Gold Paper

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Paper	Gold Paper
Booklet	Question Paper 1

Time allowed: **84 minutes**

Score: **/62**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

(a) Chromista are photosynthetic protoctists that live in water.

Chromista are different from other photosynthetic organisms because they contain the pigment chlorophyll *c*.

Chlorophyll *c* is not found in plants.

(i) Outline the importance of photosynthetic pigments in photosynthesis. **[4]**

(ii) The wavelengths of light absorbed by chlorophyll *c* are different from those wavelengths absorbed by chlorophyll *a* and chlorophyll *b*.

Suggest why Chromista need pigments that are different from those of other photosynthetic organisms.

[1]

(b) Fig. 17.1 is a diagram of the chloroplast found in a Chromista cell.

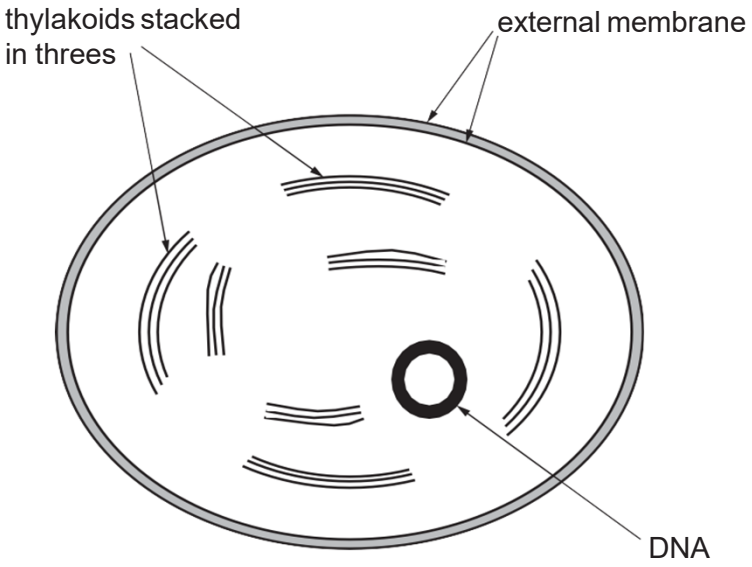

Fig. 17.1

Outline the structural differences between the Chromista chloroplast in Fig. 17.1 and the chloroplasts found in flowering plants.

[2]

(c) Fig. 17.2 is a diagram of part of the plasma membrane of a Chromista cell.

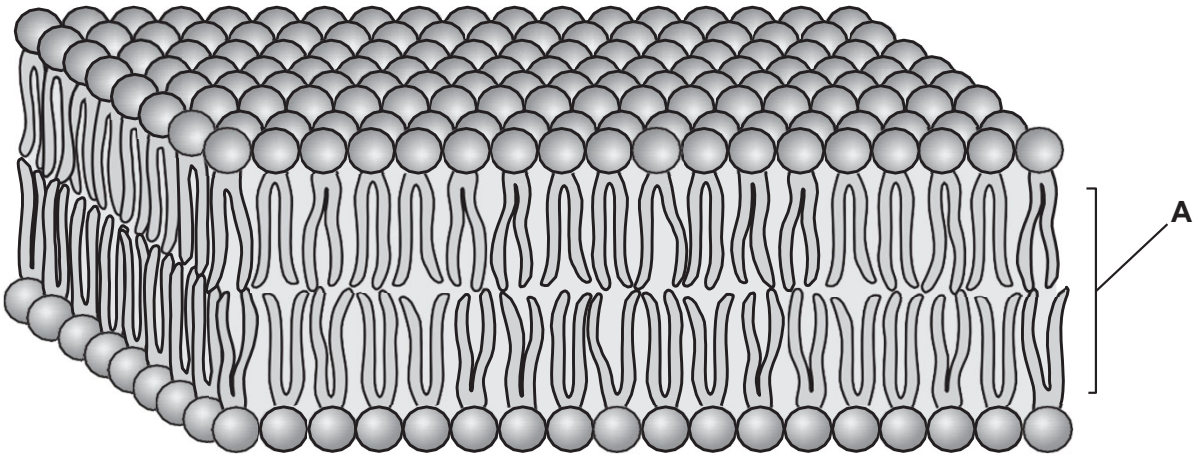

Fig. 17.2

(i) State and explain how **one** property of region **A** in Fig. 17.2 contributes to the stability of the plasma membrane.

[2]

(ii) There are differences between the plasma membrane and membranes within cells.

Outline the role of membranes **within** cells. **[2]**

[Total: 11]

Between 1996 and 2012, the number of people diagnosed with diabetes in the UK increased from 1.4 million to 2.9 million. It is estimated that the condition will affect 5 million people by 2025.

(a) Table 1.1 lists a number of facts about diabetes.

Complete the table by using a **single tick** (✓) to indicate whether each fact relates to Type 1 diabetes only **or** Type 2 diabetes only **or** both types.

Fact	Type 1 diabetes only	Type 2 diabetes only	Both Type 1 and Type 2 diabetes
body cells no longer respond to insulin			
blood glucose concentration cannot be controlled			
insulin injections are required			
linked to obesity			

Table 1.1

[4]

(b) Cost is one important factor when considering how diabetes may be treated.

(i) Discuss the advantages, **other than cost**, of using insulin produced by genetically modified bacteria compared with using other sources of insulin. **[3]**

(ii) Discuss the advantage, **other than cost**, of the future use of stem cells to treat diabetes rather than using insulin injections. **[2]**

[Total: 9]

Enzymes are important in a wide range of biological reactions.

(a) Fig. 1.1 represents a mechanism of enzyme action.

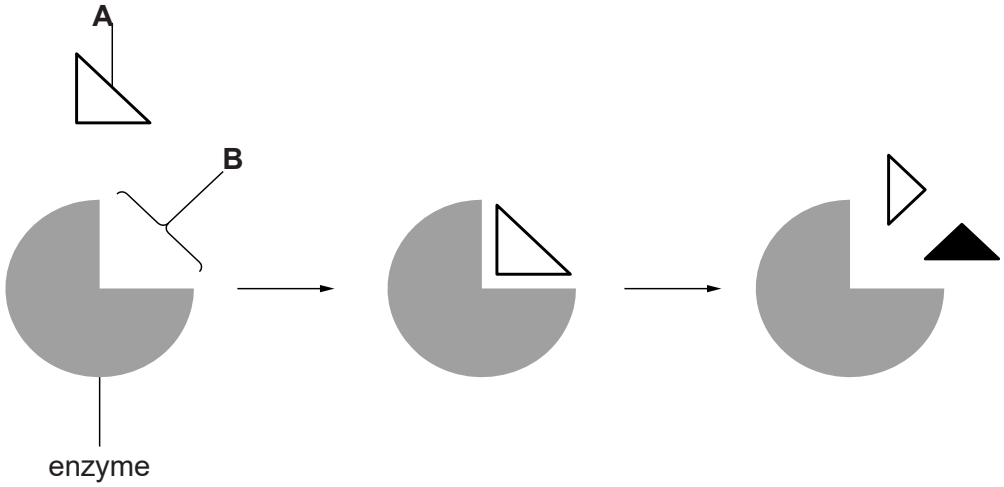

Fig. 1.1

(i) Name the structures represented by the letters **A** and **B**. **[2]**

(ii) The mechanism of enzyme action was originally explained in terms of the 'lock-and-key model'. It is now more often explained in terms of the 'induced-fit' model.

Suggest why the lock-and-key and induced-fit explanations are termed **models**. **[1]**

(iii) Suggest why most scientists now accept the induced-fit model rather than the lock-and-key model. **[1]**

(b) Many fish live in the Antarctic where the water temperature can be close to 0 °C.

- Scientists have studied enzymes from these Antarctic fish and also from
- non-Antarctic fish that live in water at a temperature of 10 °C.
- One of the enzymes studied has been lactate dehydrogenase (LDH), an important enzyme involved in cell metabolism.
- One way in which LDH works is to catalyse the conversion of lactate to an important compound known as pyruvate.

(i) Scientists investigated the rates of reaction of LDH from Antarctic and non-Antarctic fish at a range of temperatures.

Suggest **three** variables that should be controlled in an investigation of this type. **[3]**

(ii) Some suggested controls used in this investigation are listed below.

J	water, lactate and heated LDH (non-Antarctic at 10 °C)
K	lactate alone at all temperatures
L	lactate and water at all temperatures
M	boiled LDH (Antarctic and non-Antarctic) at all temperatures
N	pyruvate and water at all temperatures

Select the letter, **J**, **K**, **L**, **M** or **N**, that represents the most appropriate control to be used in this investigation. **[1]**

(iii) The rate of conversion of lactate to pyruvate at 1 °C was found to be relatively slow when catalysed with LDH from **non-Antarctic fish**.

Suggest reasons for this result. **[2]**

(iv) It was discovered that the rate of conversion of lactate to pyruvate at 1 °C was higher if catalysed with LDH enzyme from Antarctic fish than when catalysed with LDH enzyme from non-Antarctic fish.

Certain parts of the enzyme molecule from the Antarctic fish are more flexible than the equivalent parts of the molecule from the non-Antarctic fish.

Suggest how a more flexible structure might help this enzyme work faster at lower temperatures.

[1]

(c) Enzymes are proteins. The enzymes in Antarctic fish have a different structure from those found in non-Antarctic fish.

(i) Suggest how the structure of the **enzymes** may differ in Antarctic and non-Antarctic fish.

[2]

(ii) Suggest how the **DNA** of the Antarctic and non-Antarctic fish might differ. **[2]**

(d) If species of Antarctic fish were to become extinct, their unique enzymes would be lost.

(i) Suggest why the loss of these **enzymes** might be undesirable. **[1]**

(ii) Suggest **two** ways in which the population of Antarctic fish could be conserved. **[2]**

[Total: 18]

A student looked at a slide containing onion root tip cells under a light microscope in order to identify cells in different stages of mitosis. Fig. 21 shows a diagram of what they observed.

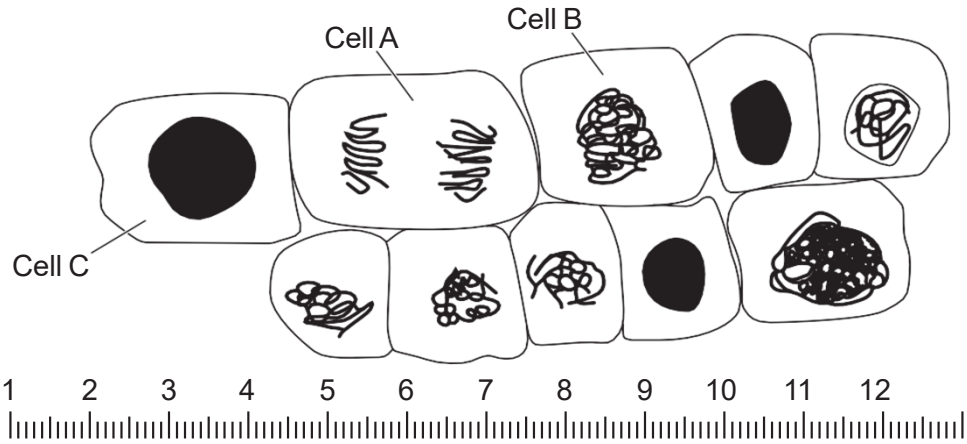

Fig. 21

(a) **(i)** Explain why onion root tips were used to view cells undergoing mitosis. **[2]**

(ii) Suggest a stain that the student could have used to highlight the nuclei of these cells. **[1]**

(b) The student used an eyepiece graticule, which is shown in Fig. 21. The student calibrated the graticule before carrying out the root tip squash. He observed that 20 μm measured 2.35 divisions on the graticule.

Calculate the diameter of the nucleus in cell **C** in Fig. 21.

[2]

[Total: 5]

(a) Light intensity, carbon dioxide concentration and temperature are all limiting factors in photosynthesis.

Explain what is meant by a **limiting factor**. **[2]**

(b) An investigation was carried out into the effect of adding different volumes of water on the survival of seedlings.

There were 60 seedlings in each group.

The results are shown in Table 18.

Volume of water added to soil (cm^3)	Day	Number of seedlings surviving
10	3	60
	6	59
	9	59
	12	58
	15	57
	18	57
20	3	60
	6	57
	9	54
	12	54
	15	54
	18	53
30	3	60
	6	58
	9	56
	12	50
	15	50
	18	48
40	3	60
	6	48
	9	40
	12	34
	15	26
	18	20
60	3	60
	6	41
	9	21
	12	6
	15	2
	18	2

Table 18

(i) Summarise the conclusions that can be drawn from these data. **[3]**

(ii)* Water can fill air spaces in the soil surrounding the roots.

This prevents oxygen from reaching root hair cells.

Using your knowledge of aerobic and anaerobic respiration, explain why overwatering can kill plants. **[6]**

(c) **(i)** Soluble mineral ions are present in soil.

Explain why water molecules can form hydrogen bonds with nitrate (NO_3^-) ions. **[2]**

(ii) Fig. 18 shows a process that occurs in the cell surface membrane of the endodermis in the root.

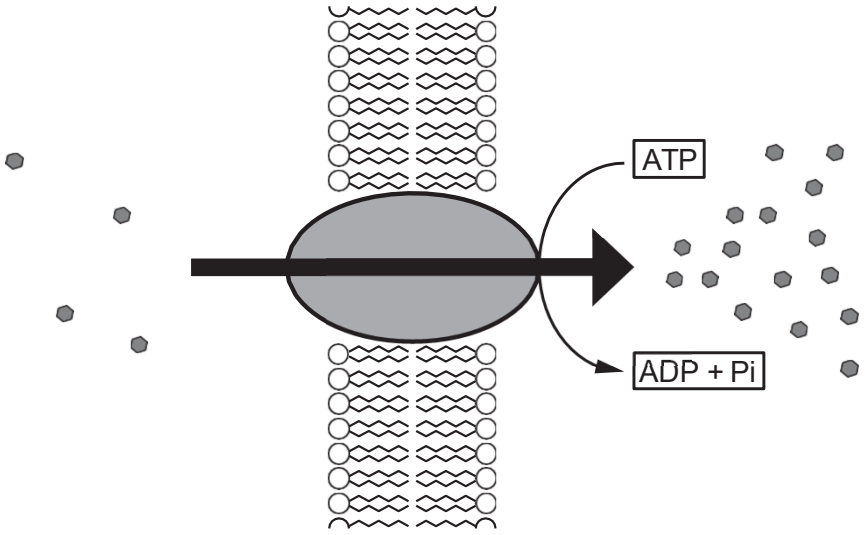

Fig. 18

Explain how the events shown in Fig. 18 cause water to enter the endodermis. **[2]**

(d) Explain why a plant leaf is described as an organ.

[4]

[Total: 19]