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8178572070

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 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 **20** pages.

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1 Enzymes are catalysts.

(a) (i) Describe what is meant by the term catalyst.

.....

.....

.....

.....

..... [2]

(ii) Enzymes are proteins.

State the names of the chemical elements found in all proteins.

.....

..... [2]

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(b) Lipase is an enzyme found in the human digestive system.

Fig. 1.1 shows the effect of pH on the percentage activity of lipase.

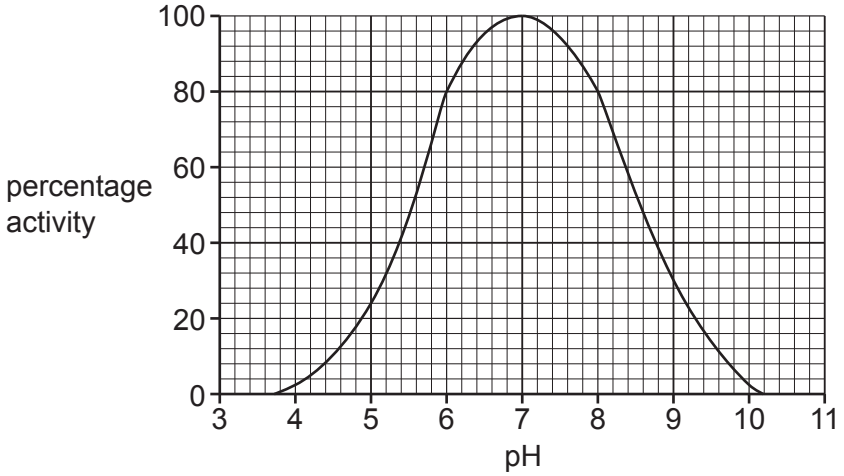


Fig. 1.1

Describe **and** explain the change in percentage activity of lipase shown on Fig. 1.1.

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..... [6]

(c) (i) Complete the word equation to show the substrate and products for lipase.

.....	lipase →	.....	+	.....

[2]

(ii) Lipase acts in the duodenum.

Explain how the body provides a suitable pH for lipase activity.

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..... [3]

[Total: 15]

2 Fig. 2.1 shows a cross-section of a human heart.

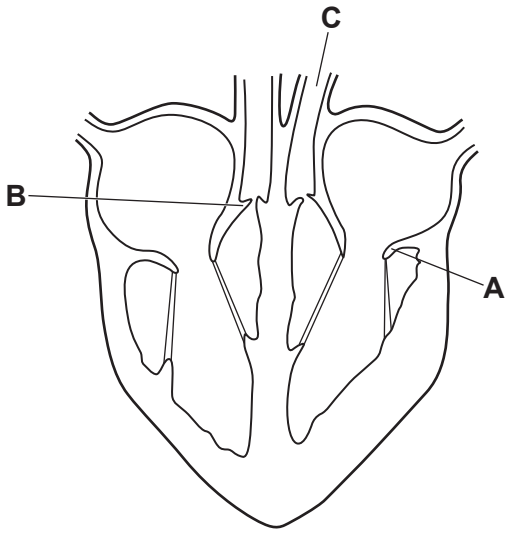


Fig. 2.1

(a) (i) On Fig. 2.1, label with an **R** the position of the right ventricle. [1]

(ii) State the names of the structures labelled **A** and **B** on Fig. 2.1.

A .....

B .....

[2]

(iii) Complete the sentence about blood vessel **C**.

Blood vessel **C** transports blood from the ..... to the

..... .

[2]

(b) Fig. 2.2 shows a cross-section of part of a heart that has an incomplete structure.

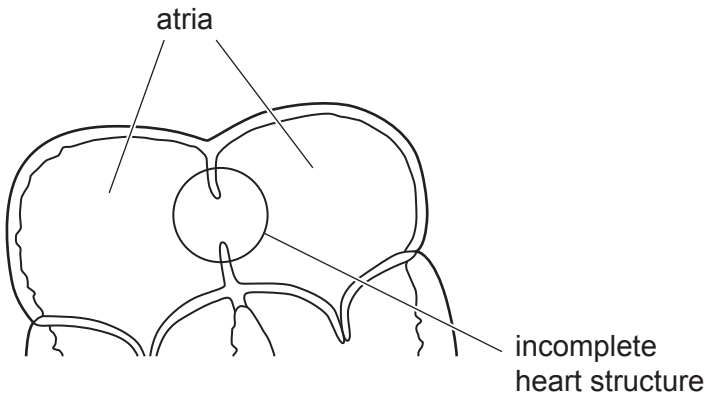


Fig. 2.2

Explain how the incomplete heart structure shown in Fig. 2.2 may affect a person's ability to transport oxygen.

.....

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.....

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..... [3]

(c) Fig. 2.3 shows how the body uses aerobic and anaerobic respiration during the first 120 seconds of vigorous physical activity. Between 0 and 20 seconds, the body also uses stored energy.

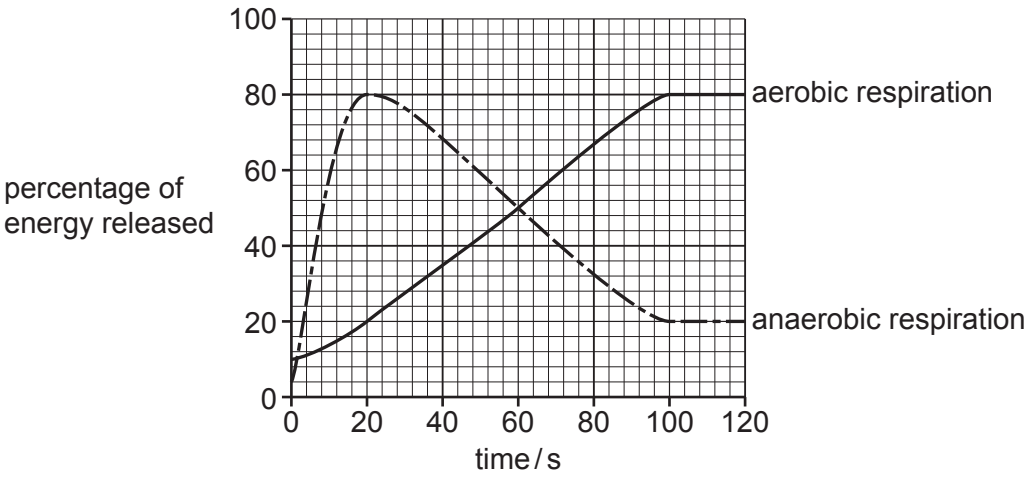


Fig. 2.3

(i) Describe the data shown in Fig. 2.3.

.....

.....

.....

.....

.....

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.....

.....

..... [4]

(ii) State the balanced chemical equation for aerobic respiration.

..... [2]

(iii) During anaerobic respiration an oxygen debt can build up.

State the name of the chemical that causes this oxygen debt.

..... [1]

[Total: 15]

3 **(a)** Fig. 3.1 shows a growing plant. The plant is growing in the dark.

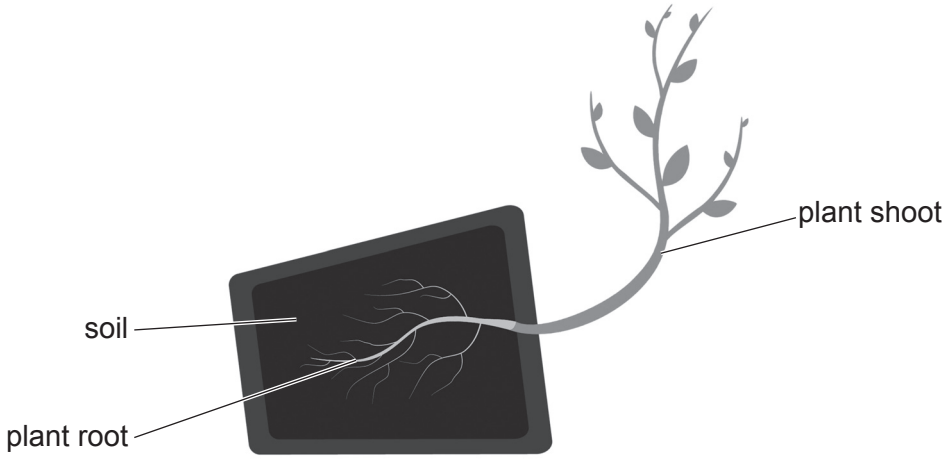


Fig. 3.1

(i) State the name of the growth response shown by the plant shoot in Fig. 3.1.

..... [1]

(ii) Explain how the growth of the plant shoot in Fig. 3.1 is controlled.

.....

.....

.....

.....

.....

.....

..... [3]

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(b) Plant roots growing towards water is another growth response.

State **two** uses of water in a plant.

1 .....

.....

2 .....

.....

[2]

(c) A student measured the root length of a bean seedling over a period of 120 hours.

Fig. 3.2 shows the results.

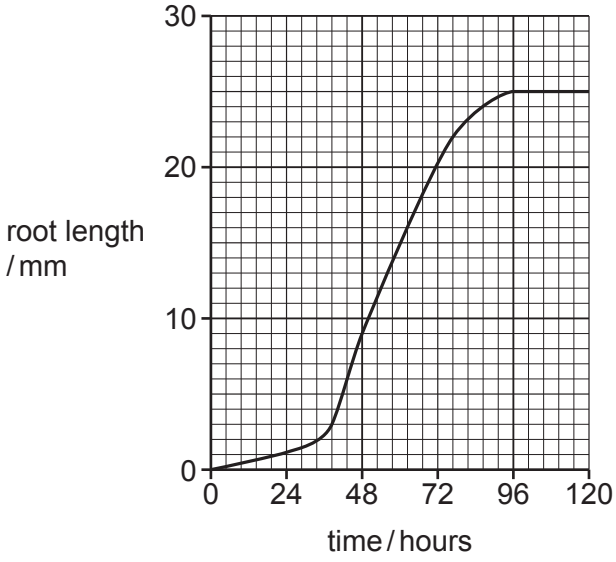


Fig. 3.2

Calculate the percentage increase in root length between 48 hours and 96 hours.

Give your answer to **two** decimal places.

Space for working.

..... %
[3]

[Total: 9]

4 Fig. 4.1 shows the concentrations of female sex hormones during the menstrual cycle.

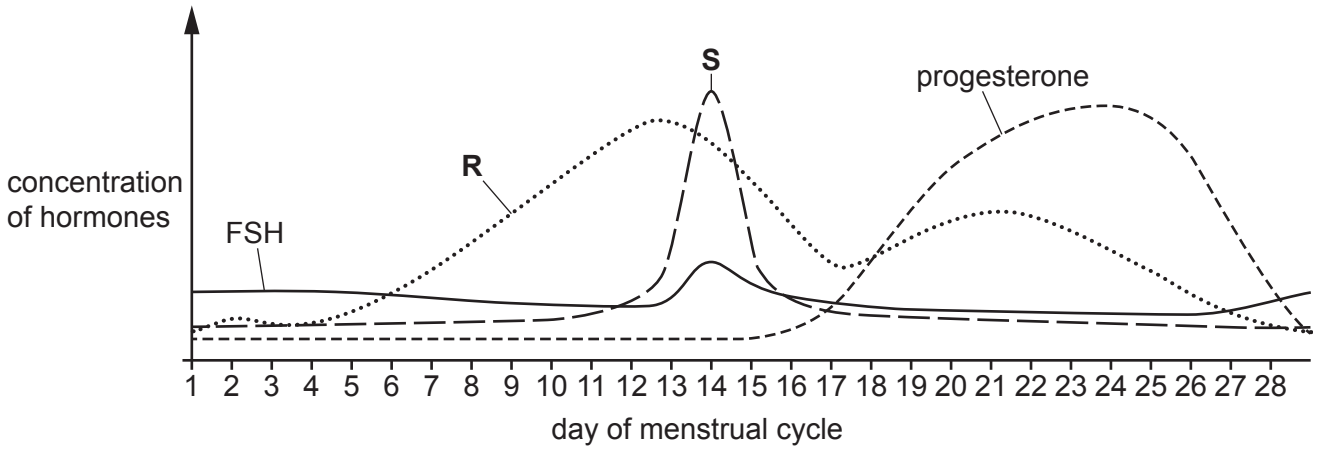


Fig. 4.1

(a) Identify, from Fig. 4.1, hormone:

R .....

S. .....

[2]

(b) State the day or days of the menstrual cycle shown in Fig. 4.1 when:

ovulation is most likely to occur .....

shedding of the uterine lining occurs. .....

[2]

(c) Describe how the concentration of progesterone would change during pregnancy.

Give a reason for this change.

.....

.....

.....

.....

..... [2]

(d) State the sites of production of progesterone during a menstrual cycle and during pregnancy.

during a menstrual cycle .....

during pregnancy .....

[2]

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[Turn over

(e) Describe the role of FSH in the menstrual cycle.

.....

.....

..... [1]

[Total: 9]

5 Fig. 5.1 shows part of a monkey flower plant.



Fig. 5.1

(a) (i) State **two** pieces of evidence, **visible** in Fig. 5.1, that show that monkey flower plants are pollinated by insects.

1 .....

.....

2 .....

.....

[2]

(ii) The monkey flower plant in Fig. 5.1 reproduces sexually.

Describe the advantages and disadvantages of sexual reproduction for monkey flower plants.

.....

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.....

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..... [4]

(b) Monkey flower plants were introduced to Europe from North America about 200 years ago.

Scientists measured the leaf area of five monkey flower plants growing in Europe and five monkey flower plants growing in North America.

Their results are shown in Table 5.1 and Table 5.2.

Table 5.1

plants growing in Europe	
plant number	leaf area / cm^2
1	310
2	335
3	390
4	348
5	365
mean	350

Table 5.2

plants growing in North America	
plant number	leaf area / cm^2
1	285
2	310
3	302
4	315
5	294
mean	

(i) Using the data in Table 5.2, calculate the mean leaf area for plants growing in North America.

Give your answer as a whole number and include the unit.

.....

[2]

(ii) State a conclusion for the results shown in Table 5.1 and Table 5.2.

.....

.....

..... [1]

(iii) Ancestors of monkey flower plants had a much smaller leaf area.

Explain how the monkey flower plants have developed a larger leaf area over time.

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..... [5]

[Total: 14]

6 **(a)** Fig. 6.1 shows part of the carbon cycle in the ocean.

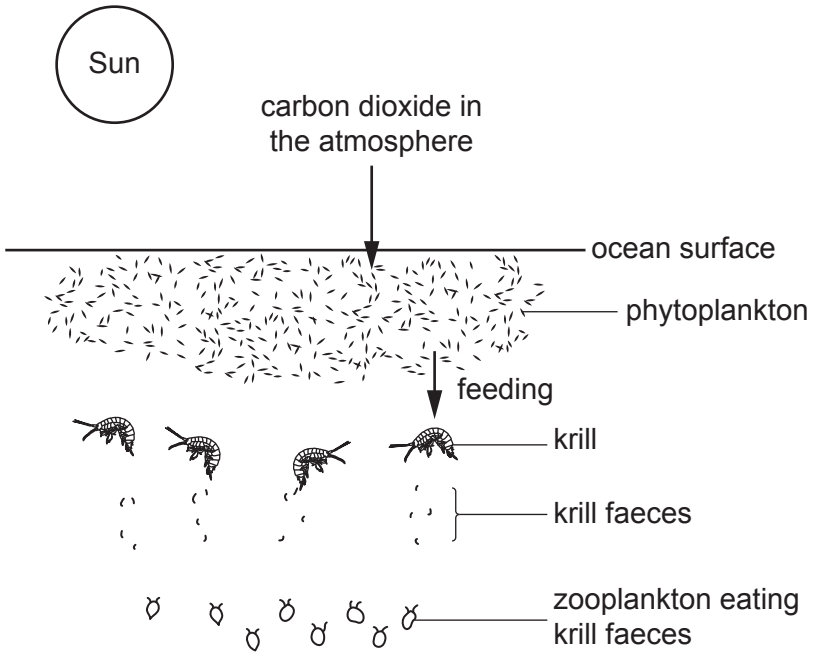


Fig. 6.1 (not to scale)

(i) Phytoplankton contain chlorophyll.

Explain how phytoplankton lower carbon dioxide concentrations in the atmosphere.

.....

.....

.....

.....

..... [2]

(ii) Suggest the role of zooplankton in this ecosystem.

.....

..... [1]

(iii) State the names of **two** processes that add carbon dioxide to the atmosphere.

1 .....

2 .....
[2]

(iv) Describe the effect on the environment of additional carbon dioxide in the atmosphere.

.....

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..... [3]

(b) Fig. 6.2 shows the pyramid of energy for a food chain in an ocean ecosystem.

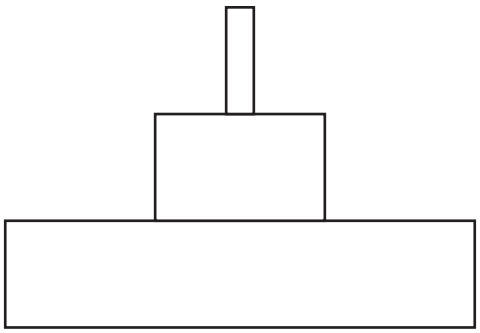


Fig. 6.2

(i) On Fig. 6.2, label the trophic level containing herbivores. [1]

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(ii) Explain why pyramids of energy usually have fewer than five trophic levels.

.....

.....

.....

.....

.....

.....

..... [3]

(iii) State **two** advantages of using a pyramid of energy rather than a pyramid of biomass to represent a food chain.

1 .....

.....

2 .....

.....

[2]

(c) The oceans contain fish stocks that can be managed as a sustainable resource to provide food for humans.

(i) State what is meant by the term sustainable resource.

.....

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..... [2]

(ii) Fishing can be managed to promote the conservation of fish stocks.

Explain **one** way that fishing can be managed to conserve fish stocks.

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..... [2]

[Total: 18]

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