Cambridge Assessment International Education

# Cambridge IGCSE™

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**BIOLOGY** **0610/31**

Paper 3 Theory (Core) **October/November 2023**

**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)** Complete the sentences about movement into and out of cells.

View solution

Diffusion is the net movement of particles down a concentration gradient.

The energy for diffusion comes from the ..... energy of random movement of molecules and ions.

Factors that influence diffusion include concentration gradient, ....., and ..... .

Osmosis is the movement of water by diffusion through a ..... permeable membrane.

The movement of particles through a cell membrane against a concentration gradient using energy from ..... is called ..... .

[6]

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**(b)** Fig. 1.1 is a diagram of a normal red blood cell.

View solution

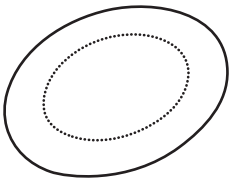

**Fig. 1.1**

Fig. 1.2 shows three red blood cells that have been placed in different concentrations of a salt solution.

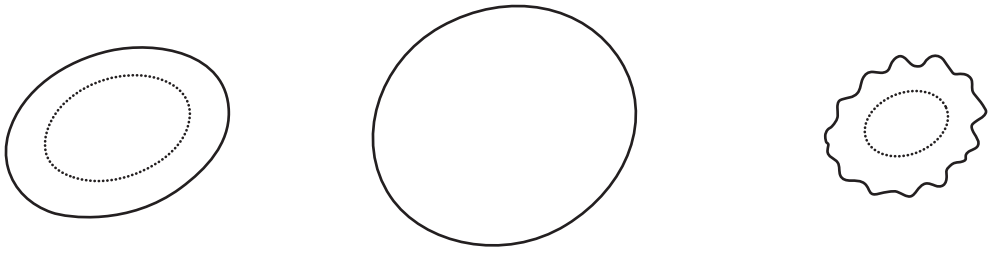


**Fig. 1.2**

Identify the cell that has been placed in a very concentrated salt solution.

Give reasons for your answer.

cell .....

reasons .....

.....

.....

.....

.....

.....

[3]

**(c)** Water is needed by all organisms.

View solution

State **two** processes in organisms that use water as a solvent.

1 .....

2 .....

[2]

[Total: 11]

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**2** Fig. 2.1 is a diagram of part of the human digestive system.

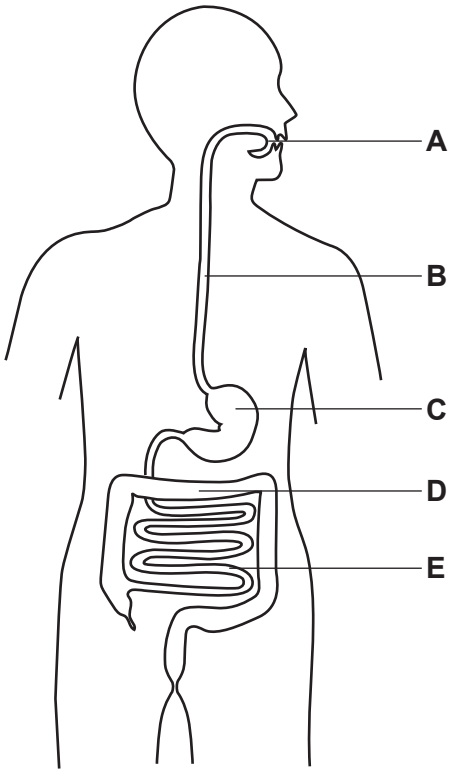


**Fig. 2.1**

**(a)** Using the information in Fig. 2.1, state the letters where:

View solution

chemical digestion of proteins begins .....

hydrochloric acid is produced .....

physical digestion of food occurs. ..... and .....

[4]

**(b)** State the names of **three** parts of the large intestine.

View solution

1 .....

2 .....

3 .....

[3]

**(c)** Many processes occur in the digestive system.

View solution

The boxes on the left show some of the processes.

The boxes on the right show descriptions of some processes.

Draw **one** line to link each process to its description.

Draw **four** lines.

| process | description |
| --- | --- |
| absorption | breakdown of food |
| digestion | movement of nutrients from the intestines into the blood |
| egestion | removal of undigested food from the body as faeces |
| ingestion | taking substances into the body |
| | uptake and use of nutrients by cells |

[4]

[Total: 11]

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**3** **(a)** Complete the sentences about transpiration using words from the list.

View solution

Each word may be used **once** or not at all.

**decomposition** **evaporation** **mesophyll**

**phloem** **root hair cells** **stomata**

Transpiration is the loss of water vapour from leaves.

Water moves from the surface of ..... cells into the air spaces by

..... .

Then the water vapour diffuses out of the leaf through the ..... .

[3]

**(b)** A student investigated transpiration.

Fig. 3.1 is a diagram of the apparatus used in the investigation.

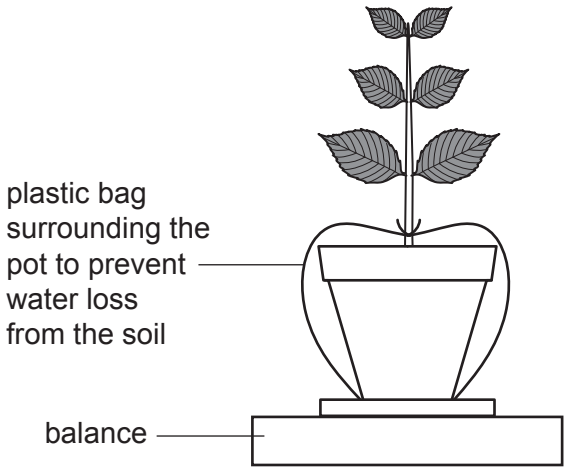


**Fig. 3.1**

- The student watered the plant before the investigation started.
- She measured the mass of water lost every five minutes.
- The mass of water lost represents the rate of transpiration.
- She took measurements in still air and with a fan moving air past the plant.
- She plotted her results on a graph as lines labelled **A** and **B**.

Fig. 3.2 shows the results.

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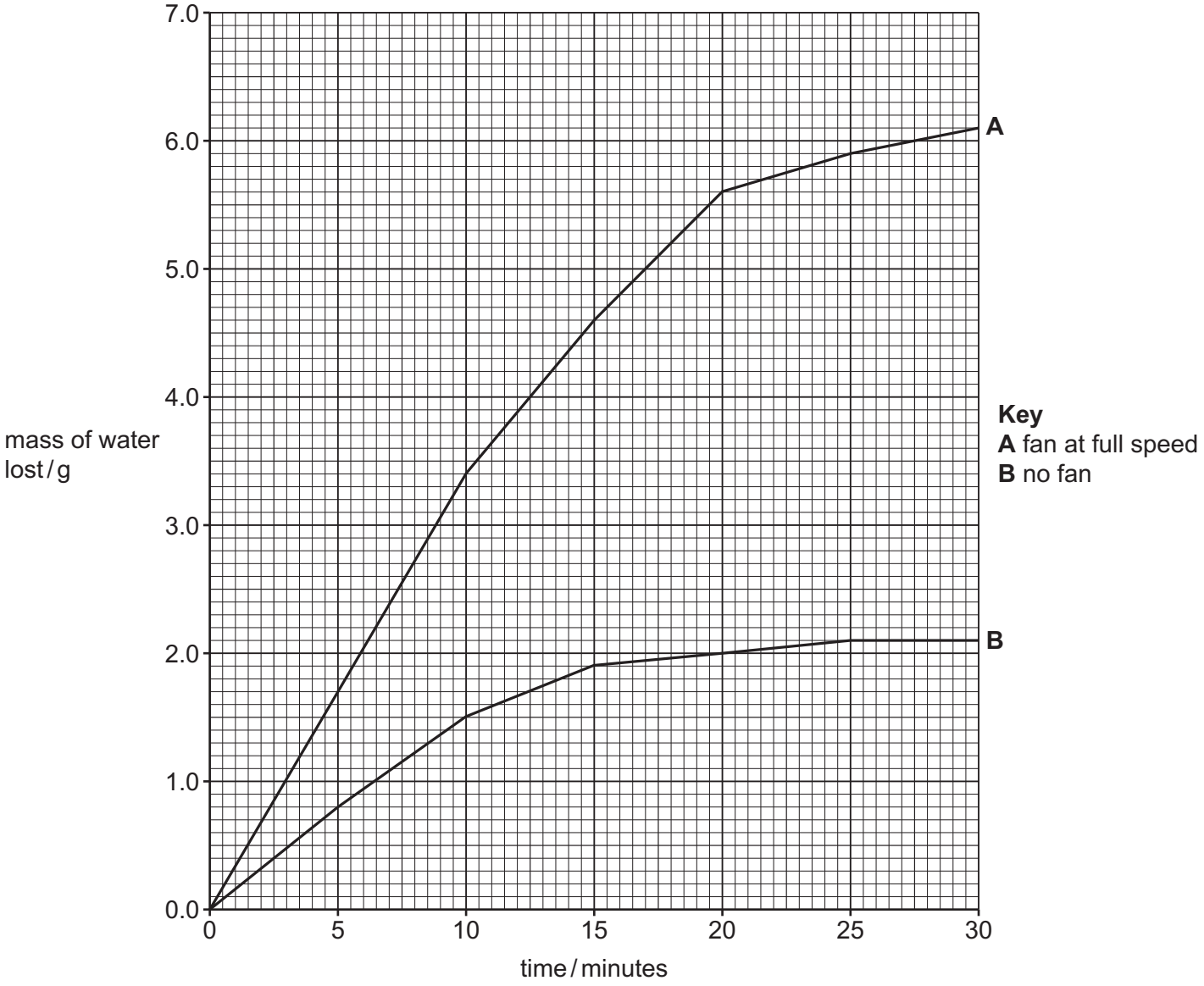


**Fig. 3.2**

**(i)** Calculate the difference in the mass of water lost between the results for **A** and the results for **B** at **30** minutes.

.....g [1]

**(ii)** Calculate the percentage increase in water loss shown for **A** between **10** minutes and **20** minutes.

View solution

Give your answer to the nearest whole number.

Space for working.

.....%
[3]

**(iii)** The student repeated the investigation using the fan at **half-speed**.

Draw a line **on Fig. 3.2** to show the result you would expect when the fan is at half-speed.
[2]

**(c)** State **one** factor, other than wind speed, that affects the rate of transpiration.

..... [1]

[Total: 10]

View solution

**4** Fig. 4.1 is a photograph of part of a kitchen.



**Fig. 4.1**

**(a)** Describe methods of maintaining hygiene in the home that reduce the spread of disease.

View solution

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

**(b)** State **two** ways that pathogens can be transmitted indirectly.

View solution

1 .....

2 .....

[2]

**(c)** State **three** body defences against infection.

View solution

1 .....

2 .....

3 .....

[3]

[Total: 9]

**5** **(a)** Fig. 5.1 is a diagram of an insect-pollinated flower.

View solution

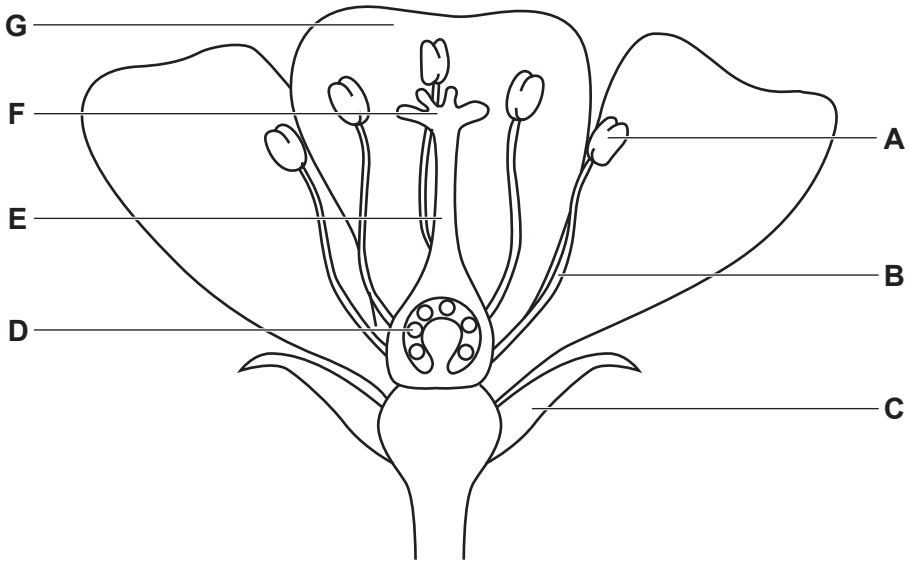


**Fig. 5.1**

**(i)** State the letters of the structures in Fig. 5.1 that make up the stamen.

..... and .....

[2]

**(ii)** State the letter of the structure in Fig. 5.1 where fertilisation takes place.

View solution

..... [1]

**(iii)** Explain how the part labelled **G** in Fig. 5.1 is adapted for its function.

View solution

.....

.....

.....

.....

..... [2]

**(b) (i)** Complete the sentence about pollination.

Pollination is the transfer of pollen grains from the ..... to the

..... .

[2]

**(ii)** State **three** ways that pollen grains from insect-pollinated flowers differ from pollen grains from wind-pollinated flowers.

1 .....

2 .....

3 .....

[3]

[Total: 10]

View solution

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**6** **(a)** The boxes on the left show two terms.

The boxes on the right show the descriptions of some terms.

Draw **one** line to link each term to its description.

Draw **two** lines.

| **term** | **description** |
| --- | --- |
| | a group of organisms that can reproduce to produce fertile offspring |
| | all of the populations of different species in an ecosystem |
| community | |
| | an organism that gets its energy by feeding on other organisms |
| | a group of organisms of one species, living in the same area, at the same time |
| population | |
| | the position of an organism in a food chain, food web or ecological pyramid |
| | a unit containing the different species of organisms and their environment, interacting together |

[2]

View solution

**(b)** The growth of bacteria in a flask containing nutrients was monitored for six hours.

View solution

The number of **live** bacteria per $cm^3$ was estimated every 30 minutes.

Fig. 6.1 shows the results.

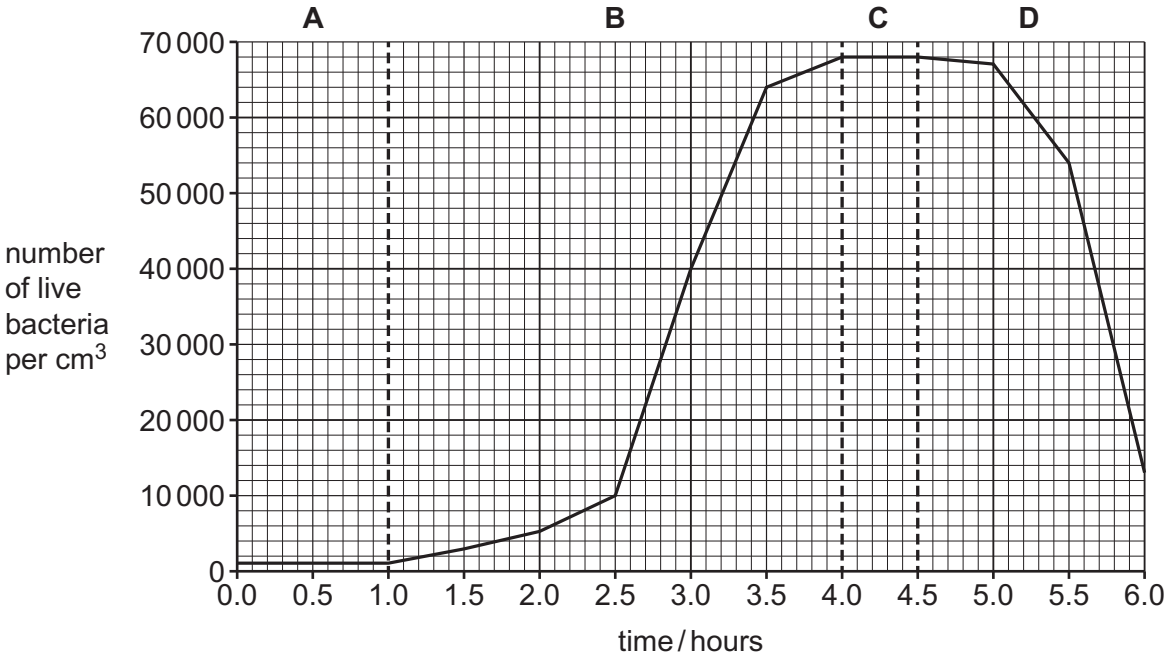


**Fig. 6.1**

**(i)** The data in the graph has been divided into four phases: **A**, **B**, **C** and **D**.

The list shows the names of the four phases.

**death** **exponential** **lag** **stationary**

Use the words from the list to identify phases **A**, **B**, **C** and **D** shown in Fig. 6.1.

**A** .....

**B** .....

**C** .....

**D** .....

[2]

**(ii)** Complete the sentences using the data shown in Fig. 6.1 and your knowledge.

View solution

The number of live bacteria in phase **A** remained at .....

per $cm^3$.

In phase **B** the number of live bacteria doubled between 2.0 hours and

..... hours.

The maximum number of live bacteria occurred in phase ..... .

In phase ..... the number of live bacteria decreased because

the bacteria did not have enough ..... .

[5]

[Total: 9]

**7** **(a)** HIV infection can lead to AIDS.

View solution

**(i)** State the words that the letters HIV represent.

..... [1]

View solution

**(ii)** Describe ways of reducing the risk of a person becoming infected with HIV.

.....

.....

.....

.....

.....

.....

..... [3]

**(b)** Chlamydia, gonorrhoea and syphilis are sexually transmitted infections (STIs).

Table 7.1 shows the numbers of people infected with these STIs in one country from 2014 to 2018.

View solution

**Table 7.1**

| year | number of people infected | | |
|---|---|---|---|
| | chlamydia | gonorrhoea | syphilis |
| 2014 | 1 400 000 | 350 000 | 19 000 |
| 2016 | 1 600 000 | 468 000 | 27 000 |
| 2018 | 1 800 000 | 583 000 | 35 000 |

**(i)** The list shows some conclusions.

Place ticks (✓) in the boxes to identify **two** correct conclusions for the data shown in Table 7.1.

| | |
|---|---|
| In 2014, there were 1 050 000 more people infected with chlamydia than were infected with gonorrhoea in 2014. | |
| In 2016, the number of people infected with chlamydia was three times greater than the number of people infected with gonorrhoea. | |
| In 2018, more people were infected with syphilis than with gonorrhoea. | |
| The number of people with STIs has increased each year. | |
| Between 2016 and 2018, the number of people infected with syphilis increased by 16 000. | |

[2]

**(ii)** Syphilis can be treated with antibiotics.

View solution

Suggest the type of organism that causes syphilis.

..... [1]

[Total: 7]

**8** **(a)** Humans have developed modern farming methods to increase food production.

View solution

Explain how the use of herbicides and chemical fertilisers has increased food production.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

**(b)** Fig. 8.1 shows intensive farming of chickens.

View solution



**Fig. 8.1**

State **three** disadvantages of intensive livestock production.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

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The protein pectinase is used in food industries to make fruit juice clear.

**(c)** Pectinase is an example of a type of protein.

View solution

State the name of this type of protein.

..... [1]

**(d)** Fig. 8.2 shows the process used to produce clear fruit juice.

View solution

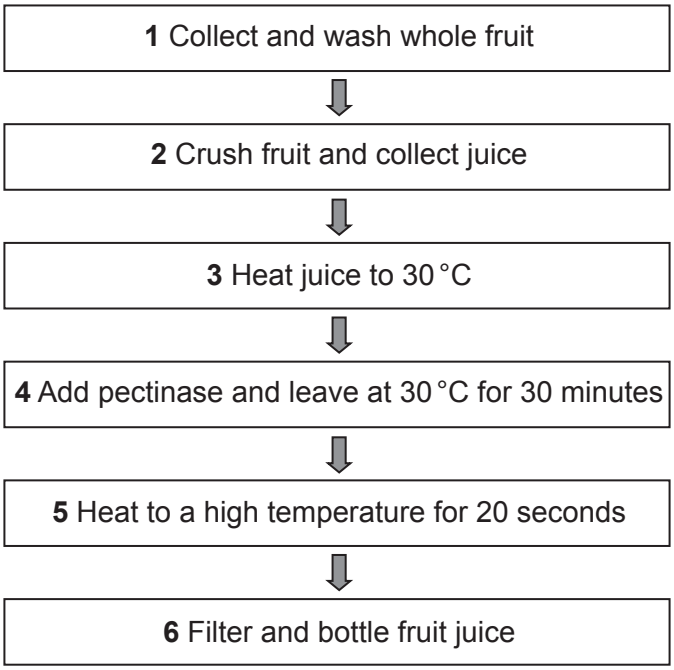


**Fig. 8.2**

**(i)** Explain why a temperature of 30 °C is used in step **4**.

.....

.....

..... [1]

**(ii)** During step **4** amylase may be added to the fruit juice.

View solution

Suggest the purpose of adding amylase.

.....

.....

..... [1]

**(iii)** Explain why the juice is heated to a high temperature in step **5**.

View solution

.....

.....

..... [1]

**(e)** Yeast is used in biotechnology.

View solution

Circle **two** uses of the products of anaerobic respiration in yeast.

**biofuels** **bread-making** **herbicide production**

**insulin production** **lactic acid production** **washing powders**

[2]

[Total: 13]

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