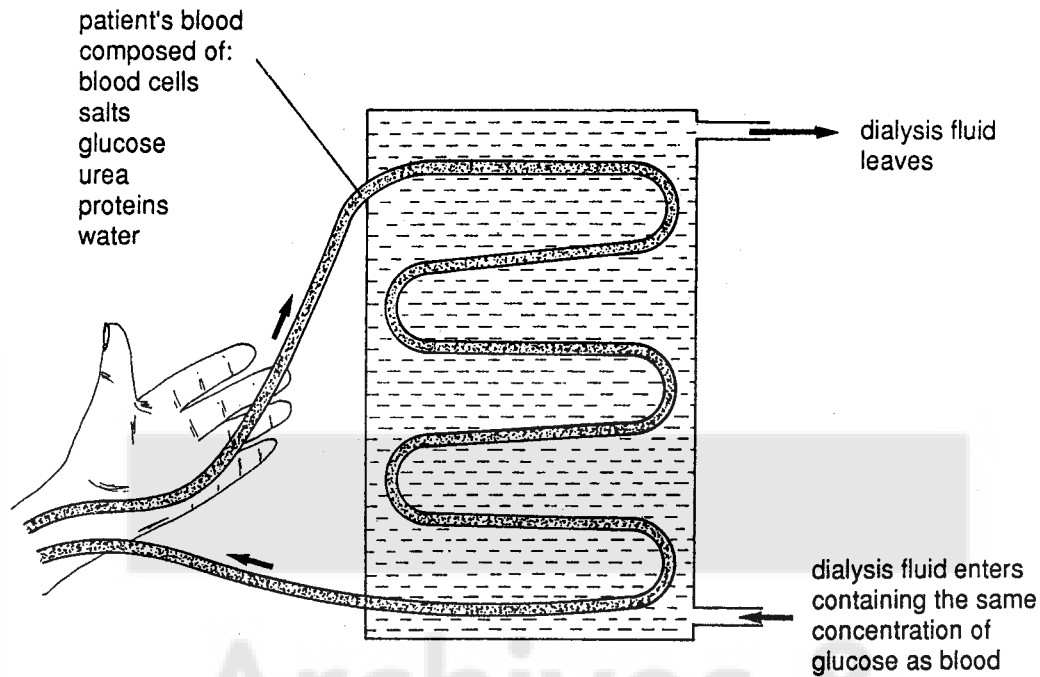


Fig. 10

Which of the components of the blood will be removed by the dialysis fluid?

- A blood cells and salts
- B glucose and urea
- C protein and salts
- D water and glucose
- E urea and water

35 The diagram in Fig. 11 shows chromosomes at a stage of mitosis.

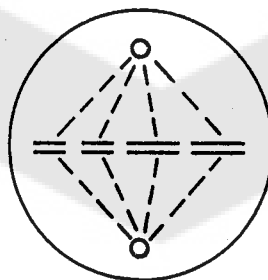
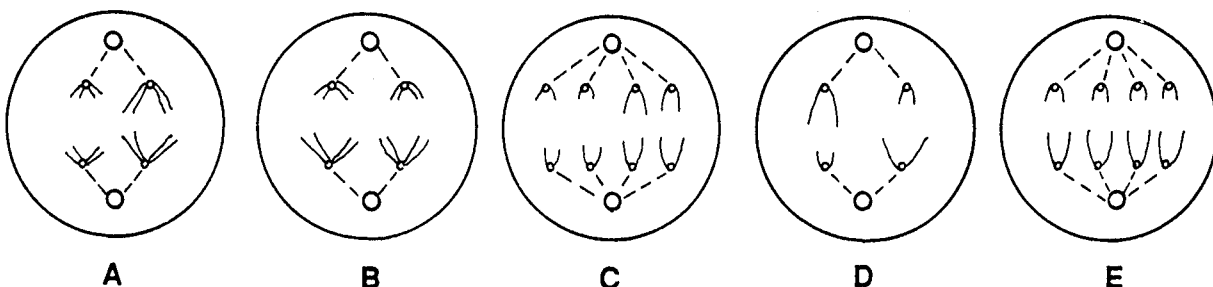


Fig. 11

Which diagram shows how these chromosomes will look at the next stage?



[Turn
over

36 Fig. 12 below shows the structure of part of a green leaf in section.

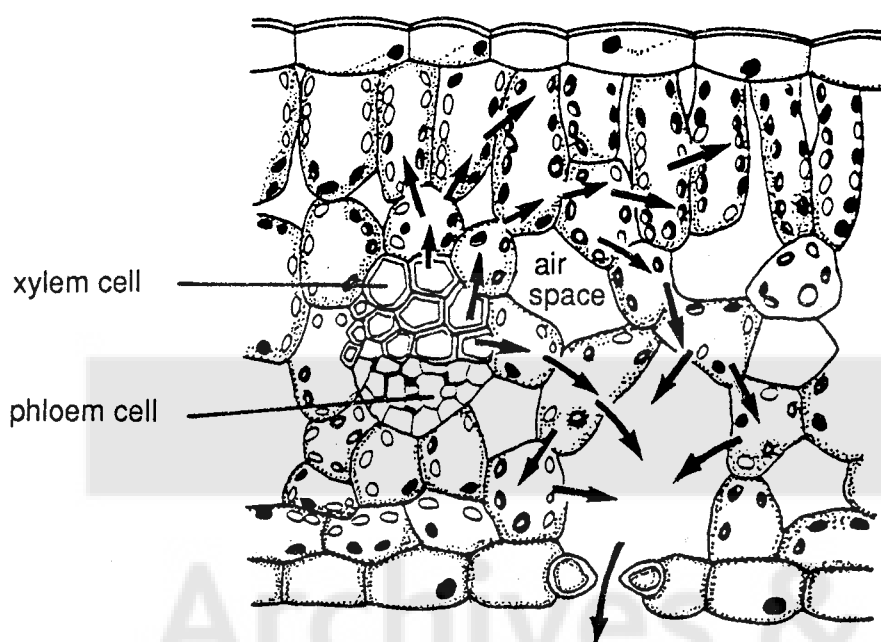


Fig. 12

The arrows show the movement of

- A carbon dioxide during respiration.
- B oxygen during respiration.
- C oxygen during photosynthesis.
- D sugars during photosynthesis.
- E water during transpiration.

37 Five test tubes each containing starch suspension were treated in different ways as shown in Table 3.

Table 3

Test tube	A	B	C	D	E
Amylase added	Yes	No	Yes	No	Yes
Strong acid added	No	No	Yes	Yes	No
Mixture boiled	No	Yes	No	No	Yes

In which test tube would the starch be broken down most rapidly?

- 38 A destarched plant was set up as shown in Fig. 13 below. It was then left for several hours in the light and at room temperature. The leaves 1 and 2 were then tested for starch.

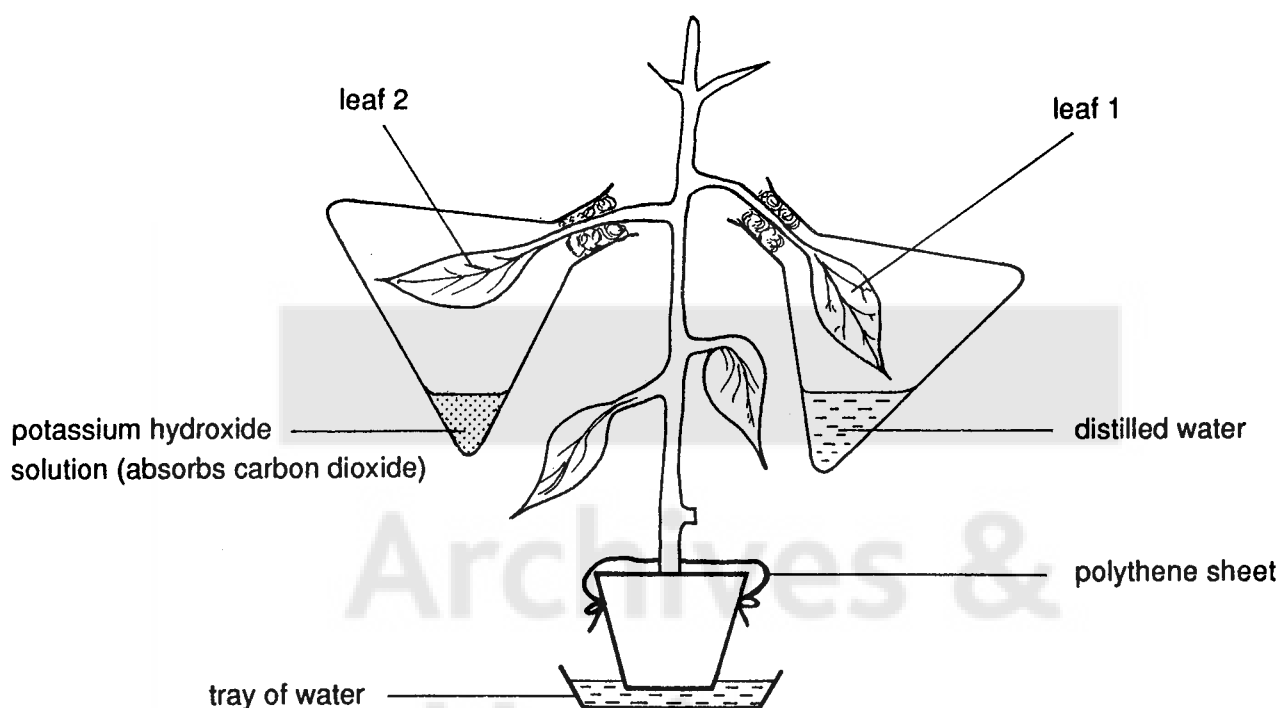


Fig. 13

Which **ONE** of the following results would be most likely?

- A Starch was present in both leaves.
 - B Leaf 2 had starch present but leaf 1 had none.
 - C Leaf 1 had starch present but leaf 2 had none.
 - D Neither of the leaves had starch present.
 - E Leaf 1 wilted but leaf 2 did not.
- 39 What is the approximate percentage volume of carbon dioxide in **EXHALED** air?
- A 0.04
 - B 4
 - C 16
 - D 20
 - E 79
- 40 A young athlete took 20 breaths per minute after doing some exercise. The volume of each breath was 2000 cm^3 . At each breath 20% of the inspired air was oxygen and 16% of the expired air was oxygen. What volume of oxygen was the athlete absorbing per minute?

- A 40 cm^3
- B 1600 cm^3
- C 4000 cm^3
- D $16\,000 \text{ cm}^3$
- E $40\,000 \text{ cm}^3$

- 41 Two different-sized cubes of agar were put into a coloured solution for 10 minutes and were then cut in half. The appearance of the cut smaller cube is shown in Fig. 14.

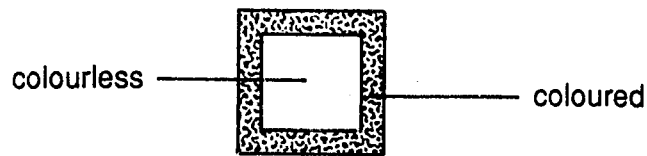
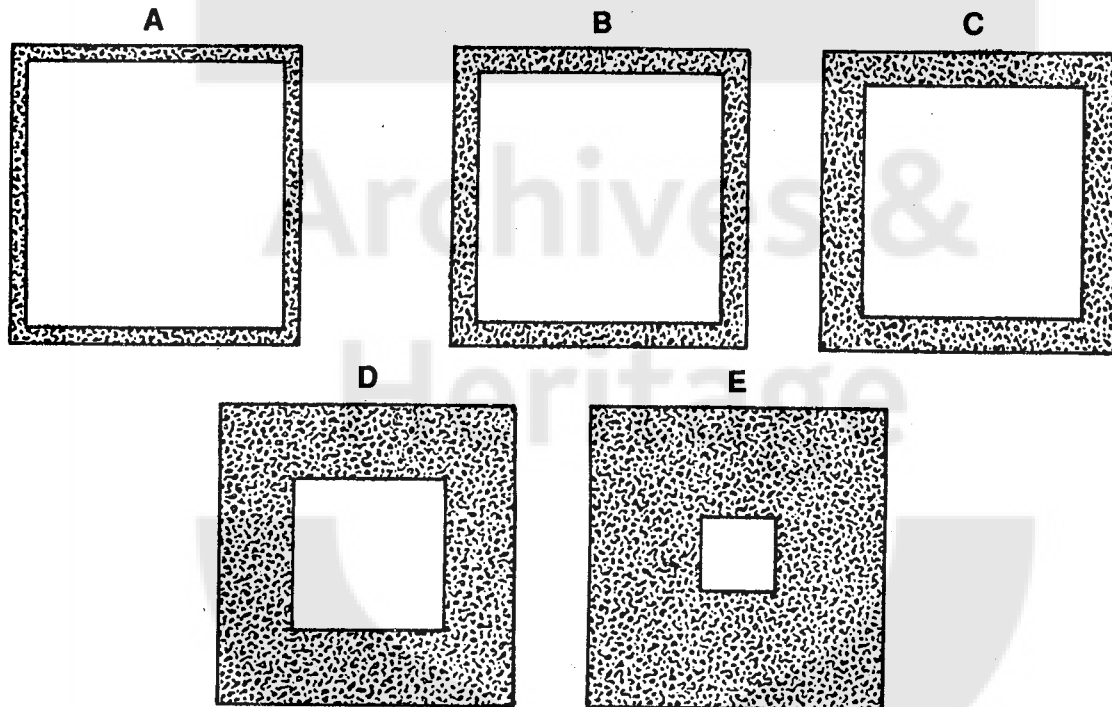


Fig. 14

Which **ONE** of the following shows the appearance of the cut larger cube?



- 42 Fig. 15 shows the days on which events in the menstrual cycle of one woman take place.

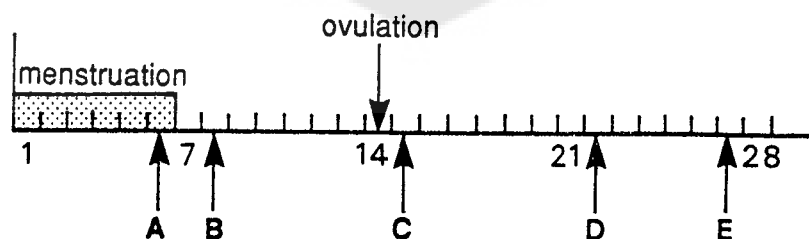


Fig. 15

On which of the days labelled A, B, C, D or E would sexual intercourse most likely result in pregnancy?

43 Fig. 16 shows the female reproductive system.

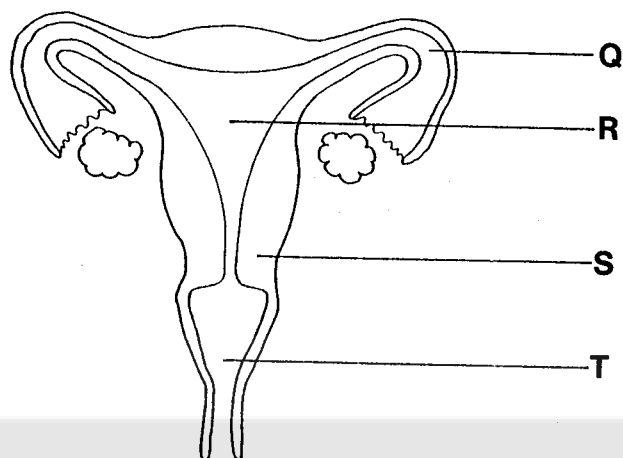


Fig. 16

Which of the following combinations shows the correct labelling for the uterus and oviduct?

	Uterus	Oviduct
A	R	S
B	R	Q
C	T	S
D	Q	T
E	Q	S

44 Fig. 17 shows a plan view of an open flower.

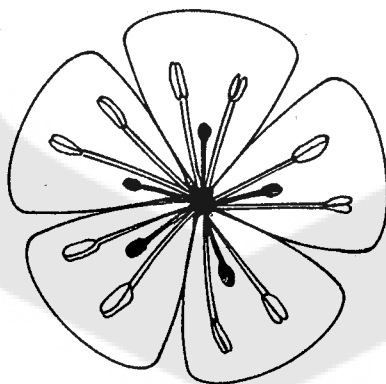


Fig. 17

Using the key below, identify the flower as either A, B, C, D or E.

- | | | |
|-------|-------------------------|------------------|
| (i) | Petals 4 or less | A |
| | Petals 5 or more | go to step (ii) |
| (ii) | Stamens 4 or less | B |
| | Stamens 5 or more | go to step (iii) |
| (iii) | Style 1 | C |
| | Style 2 or more | go to step (iv) |
| (iv) | Stamens 5 | D |
| | Stamens 10 | E |

[Turn
over

- 45 The peppered moth exists in two forms, a light and a dark form. The dark form is most abundant in industrial areas and the light form abundant in country areas. Which explanation is correct?
- A Light moths cannot tolerate smoke.
 - B There is no food for light moths in industrial areas.
 - C Birds can more easily find dark moths in country areas.
 - D Dark moths require buildings to shelter in.
 - E Fewer moth-eating birds live in town.
- 46 Which of the following is an example of discontinuous variation in humans?
- A height
 - B hair colour
 - C waist measurement
 - D length of foot
 - E blood group
- 47 How many chromosomes are there in the body cells of a person affected by Down's syndrome?
- A 48
 - B 47
 - C 46
 - D 24
 - E 23
- 48 Meiosis produces
- A cells with the same number of chromosomes as normal body cells.
 - B cells with the same combination of genes as in normal body cells.
 - C a decrease in variation in a species.
 - D cells having different combinations of genes from one another.
 - E cells having the same combination of genes as one another.
- 49 Brown coloured enamel on the teeth can be inherited. It is caused by a dominant gene. People who have white coloured enamel have two recessive genes.
- Two people, both heterozygous for enamel colour, have a child. What is the chance of their child having white enamel?
- A 1 in 1
 - B 1 in 2
 - C 1 in 3
 - D 1 in 4
 - E 1 in 5
- 50 What is the sex chromosome content of an unfertilised human egg?
- A XX
 - B XY
 - C X
 - D Y
 - E YY

Candidate Name _____

Centre Number	Candidate Number

MIDLAND EXAMINING GROUP
General Certificate of Secondary Education

1325/2

SCIENCE: BIOLOGY

PAPER 2

Wednesday **22 JUNE 1994** Afternoon 1 hour 20 minutes

Candidates answer on the question paper.
No additional materials required.

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TIME 1 hour 20 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

SECTION A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

SECTION B

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

Marks will be awarded for the accurate use of spelling, punctuation and grammar.

You should spend no longer than 40 minutes on Section A and no longer than 40 minutes on Section B.

FOR EXAMINER'S USE	
Section A	
Section B	
Sub-Total	
SPG	
TOTAL	

This question paper consists of 16 printed pages.

SECTION A

Answer all the questions in the spaces provided.
You should spend no longer than 40 minutes on this section.

- 1 Table 1 gives a list of some organisms and spaces for their main features.

Complete (a) to (j) in Table 1.

Table 1

Organism	Main features
Bacteria	(a) _____ (b) _____
(c) _____	_____ mycelium of hyphae (d) _____
Fish	(e) _____ (f) _____
Birds	(g) _____ (h) _____
Mammals	(i) _____ (j) _____

[10]

- 2 (a) Fig. 1 shows two cells A and B.

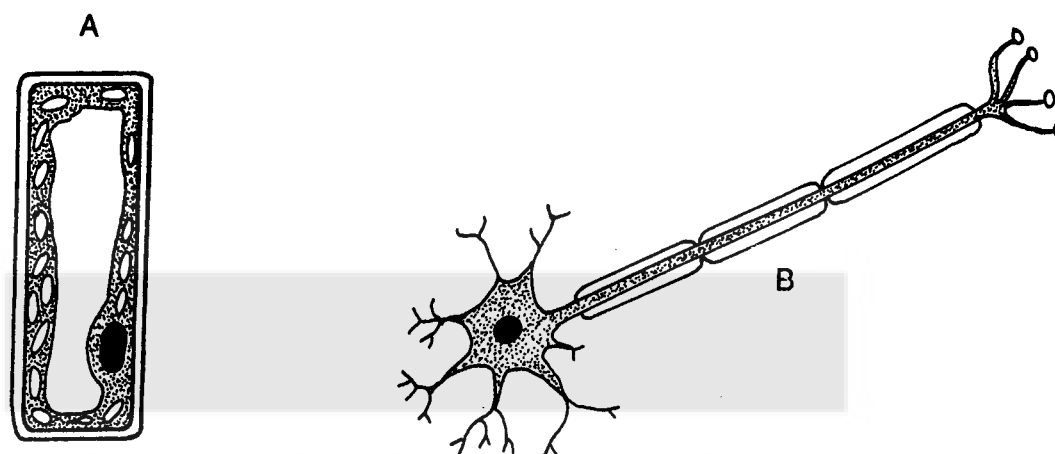


Fig. 1

- (i) Which cell is the plant cell? _____ [1]
 (ii) State the reasons for your choice in (i).

1 _____

 2 _____
 _____ [2]

- (iii) Name the two cells.

A _____
 B _____ [2]

- (b) Describe an investigation you could carry out to find out if a leaf contains starch.

 _____ [5]

3 Fig. 2 shows some of the bones and muscles in the arm.

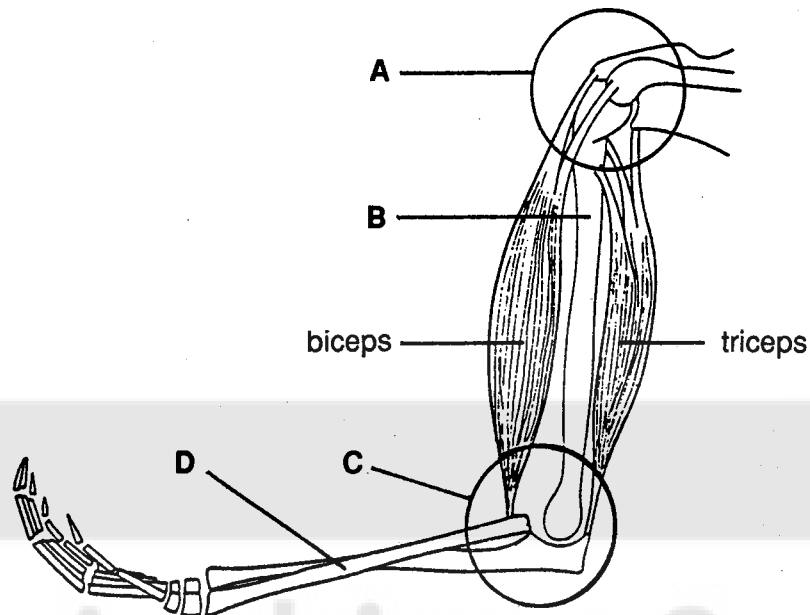


Fig. 2

(a) (i) Name the type of joint shown circled at A.

[1]

(ii) Name bones B and D.

B _____

D _____

[2]

(iii) Name the structure which would attach a muscle to bone D.

[1]

(iv) What type of movement is allowed at joint C?

[1]

(b) Describe how the biceps and triceps bring about controlled movement at joint C.

[5]

- 4 Under the following headings, compare the use of natural (organic) fertilisers with the use of artificial (inorganic) fertilisers.

(a) Cost _____

(b) Way in which they are spread _____

(c) Length of effect in the soil _____

(d) Effect on soil structure _____

(e) Pollution risk _____

[10]

5 (a) What is the difference between asexual and sexual reproduction in terms of the number of parents involved and the variation in the offspring?

(i) Number of parents _____

(ii) Variation in the offspring _____

[2]

(b) What are the advantages and disadvantages of the differences stated in (a) (ii)?

Advantage: asexual reproduction _____

Advantage: sexual reproduction _____

Disadvantage: asexual reproduction _____

Disadvantage: sexual reproduction _____

[4]

(c) Some flowering plants use runners to reproduce asexually.
Describe how this happens.

[4]

6 (a) Artificial selection can be used to improve crop plants and animals.

(i) Give **THREE** different examples of improvements brought about by artificial selection.

1 _____

2 _____

3 _____ [3]

(ii) How does a plant or animal breeder produce a new variety by artificial selection?

_____ [2]

(b) Describe briefly the theory of evolution by natural selection. The following words may help you.

variation

over population

competition

adaptation

selection

_____ [5]

SECTION B

Answer all the questions in the spaces provided.
You should spend no longer than 40 minutes on this section.

- 7 Table 2 shows the daily energy needs of different people.
Table 3 shows the energy content of four foods.

Table 2

Person	Occupation	Daily energy need/kJ
Active girl aged 8 years	school girl	8 000
Active boy aged 8 years	school boy	8 400
Woman	office worker	10 500
Man	office worker	10 500
Active girl aged 15 years	school girl	11 800
Active boy aged 15 years	school boy	14 700
Man	labourer	18 900

Table 3

Food	1	2	3	4
Energy Content kJ per 100g	3 800	130	1 050	400

- (a) What is the daily energy need for an active 8 year old boy?

_____ kJ

[1]

- (b) How many grams of Food 3 would meet the energy needs of an office worker?

_____ grams

[1]

- (c) How much more energy does a labourer need than a male office worker each day?
Show your working.

[2]

- (d) (i) From the foods given in Table 3, which **ONE** would be the best for the labourer to eat? Give a reason for your choice.

[2]

- (ii) If the labourer ate only the food you have suggested in your answer to (i), what is the least amount he should eat to meet his daily energy need? Show your working.

[2]

- (e) The heat energy in foods can be measured experimentally by burning food under a known mass of water. The temperature rise of the water is recorded. The number of joules received by the water from 1 gram of food can be calculated using the following formula:

$$\begin{array}{l} \text{heat gained by} \\ \text{water from Y grams} \\ \text{of food} \end{array} = \frac{\text{mass of water} \times \text{temperature rise} \times 4.2}{Y} \text{ J per g}$$

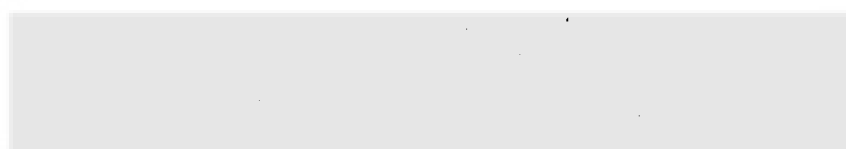
Use the following data and the formula to work out the number of joules released from 1 gram of food which caused the rise in temperature of the water.

$$\begin{array}{lcl} \text{mass of water} & = & 20 \text{ g} \\ \text{temperature rise} & = & 18^\circ\text{C} \\ \text{mass of food} & = & 2 \text{ g} \end{array}$$

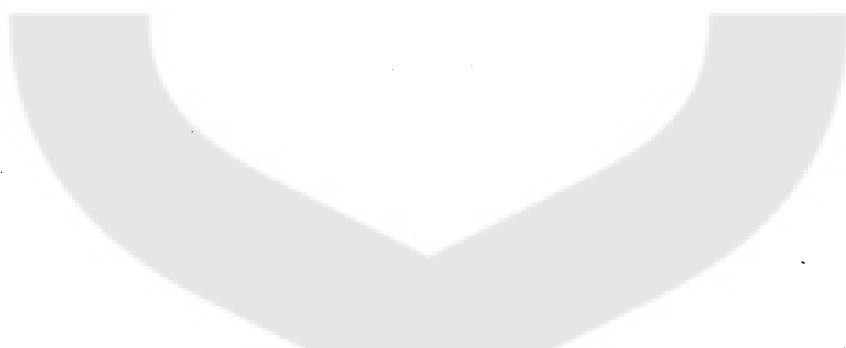
[2]

- 8 Sparrow-hawks are birds of prey. They do not eat plants but feed mainly on smaller birds and insects. Some of the smaller birds feed on insects too. A recent report says that the sparrow-hawk population in Britain has increased from 5000 in the 1960s to 30 000 breeding pairs at the present time. The rise follows the banning of lethal farming chemicals like DDT. DDT is a pesticide used to kill insect pests feeding on crops. This poisonous chemical may kill adult sparrow-hawks. It also affects their egg production, making the shells thinner. This leads to breeding failure. DDT remains active for a long time and it cannot be excreted by those animals which ingest it.

(a) Draw a food web based on the feeding relationships described above.



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[4]

- (b) DDT was used at low concentration and was not intended to kill the sparrow-hawks. Explain how DDT accidentally affected the size of the sparrow-hawk population.

[4]

9 Fig. 3 is a diagram of part of a human placenta.

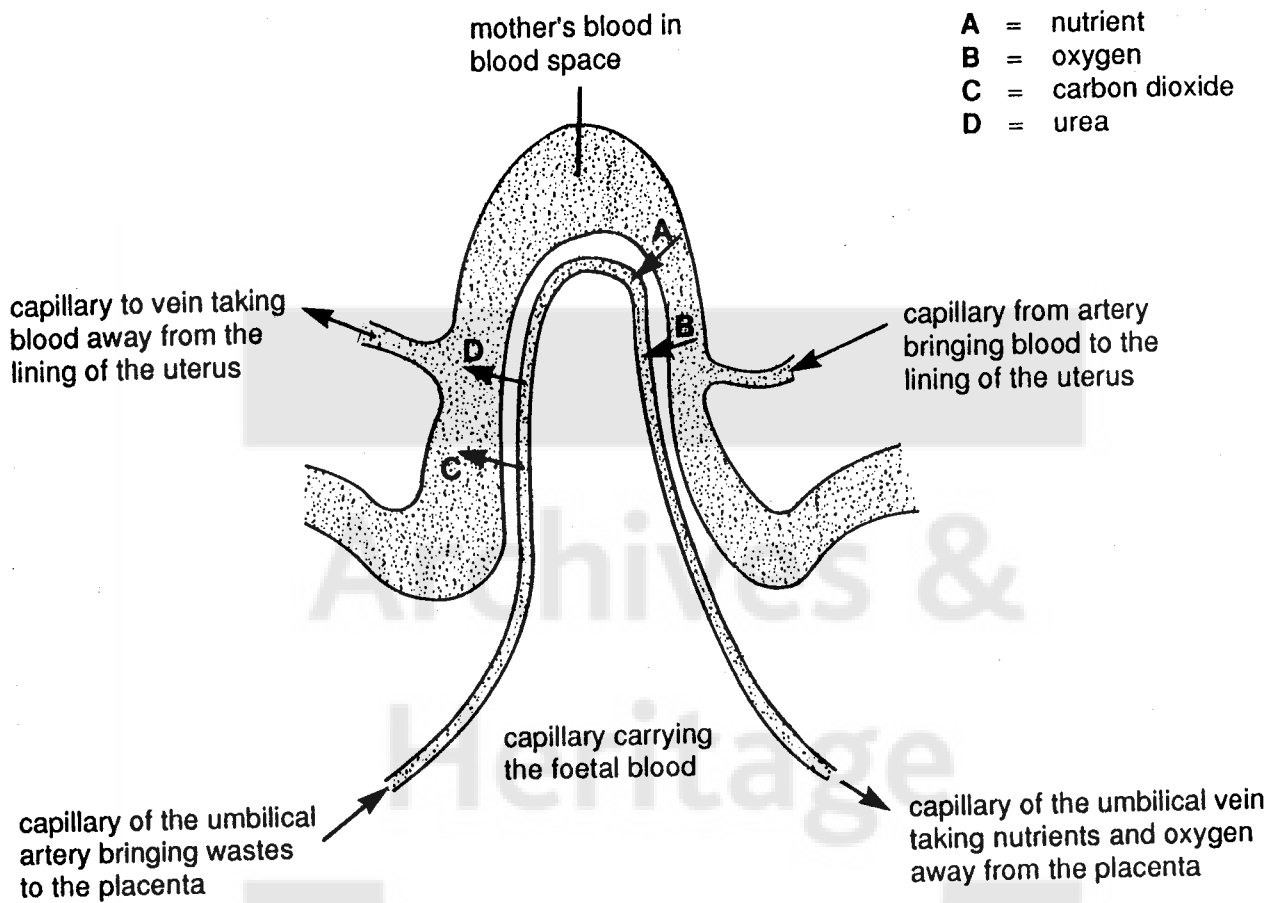


Fig. 3

Use the information in Fig. 3 to describe the flow of blood and exchange of dissolved nutrients, gases and excretory products which take place in the placenta. Your description should start with blood flowing from the foetus to the placenta.

[6]

[Turn
over

- 10 (a) Table 4 shows some information about what have become known as the 'greenhouse gases'.

Table 4

Name	Source	Influence on greenhouse effect/%
Carbon dioxide	burning forests	56
	burning fossil fuels	
	cement production	
C. F. C.s (chlorofluoro-carbons)	refrigerators	23
	air conditioning systems	
	aerosol propellant	
Methane	rotting vegetation	14
	waste gases from animals e.g. cows, sheep	
Nitrous oxide	breakdown of organic and inorganic fertilisers	7

- (i) On the graph in Fig. 4 plot the data showing the influence of each gas on the greenhouse effect. The percentage for carbon dioxide has already been plotted for you.

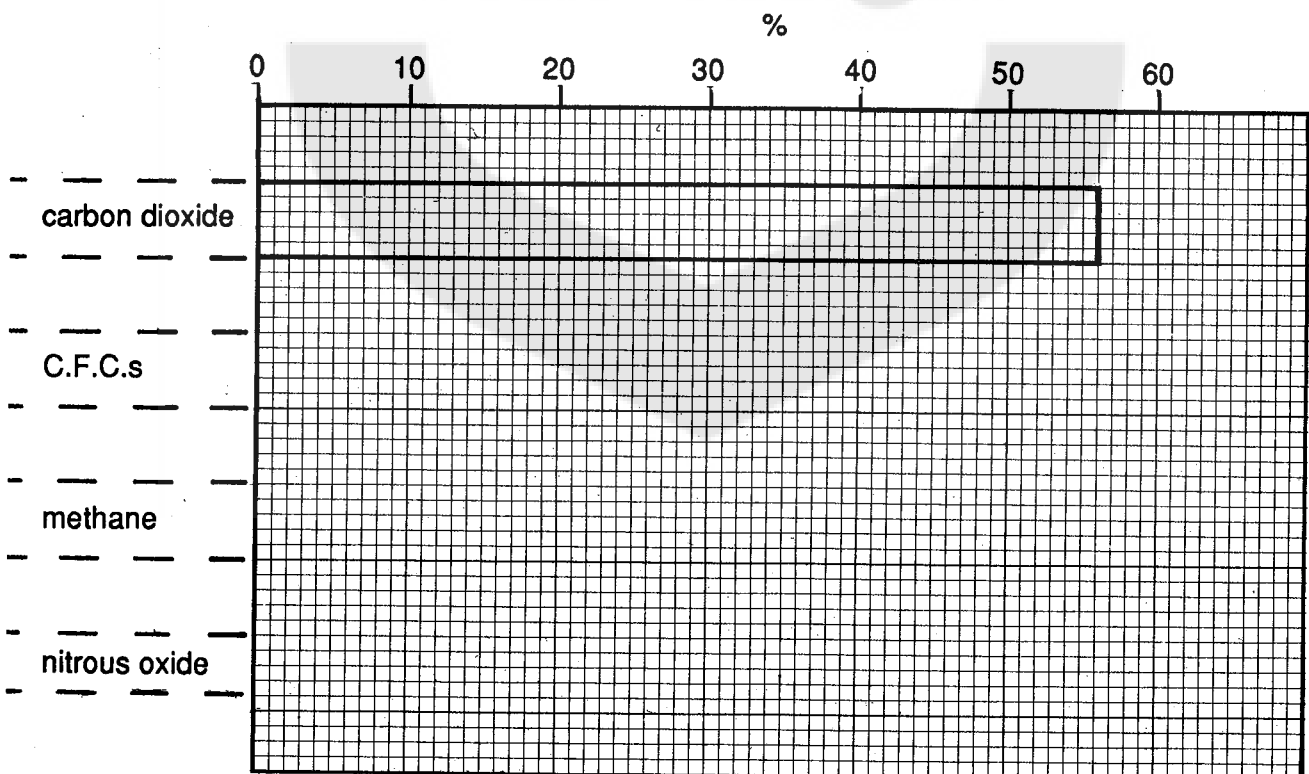


Fig. 4

- (ii) On the evidence in Table 4, which of the greenhouse gases are products of natural processes?

_____ [2]

- (iii) In the light of the data in Table 4, suggest why the following should be encouraged:

- 1 the development of renewable energy devices such as windmills;
- 2 better insulation of houses;
- 3 planting more trees.

_____ [6]

- (b) In 1800 there were 280 parts per million of carbon dioxide in the atmosphere. In 1990 there were 350 parts per million and this is expected to rise to 560 by the year 2030.

- (i) How much more carbon dioxide was in the air in 1990 compared to 1800?

_____ [1]

- (ii) The predicted rise in carbon dioxide concentration in the period from 1990 to 2030 is 210 parts per million.

Suggest an explanation for the difference between this value and your answer to (i).

_____ [2]

- 11 Plants respire throughout the 24 hours of each day and produce carbon dioxide as a waste product. Plants need light and a supply of carbon dioxide in order to photosynthesise.

Fig. 5 shows a graph of the results of an investigation into the uptake and release of carbon dioxide by a plant.

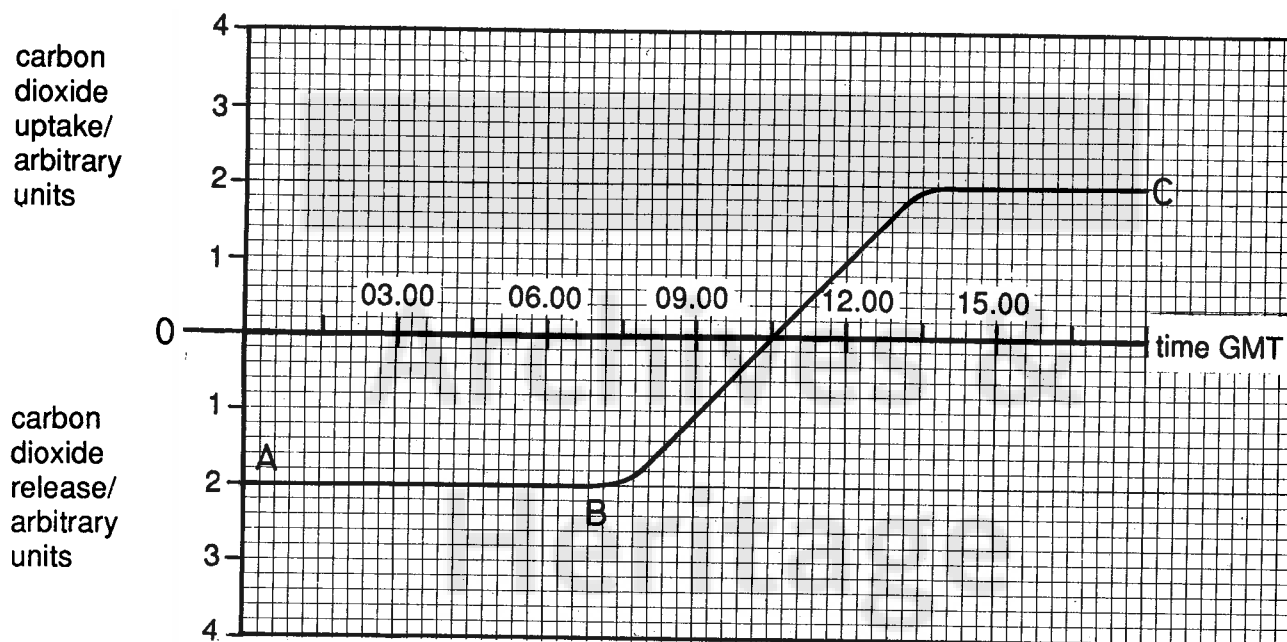


Fig. 5

- (a) Which part of the curve ABC, shows that the plant was respiring only?
_____ [1]
- (b) Which part of curve ABC, shows that the plant was respiring and photosynthesising?
_____ [1]
- (c) At what time did it get light? Explain your answer.

_____ [4]
- (d) At what time was photosynthesis in balance with respiration? Explain your answer.

_____ [2]

- (e) How many units of carbon dioxide were being taken in by the plant at 12.00?

[1]

- (f) Assume that the rate of respiration remained constant throughout the investigation. What was the maximum number of units of carbon dioxide used in photosynthesis at any one time? Explain how you arrived at your answer.

[3]

- 12 (a) Using only the information given, answer questions (i), (ii) and (iii).

Table 5 shows the composition of blood entering the kidney, the fluid passing into the kidney tubules and the urine of a mammal.

Table 5

Substance	Blood entering kidney/g per 100 cm ³	Fluid passing into kidney tubule/g per 100 cm ³	Urine/g per 100 cm ³
urea	0.03	0.03	2.00
glucose	0.10	0.10	0.00
amino acids	0.05	0.05	0.00
salts	0.72	0.72	1.50
proteins	8.00	0.00	0.00

- (i) Which substances are permanently lost from the blood via the kidney?

[2]

- (ii) Which substances are reabsorbed?

[2]

- (iii) Explain the figures given for proteins.

[1]

- (b) Table 6 shows how much water is lost in three different ways by two types of rat. It also shows the water gained by each rat from the oxidation of the same quantity of food (oxidative intake) during respiration. The measurements are given in grams of water per unit of food.

One of the rats is a laboratory rat and the other is a kangaroo rat which is normally found in deserts.

Table 6

Water loss or gain	Rat A	Rat B
loss in faeces/g	4.00	0.63
loss in urine/g	5.00	3.40
evaporation loss/g	14.00	3.97
total loss/g		
oxidative intake/g (gain)	13.00	13.00

- (i) Both types of rat gain the same amount of water from their food by oxidising it. How big is this gain?

_____ grams [1]

- (ii) Complete the table by entering the total water loss for each rat. [2]

- (iii) Explain how, provided it had solid food, which one of the two types of rat could survive without drinking water.

_____ [2]

Candidate Name _____

Centre Number	Candidate Number

MIDLAND EXAMINING GROUP
General Certificate of Secondary Education

1325/3

SCIENCE : BIOLOGY

PAPER 3

Monday 27 JUNE 1994 Afternoon 1 hour 30 minutes

Additional materials:
Answer paper for Section B

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TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on all separate answer paper used.

SECTION A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

SECTION B

Answer **two** questions.

Answer either question 4 or question 5 and either question 6 or question 7.

Write your answers to this section on the separate answer paper provided. At the end of the examination, fasten the answer paper securely to this question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

Marks will be awarded for the accurate use of spelling, punctuation and grammar.

You should spend no longer than 40 minutes on Section A and no longer than 50 minutes on Section B.

FOR EXAMINER'S USE	
Section A	
Section B	
Sub-Total	
SPG	
TOTAL	

SECTION A

Answer all the questions in the spaces provided.
You should spend no longer than 40 minutes on this section.

- 1 Fig. 1 shows the apparatus used in a laboratory investigation of water loss from and water uptake by a green plant. The roots were washed carefully before placing the plant in the measuring cylinder.

The apparatus containing the plant was weighed at the start of the investigation and again 24 hours later.

The scale on the measuring cylinder was used to read the volume of water before and after the 24-hour period.

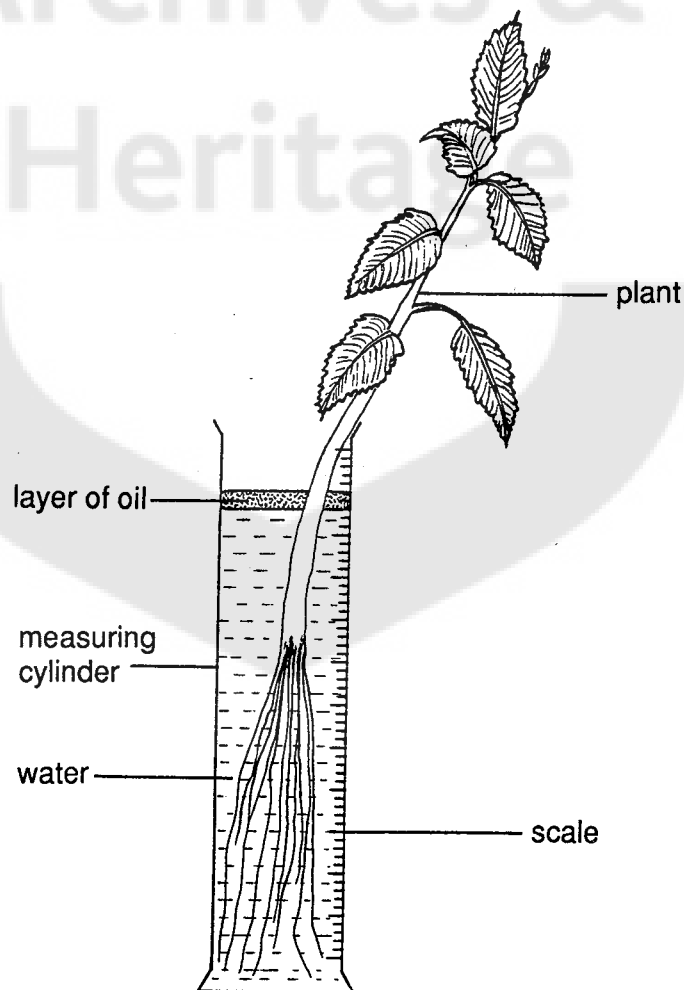


Fig. 1

Table 1 shows the results obtained.

Table 1

	Mass of apparatus containing plant/g	Volume of water in measuring cylinder/cm ³
Start of investigation	220	100
24 hours later	210	88

- (a) Calculate the loss of mass due to water loss from the plant during the 24-hour period. Show your working.

Answer _____ g

[1]

- (b) Calculate the **mass** of water which has been absorbed by the roots of the plant during the 24-hour period. Show how you arrive at your answer.

Answer _____ g

[2]

- (c) With reference to the mechanisms by which water moves upwards in a green plant, explain why your answers to (a) and (b) above are quite similar.

[4]

- (d) Explain why the amount of water absorbed by the roots is not exactly the same as the amount of water lost by the plant.

[1]

- (e) Explain why a plant growing in natural conditions would be unlikely to lose the same mass of water on each of several days.

[2]

- (f) A plant growing in a natural environment might, under certain conditions, lose far more water than it absorbs by the roots. Describe the effect this would have on the plant.

[2]

- 2 Biogas digesters/fermenters are useful in both developed and developing countries. They are an example of biotechnology and involve the use of microorganisms to re-cycle waste to produce a useful product (fuel).

Fig. 2 shows a small scale biogas digester designed for farm use. A mixture of animal dung and water is placed in the slurry vessel. Anaerobic bacteria break down the waste to produce a mixture of gases known as biogas.

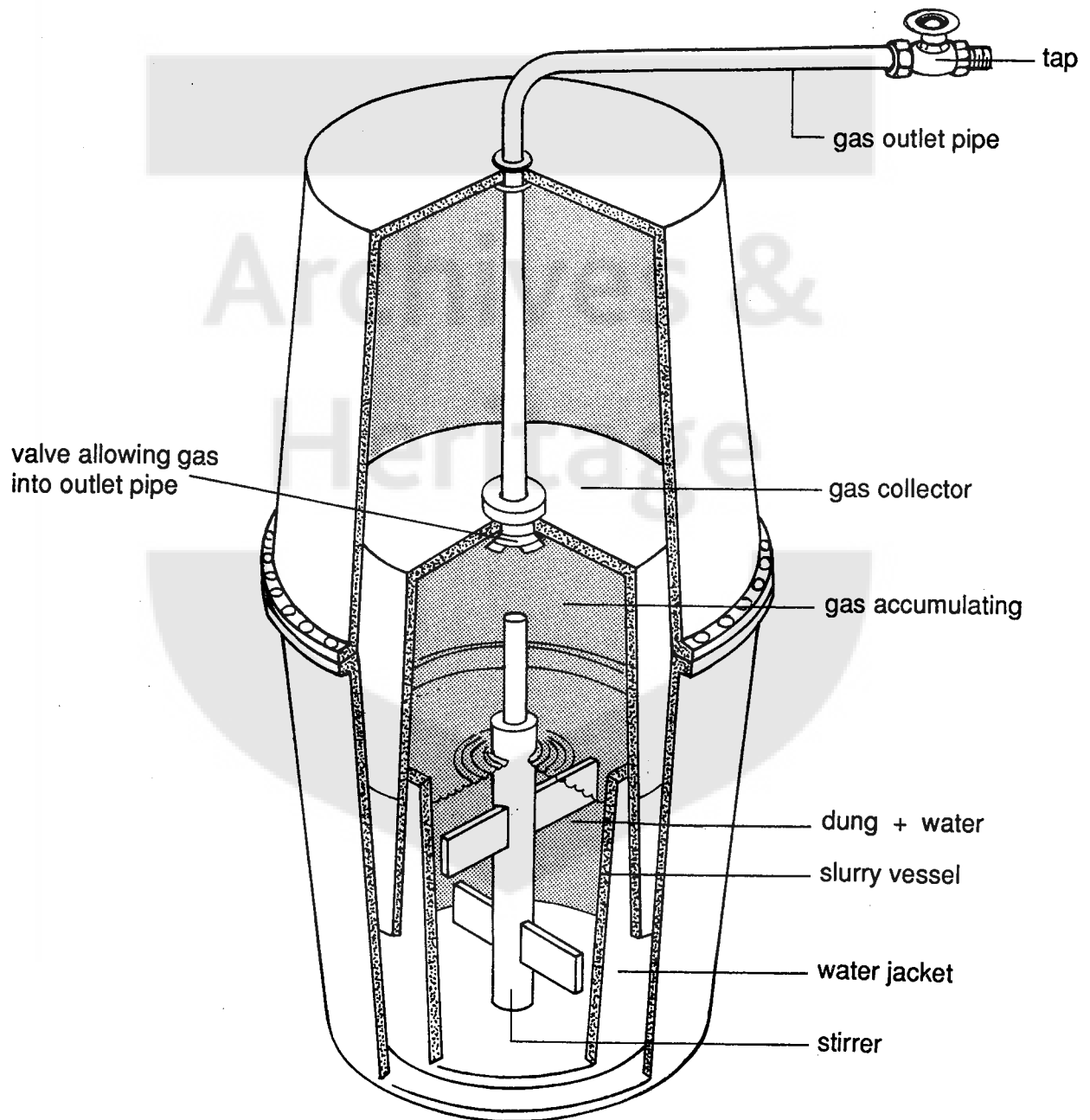
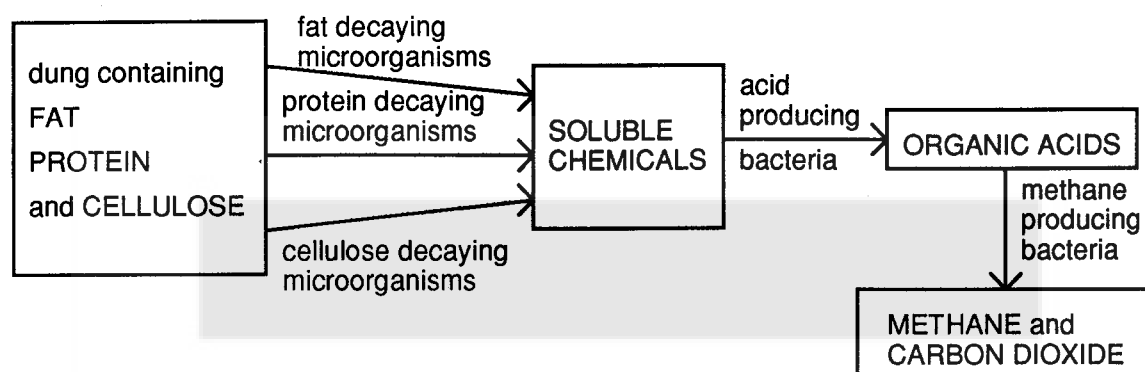


Fig. 2

A simplified outline of the series of reactions involved is shown below.

Summary of how biogas is produced



(a) Using **only** the information supplied above, answer the following questions.

- (i) Name the **TWO** main gases which make up biogas.

1 _____

2 _____

[1]

- (ii) How many **types** of microorganism are involved in the production of biogas?

[1]

- (iii) Describe briefly how **FOUR** of the labelled parts of the digester shown in Fig. 2 are used in the production, collection, storage and delivery of the biogas.

1 _____

2 _____

3 _____

4 _____

[4]

- (b) (i) Explain the importance of keeping the digester warm, at a temperature of at least 15°C.

[1]

- (ii) Explain the importance of making sure that the interior of the digester is free of oxygen.

[2]

- (iii) Suggest **TWO** other conditions which may affect the efficiency of biogas production in the digester.

1

2

[2]

- (c) In developing countries the biogas may be used for cooking or lighting. The sludge produced by the digester is a useful fertiliser.

Describe **ONE** way in which digesters of this type can help to conserve habitats or resources.

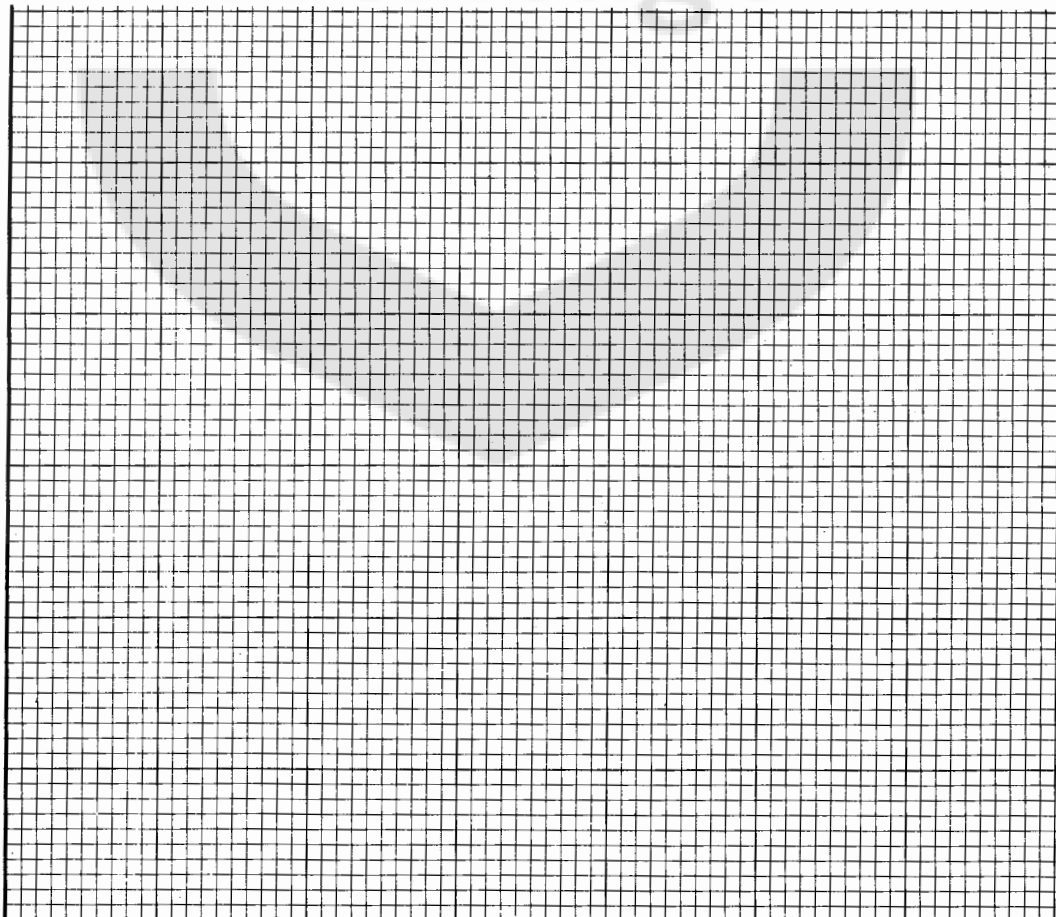
[2]

- 3 (a) Glycogen is a carbohydrate storage product similar to starch. It is formed in the liver and muscles from glucose in the bloodstream. When required, glycogen can be broken down into glucose which re-enters the bloodstream. Table 2 shows the level of glycogen in a human liver sampled several times over a period of 12 days. After the first sample was taken the person cycled vigorously for one hour. For the first 10 days of the 12-day period the person did not eat any carbohydrates. The person was then given a high carbohydrate diet.

Table 2

Diet	Time sample taken/days	Liver glycogen/g per kg of liver tissue
carbohydrate starvation	0	40
	1	6
	3	2
	4	8
	7	8
	8	6
	10	5
high in carbohydrate	11	80
	12	102

- (i) Plot a line graph of the data in Table 2 on the graph paper below to show how the liver glycogen level changes over the 12-day period. Join the points with straight lines. Label your graph to communicate all the information given in Table 2.



- (ii) Predict the glycogen level in the liver tissue on day 2.

_____ [1]

- (iii) Account for the decrease in liver glycogen on the first day of carbohydrate starvation.

_____ [2]

- (iv) The blood glucose level rises considerably a few hours after eating a high carbohydrate meal. How does this come about?

_____ [1]

- (v) The liver glycogen level changes in the twenty four hours immediately following the introduction of a high carbohydrate diet. Describe how a **named** hormone is responsible for this change.

_____ [3]

Turn over for Question 3 (b)

[Turn
over

- (b) In Kerry cattle there is an allele known as 'amputated' which is recessive to the normal allele. Table 3 shows the three possible genotypes and their phenotypes.

Table 3

Genotype (alleles)	Phenotype
AA	Normal cattle
Aa	Cattle having shorter legs than normal
aa	'Amputated' cattle - abnormal, very short legs, die soon after birth.

- (i) By means of a genetic diagram, describe the type of cross that could produce an 'amputated' calf.

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[2]

- (ii) In the cross described in (b) (i), what would be the expected proportion of the surviving calves which would **not** pass on the recessive allele to a future generation? Explain your answer.

[2]

SECTION B

You are advised to spend no longer than 50 minutes on this section.

Write your answers to this section on the separate answer paper provided.

At the end of the examination, fasten the answer paper securely to this question paper.

Answer TWO questions.

Answer EITHER Question 4 OR Question 5.

EITHER

- 4 (a) The movement of blood through the circulatory system of a mammal is described as a double circulation. Explain how the structure of the heart maintains the double circulation and keeps the blood flowing under pressure. [9]
- (b) (i) Describe what is meant by coronary heart attack. [2]
- (ii) How might diet and cigarette smoking make a heart attack more likely? [4]
- (c) Describe how amino acids pass from the small intestine of a mammal to the heart via the liver. You should name the blood vessels through which the amino acids will be transported. [5]

OR

- 5 (a) A soil that contains a good balance of sand, silt and clay particles may be referred to as a loam. With reference to the sizes of the soil particles, explain why a loam soil is likely to be more fertile than a heavy clay soil. [9]
- (b) Compare the processes of **decomposition** and **nitrogen fixation** in the nitrogen cycle. [5]
- (c) (i) Describe how **ONE** named example of air pollution and **ONE** named example of water pollution may affect an animal or a plant population.
- (ii) Describe **ONE** way in which an attempt is being made to lessen the effect of each of your examples of pollution on the living organisms in the environment. [6]

Answer EITHER Question 6 OR Question 7.

EITHER

- 6 (a) The Arthropod group of animals is divided into four main classes. Use your knowledge of the characteristics of these classes to construct a simple key that could be used to put a particular arthropod into its class. [9]
- (b) How would each of the following treatments affect seed production by an insect-pollinated plant growing in a garden? In each case, fully explain your answer.
- (i) removal of the stigma(s) and style(s) [3]
- (ii) removal of the stamens [3]
- (c) Suggest how you might investigate the effects of **ONE** of the treatments from (b) above. Give full experimental details. [5]

OR

- 7 (a) A pond contains a variety of species of plants and animals. Include the following words in a short description of the changes that are likely to take place in the pond during a 24-hour period in July.
- photosynthesis respiration temperature light intensity [9]
- (b) What would be the likely effect of each of the following treatments on seed germination and the early growth of seedling plants? In each case, fully explain your answer.
- (i) absence of light [4]
- (ii) light from one direction only [2]
- (c) Suggest how you might investigate the effects of **ONE** of the treatments from (b) above. Give full experimental details. [5]