Cambridge Assessment International Education

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BIOLOGY **0610/31**

Paper 3 Theory (Core) **May/June 2024**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

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1 **(a)** Fig. 1.1 is a photograph showing different stages of bread-making.

View solution

Bread dough is made by mixing flour, water and yeast together.

Bread dough **A** has just been mixed.

Bread dough **B** was mixed a few hours before the photograph was taken and has increased in volume.



Fig. 1.1

(i) State the name of the gas that caused bread dough **B** to increase in volume.

..... [1]

(ii) State the name of the process in yeast that produces the gas during bread-making.

..... [1]

(b) State **one other** product that is made using yeast, apart from food or drink.

..... [1]

View solution

(c) Bacteria are another type of microorganism that is used in biotechnology.

View solution

Tick **two** boxes to show why bacteria are useful in biotechnology.

cause disease	
have the same structure as plant cells	
make complex molecules	
have a rapid reproduction rate	
reproduce sexually	

[2]

(d) Bacteria and yeast are living organisms.

View solution

Table 1.1 shows descriptions of some characteristics of living organisms.

Complete Table 1.1 by writing the name for each characteristic described.

Table 1.1

description	name
the ability to detect and respond to changes in the internal or external environment	
the removal of the waste products of metabolism and substances in excess of requirements	
a permanent increase in size and dry mass	

[3]

(e) State **two** cell structures that are found in both bacteria and plants.

View solution

1 .....

2 .....

[2]

[Total: 10]

2 Enzymes are biological catalysts.

(a) Describe what is meant by a catalyst.

View solution

.....

.....

.....

.....

..... [2]

(b) State the type of biological molecule enzymes are made of.

View solution

..... [1]

(c) The rates of enzyme activity of two different enzymes, **A** and **B**, were recorded at different temperatures.

Fig. 2.1 shows the results.

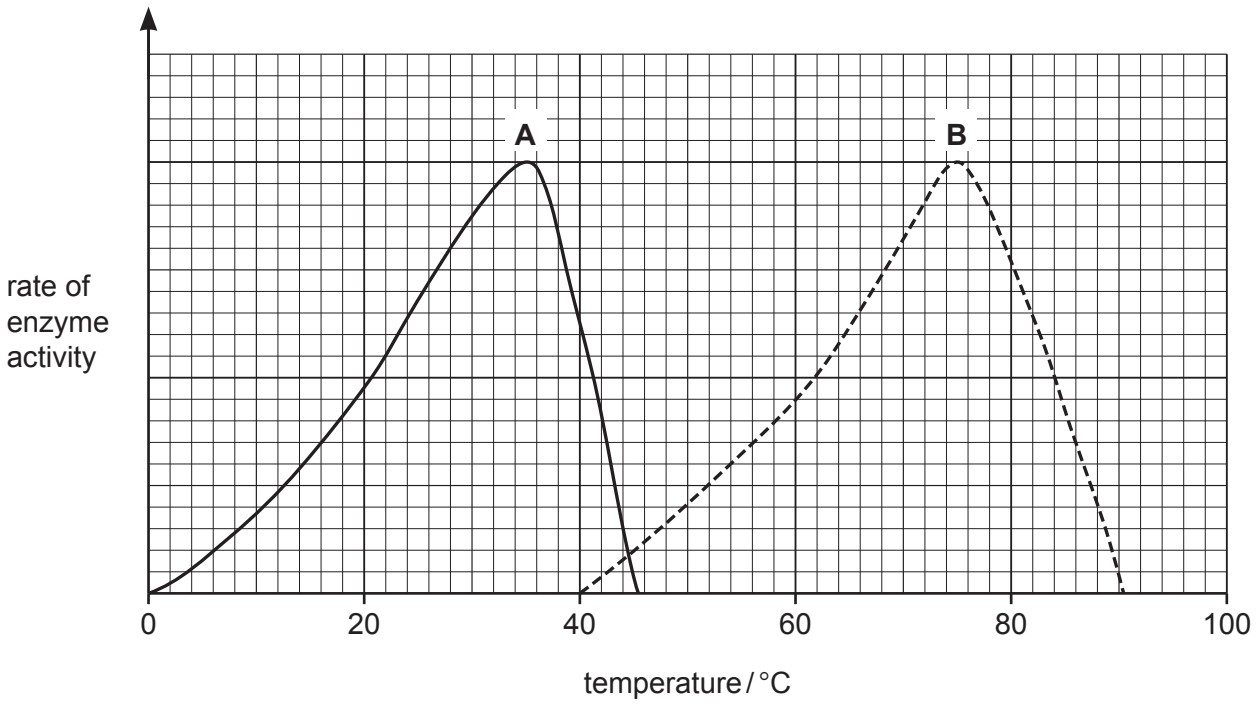

Fig. 2.1

(i) Compare the effect of temperature on the rate of enzyme activity for enzymes **A** and **B**.

Use data from Fig. 2.1 to support your answer.

View solution

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) State the part of an enzyme that has a complementary shape to a substrate. View solution

..... [1]

(iii) State **one** factor, **other than** temperature, that would affect the rate of enzyme activity.

..... [1]

View solution

(d) The box on the left contains the word ‘Enzymes’.

The boxes on the right contain some sentence endings.

Draw **three** lines from the box on the left to make three correct sentences.

View solution

Enzymes	are involved in all metabolic reactions.
	are only made of the elements carbon and hydrogen.
	are necessary to sustain life.
	are needed for the loss of water vapour from leaves.
	are a type of hormone.
	are used to make fruit juice.

[3]

[Total: 12]

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3 **(a)** A student investigated how surface area affected the rate of diffusion.

The student started with four agar cubes that each had a volume of 1 cm^3.

The agar cubes were dyed with a red indicator.

The red indicator turned yellow when exposed to acid.

The student cut the cubes into different numbers of blocks to increase the surface area.

The blocks were placed in acid, as shown in Fig. 3.1.

The student recorded the time taken for all of the agar blocks in each test-tube to turn yellow.

The student repeated the investigation twice and calculated a mean.

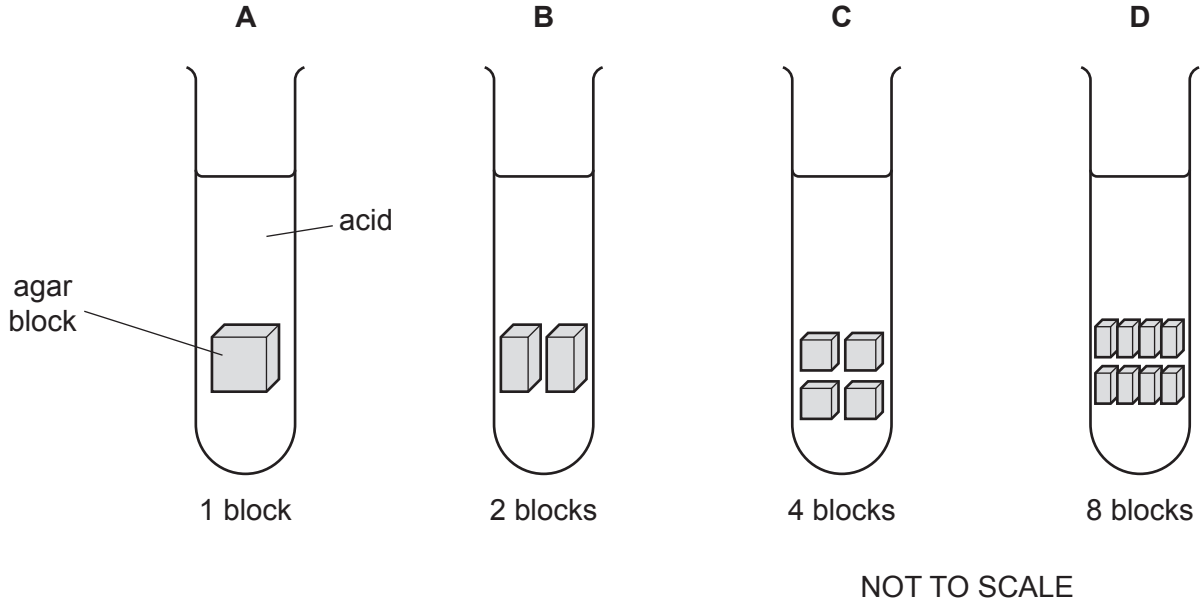

Fig. 3.1

Table 3.1 shows the results.

Table 3.1

test-tube	number of agar blocks in the test-tube	total surface area of the agar blocks / cm^2	time taken for all the blocks to turn yellow / s			mean time for all the blocks to turn yellow / s
			trial 1	trial 2	trial 3	
A	1	6	278	240	255	258
B	2	8	112	120	98	110
C	4	10	79	85	81	
D	8	12	56	48	52	52

View solution

(i) Calculate the mean time for all the blocks to turn yellow in test-tube **C**.

Give your answer to the nearest whole number.

Space for working.

.....
[2]

(ii) Using the results shown in Table 3.1, describe the effect of surface area on diffusion.

.....

.....

..... [1]

(iii) State **one** factor, **other than** surface area, that could affect diffusion in this investigation.

..... [1]

(iv) Complete the sentences to describe how the acid particles diffuse to cause the colour change.

The acid particles move from the acid solution into the .....,

down a ..... gradient.

The energy for this process comes from the ..... energy of random movement of the acid particles.

[3]

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(b) Describe **one** way that osmosis differs from other types of diffusion.

View solution

.....

.....

..... [1]

(c) Substances needed for respiration diffuse into cells.

View solution

(i) Circle the **two** substances needed for aerobic respiration in humans.

carbon dioxide **glucose** **glycogen**

oxygen **protein** **urea** **water**

[2]

(ii) State where aerobic respiration occurs in cells.

View solution

..... [1]

(iii) State the name of the part of **all** cells that substances pass through to enter the cell.

..... [1]

[Total: 12]

View solution

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4 **(a)** Symptoms of the disease influenza may include sneezing.

View solution

Fig. 4.1 shows a sign at a hospital.



Fig. 4.1

Explain why washing your hands after sneezing can help to prevent the spread of disease.

.....

.....

.....

.....

..... [2]

(b) State **two** ways of preventing the spread of disease through water.

View solution

1 .....

.....

2 .....

..... [2]

(c) State **three** ways the body defends itself against disease.

View solution

1 .....

2 .....

3 .....

[3]

(d) Identify each disease or virus as transmissible or non-transmissible by drawing a circle around the correct word.

View solution

Human immunodeficiency virus (HIV) **transmissible / non-transmissible**

coronary heart disease (CHD) **transmissible / non-transmissible**

scurvy **transmissible / non-transmissible**

[2]

[Total: 9]

5 **(a)** A student investigated the conditions needed for the germination of cress seeds.

View solution

Fig. 5.1 shows the apparatus, conditions used and the results of the investigation.

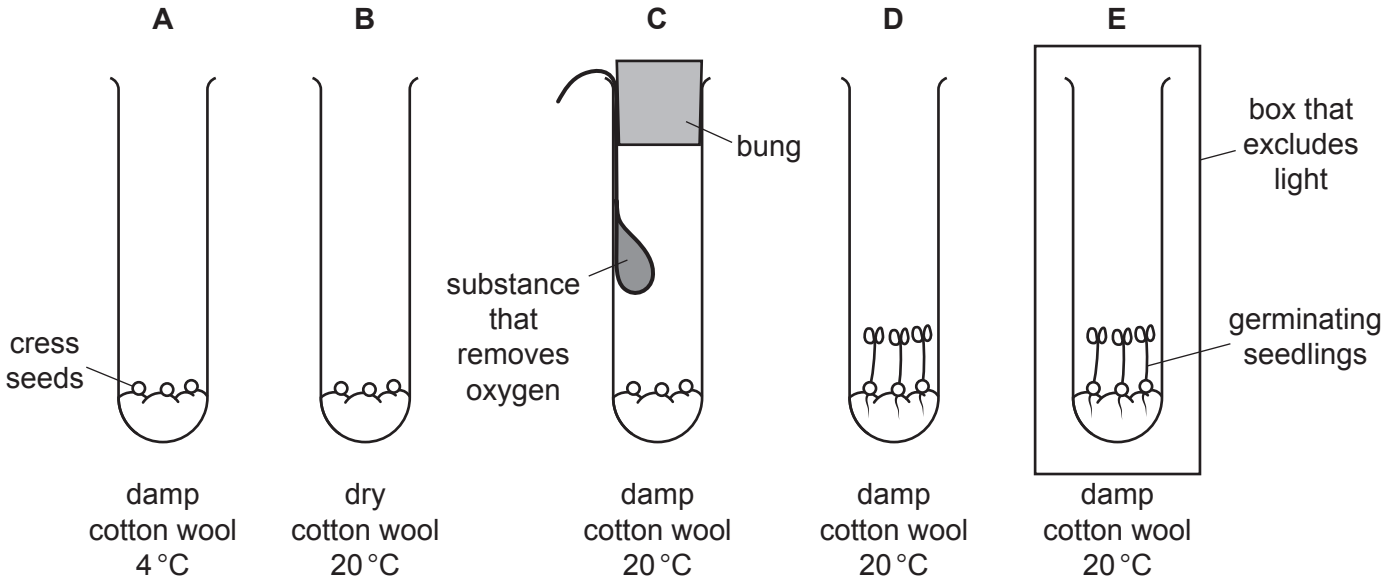

Fig. 5.1

(i) Identify the letters of the **two** test-tubes in Fig. 5.1 that show that oxygen is needed for germination.

..... and .....

[2]

(ii) A gardener wanted to store some cress seeds for a long time before using them.

View solution

Use the information in Fig. 5.1 to identify the ideal conditions to **prevent** germination.

Tick **two** boxes.

cold	
dry	
light	
low carbon dioxide concentration	
low pH	

[2]

(b) Tropic responses were investigated in two plants, **X** and **Y**.

View solution

The plants were placed in separate boxes for 5 days.

Fig. 5.2 shows plants **X** and **Y** at the start of the investigation.

Both boxes had a hole on one side that let light in.

Plant **X** was kept in the same position.

Plant **Y** was placed on a platform that was continually rotated.

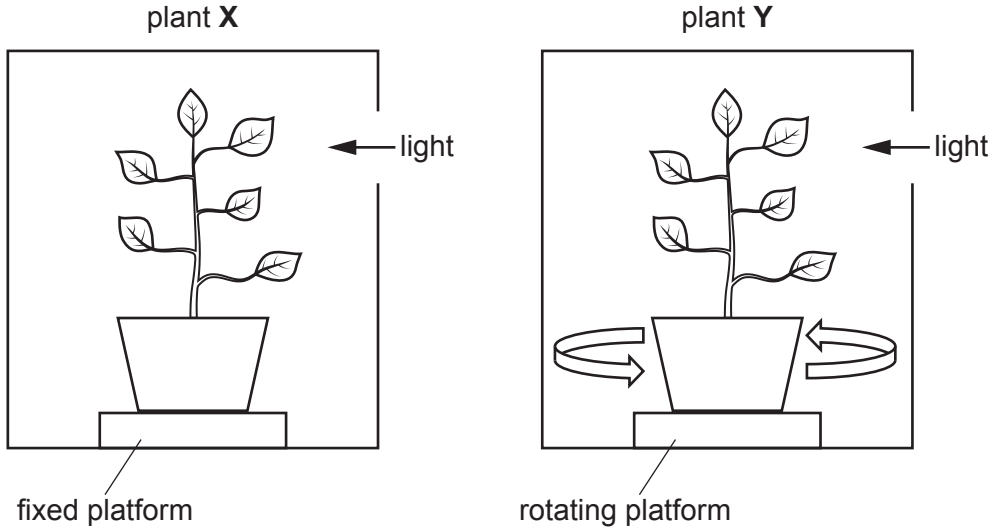

Fig. 5.2

(i) Predict **and** explain how the shape of plant **Y** will differ from the shape of plant **X** after 5 days of growth.

.....

.....

.....

.....

..... [2]

(ii) State the name of the tropic response that would be seen in plant **X** in Fig. 5.2 after 5 days.

..... [1]

View solution

(iii) Suggest **and** explain the advantage to a plant of tropic responses in shoots. View solution

.....

.....

.....

.....

..... [2]

(c) State the position plants occupy in a food chain.

..... [1]

[Total: 10]

View solution

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6 **(a)** Cabbages are crop plants.

Fig. 6.1 shows an area where the forest has been removed to create space for a monoculture of cabbage plants.

View solution



Fig. 6.1

(i) Describe reasons for habitat destruction, **other than** crop production.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Describe the **advantages** of growing crops such as cabbages as a large-scale monoculture.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Habitat destruction can cause species extinction.

View solution

State **two** ways that species can be conserved, **other than** protection of their habitat.

1 .....

2 .....

[2]

(c) Four islands, **A**, **B**, **C** and **D**, were surveyed to identify the different types of crop plant monocultures present.

View solution

The survey identifies the percentage of each type of monoculture on each island.

Fig. 6.2 shows the results of the survey.

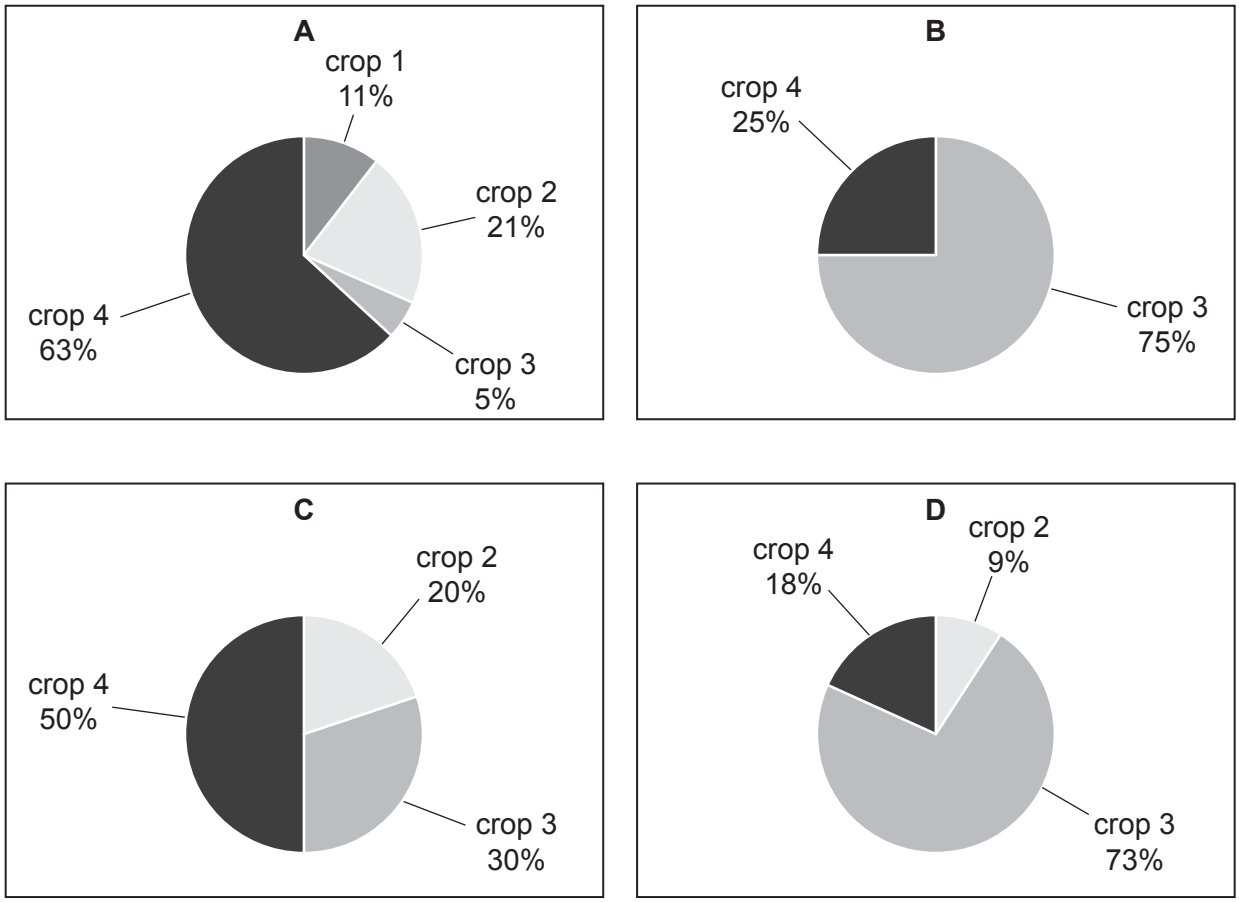

Fig. 6.2

Identify the island or islands from Fig. 6.2 that:

have the greatest number of different types of monocultures .....

have the greatest percentage of crop 2 monocultures .....

have more than 50% crop 3 monocultures. ..... and .....

[3]

(d) One effect of deforestation and monocultures is a reduction in biodiversity.

View solution

State what is meant by the term biodiversity.

.....

.....

..... [2]

(e) Crop 3 is a type of tree that can be used for firewood.

View solution

Suggest how this resource can be managed sustainably.

.....

.....

..... [1]

[Total: 14]

7 **(a)** Fig. 7.1 is a diagram of the human digestive system.

View solution

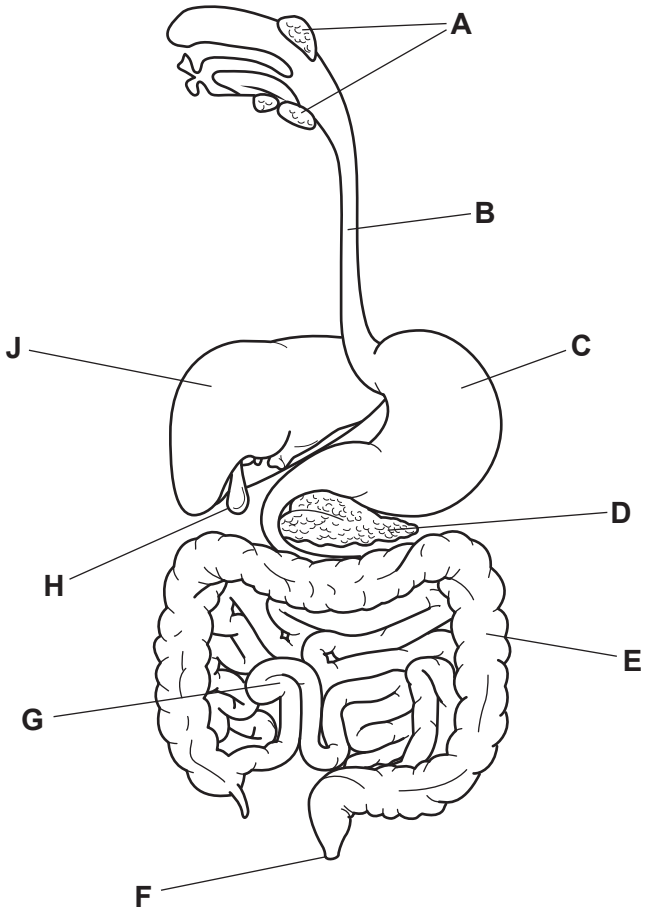

Fig. 7.1

State the letter in Fig. 7.1 that identifies:

the gall bladder .....

the organ that secretes salivary amylase .....

where egestion occurs .....

where most absorption occurs .....

where physical digestion occurs .....

where the pH is acidic. .....

[6]

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(b) The boxes on the left show some examples of nutrients.

The boxes on the right show some examples of molecules.

Draw lines to link each nutrient to a molecule found in that nutrient.

Draw **two** lines.

View solution

nutrient	molecule
	amino acid
fat	glucose
protein	glycerol
	hydrochloric acid

[2]

(c) State the vitamin deficiency that causes rickets.

View solution

..... [1]

(d) Describe the dietary importance of the mineral ions calcium and iron.

View solution

calcium .....

.....

iron .....

.....

[2]

(e) Fat, protein, vitamins and mineral ions are all required for a balanced diet.

View solution

State the names of **two other** components of a balanced diet.

1 .....

2 .....

[2]

[Total: 13]

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