



Cambridge O Level

CANDIDATE NAME



CENTRE NUMBER

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BIOLOGY

5090/21

Paper 2 Theory

October/November 2024

1 hour 45 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 **16** pages. Any blank pages are indicated.



1 Fig. 1.1 shows an experiment to measure the water loss from a small plant in 24 hours.

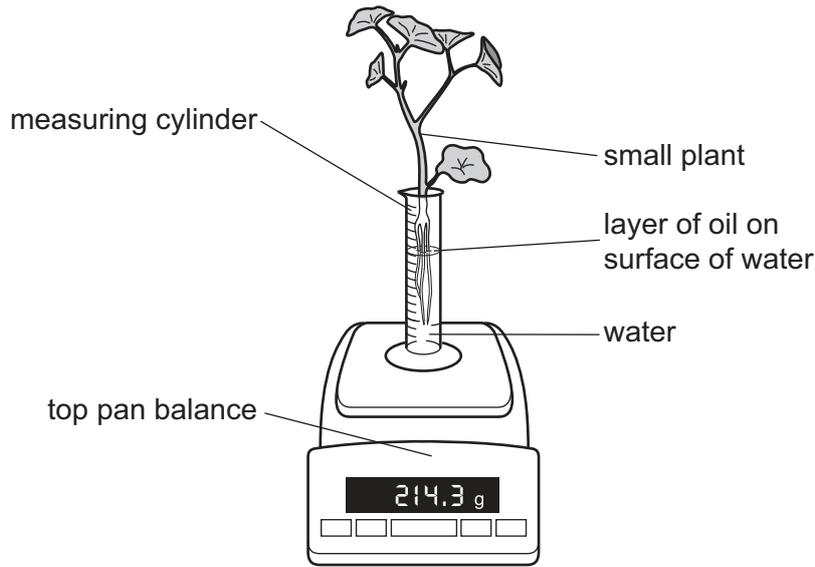


Fig. 1.1

(a) (i) Name the process by which a plant loses water from cells to the atmosphere.

..... [1]

(ii) Suggest the purpose of the layer of oil.

.....
..... [1]

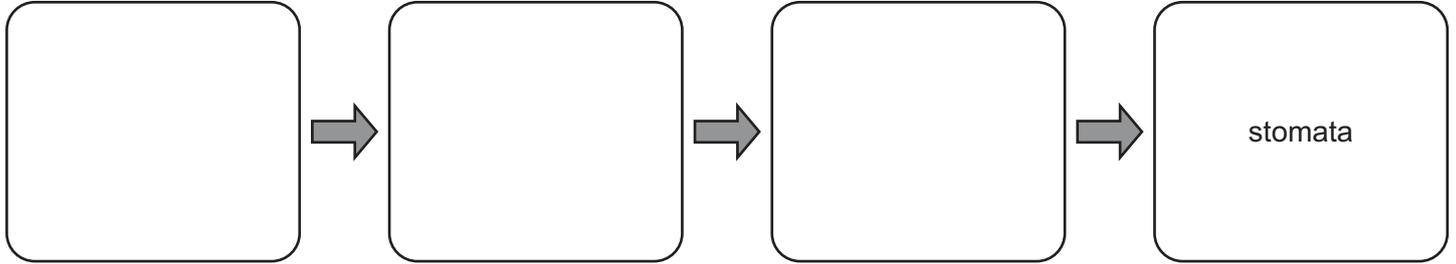
(iii) Describe **one** way in which a student could use this apparatus to obtain a value for the amount of water the plant loses in 24 hours.

.....
.....
..... [2]





- (b) Water is lost mainly through the plant's stomata.
Name **three** types of cell that the water passes through before it reaches the stomata in the leaves.
Write the names of the types of cell in the correct order in the boxes.



[3]

- (c) The experiment shown in Fig. 1.1 was repeated many times to investigate the effect of humidity on the rate of water loss.
All environmental conditions were kept constant except for humidity which was gradually increased.
Fig. 1.2 shows the axes for a graph.

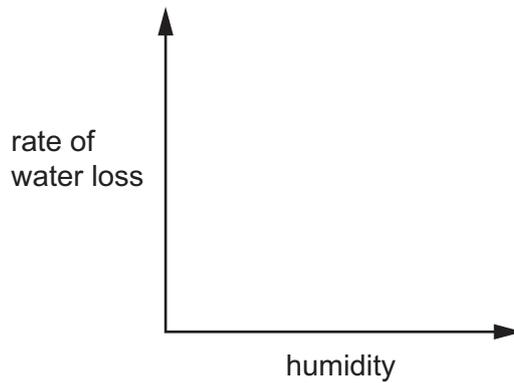


Fig. 1.2

- (i) Sketch a graph on these axes of the expected results for this investigation. [1]
- (ii) Explain what your graph shows about the effect of humidity on water loss.

.....

.....

.....

.....

..... [3]

[Total: 11]



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2 Maltase is an enzyme found in the intestines of vertebrates, including humans.

(a) Complete Table 2.1, which provides descriptions of words related to the activity of maltase. The first row has been completed for you.

Table 2.1

word	how it relates to the activity of maltase
maltase	an enzyme that is found in vertebrate intestines
	the substrate of maltase
glucose	
	part of the maltase molecule which fits the substrate
specific	

[4]

(b) Vampire bats live in South America and feed entirely on blood. They are the only known vertebrates which do **not** have maltase in their intestines. Suggest an explanation for this.

.....

.....

.....

..... [2]

[Total: 6]

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3 Fig. 3.1 shows the central nervous system and some other parts of a man's body.

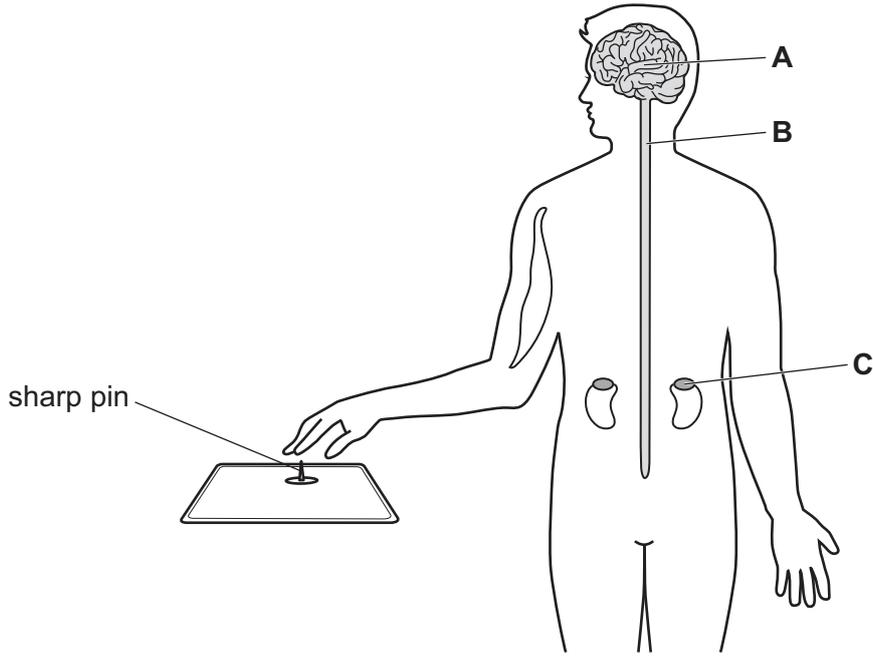


Fig. 3.1

(a) Name the **two** parts of the central nervous system labelled **A** and **B**.

A

B

[2]

(b) The man accidentally touches his hand on a sharp pin and immediately lifts his lower arm away from the pin in a reflex action.

(i) This reflex action involves a receptor and an effector. On Fig. 3.1, draw a label line to the location of:

- the receptor and label it **R**
- the effector and label it **E**.

[2]

(ii) Describe the roles of **two** named neurones in this reflex arc.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4]





(c) The part of the body labelled **C** is a gland in the endocrine system.

(i) Name gland **C**.

..... [1]

(ii) Explain the role of gland **C** in triggering an increase in heart rate in response to a sudden shock.

.....

.....

..... [2]

[Total: 11]

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4 Living organisms excrete carbon dioxide.

(a) (i) Describe the meaning of the term excretion.

.....

.....

..... [2]

(ii) Name the process which produces carbon dioxide in living organisms and state how carbon dioxide is excreted by humans.

.....

.....

..... [2]

(b) The volume of carbon dioxide excreted varies over a 24-hour period and the factors that affect this are different for animals and plants.

Suggest and explain reasons why the volume of carbon dioxide excreted varies for both animals and plants.

animals

.....

.....

plants

.....

.....

[4]

(c) Explain the effect of an increasing concentration of carbon dioxide in the atmosphere.

.....

.....

.....

.....

[2]

[Total: 10]

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- 5 The castor oil plant is a flowering plant which produces seeds. The seeds have an additional structure called an oil body that contains oil. Fig. 5.1 shows a castor oil seed with its oil body.

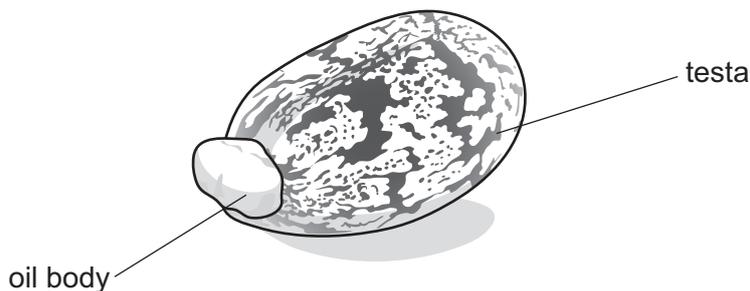


Fig. 5.1

- (a) (i) The testa protects the seed contents from environmental damage. Name parts of the seed protected by the testa and describe their functions.

.....

.....

.....

.....

.....

..... [4]

- (ii) Describe a laboratory test that can be used to show that the oil body contains oil.

.....

.....

..... [2]

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(b) When the fruits of the castor oil plant are ripe, they burst open, scattering the seeds onto the soil.

Ants feed on the oil bodies, but **not** the rest of the seeds. They either remove the oil bodies where the seeds have fallen or they take the seeds and oil bodies back to their nest.

Colonies of five different ant species, **A – E**, were supplied with the same number of castor oil seeds near to their nests.

Fig. 5.2 shows the results of this experiment into the behaviour of these different ant species.

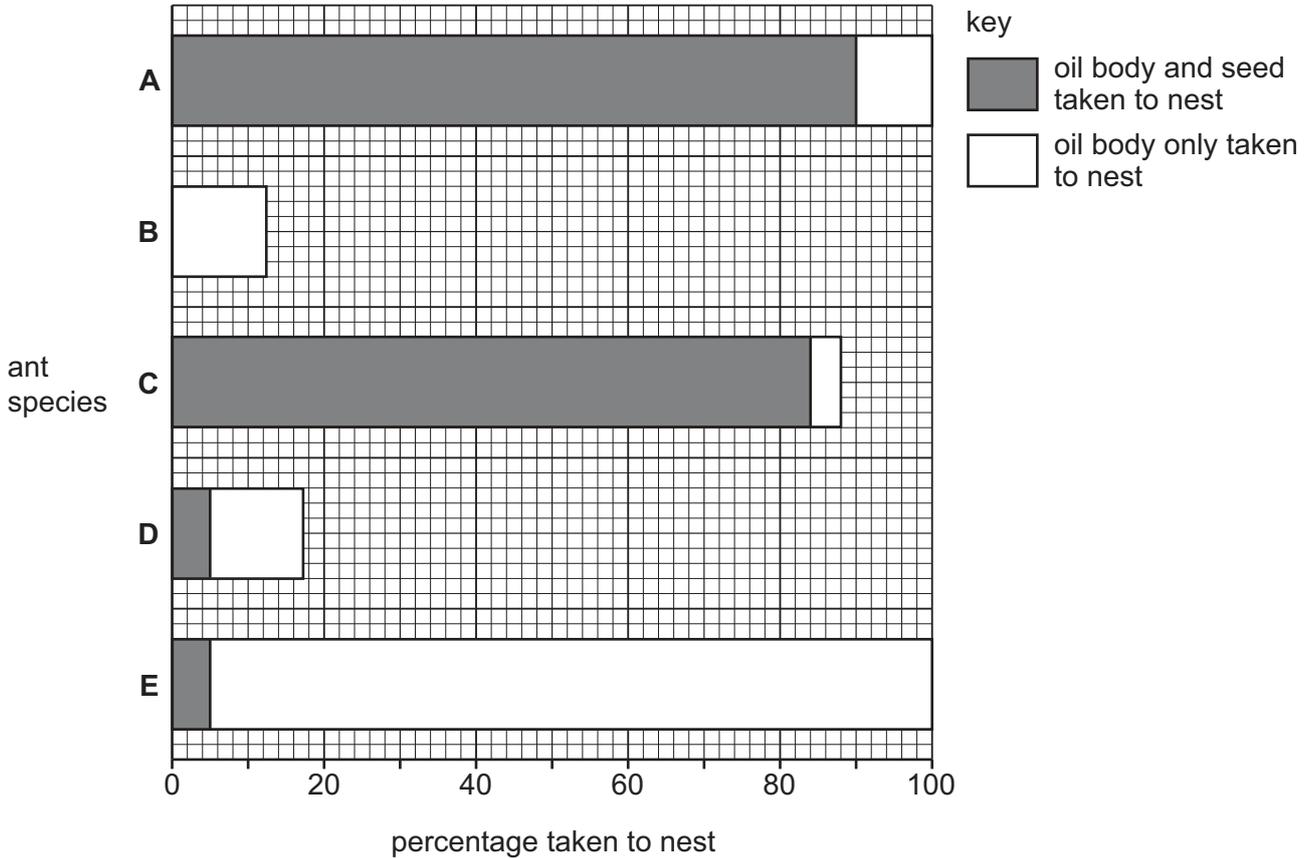


Fig. 5.2

(i) Only a small number of flowering plant species produce seeds with oil bodies. Suggest **one** advantage and **one** disadvantage to the castor oil plant of producing seeds with oil bodies.

advantage

.....

disadvantage

.....

[2]

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(ii) Use information from Fig. 5.2 to explain how useful the different ant species are to the castor oil plant.

.....
.....
.....
.....
..... [3]

(iii) The ants feed on the oil bodies and digest the oil. Name the products of this digestion.

..... [1]

(c) Ant species **A** is *Solenopsis geminata*. Fig. 5.3 shows a diagram of *S. geminata*.

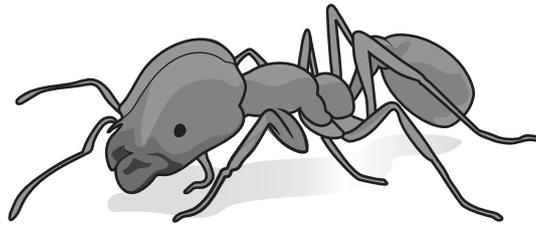


Fig. 5.3

S. geminata is an arthropod. The arthropods are classified into a number of groups.

(i) State the name of the group to which *S. geminata* belongs.

..... [1]

(ii) State **two visible** features used to classify *S. geminata* in this group of arthropods.

1
2 [2]

[Total: 15]

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6 Lake Victoria, in Africa, is one of the largest fresh water lakes in the world. It is an important ecosystem for people living around the lake who catch fish as part of their diet. Fig. 6.1 shows part of a food web for the lake.

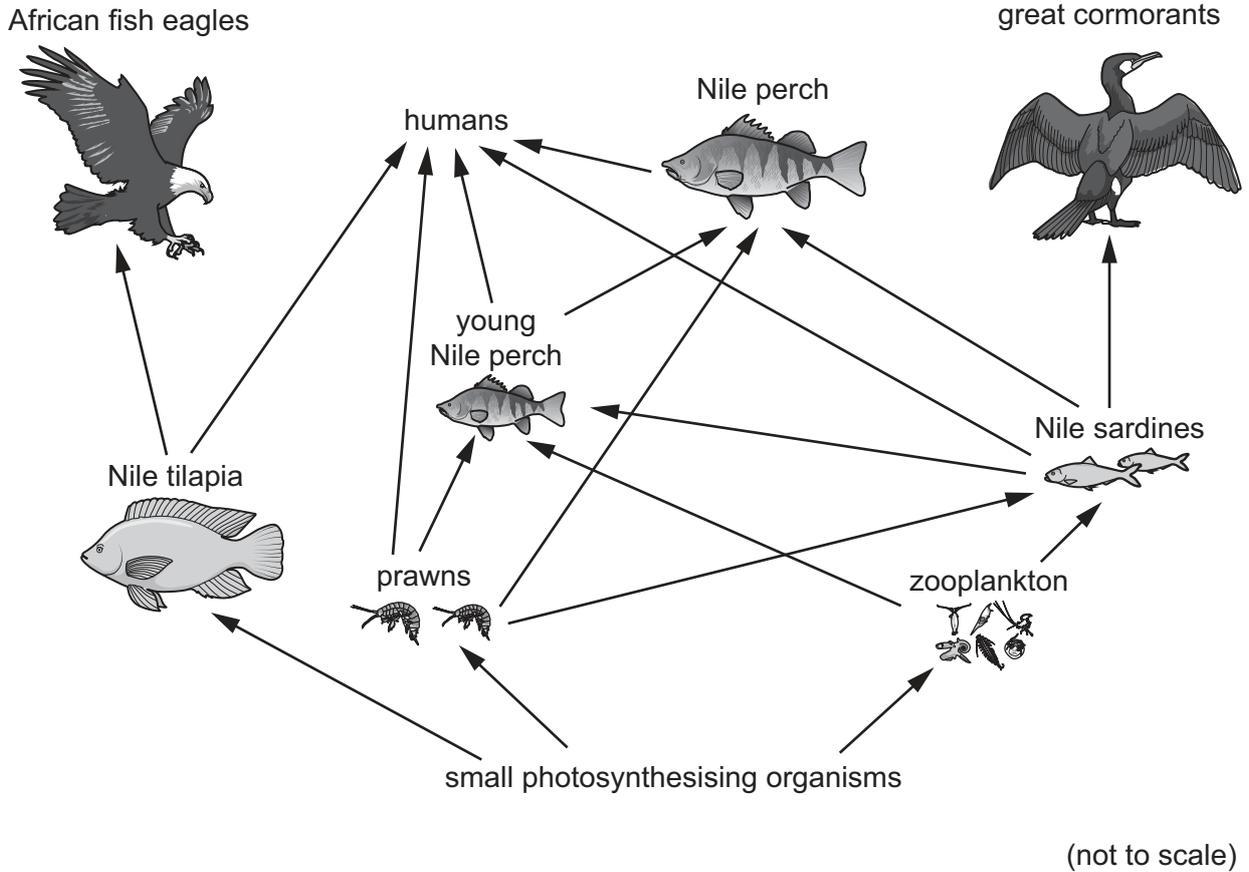


Fig. 6.1

(a) State the name of an organism shown in Fig. 6.1 that is:

a primary consumer

.....

both a secondary consumer **and** a tertiary consumer.

.....

[2]

(b) Humans eat Nile tilapia, prawns, Nile sardines and Nile perch.

Use information from Fig. 6.1 to state which of these is the **least** energy efficient for humans to eat and explain why.

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.....

.....

.....

[2]



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(c) (i) Suggest the effects on this ecosystem of increasing the mass of Nile tilapia taken from the lake by human fishing.

.....
.....
.....
.....
..... [3]

(ii) Suggest and explain ways in which the fish populations of the Lake Victoria ecosystem can be managed so that they provide a sustainable resource.

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..... [5]

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(d) Fig. 6.2 shows a diagram of the Nile perch gas exchange system and part of the circulatory system.

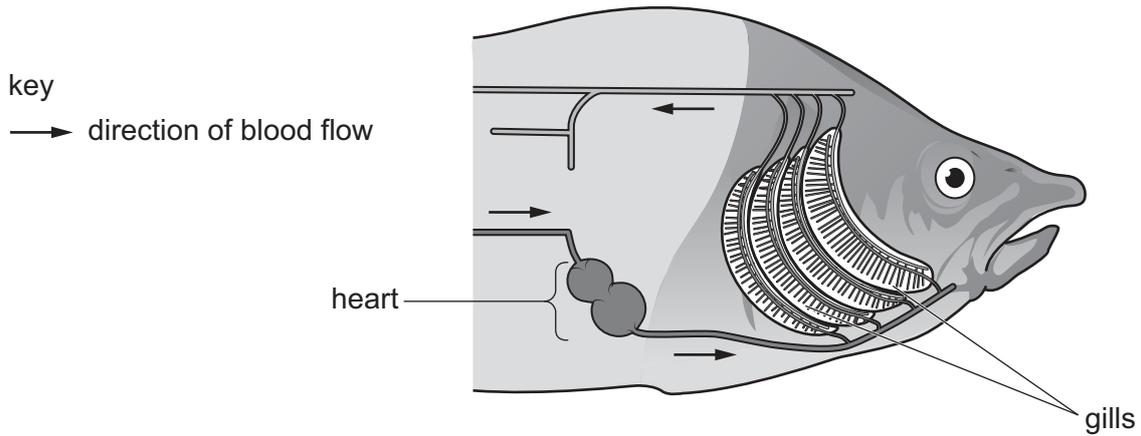


Fig. 6.2

Describe the similarities and differences between the human and Nile perch circulatory and respiratory systems.

similarities

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differences

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[5]

[Total: 17]

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