CAMBRIDGE
International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2222597628

BIOLOGY **5090/21**

Paper 2 Theory **May/June 2026**

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. Do **not** use correction fluid or tape.
- 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. Any blank pages are indicated.

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Answer **all** questions.

Write your answers in the spaces provided.

1 Figure 1.1 shows four types of fruit, **A**, **B**, **C**, and **D**.

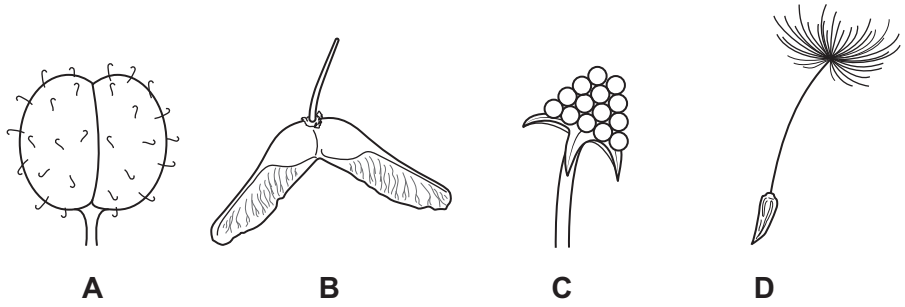


Figure 1.1

(a) **Two** of the fruits in Figure 1.1 are dispersed by animals.

State the letters that identify these **two** fruits, and complete the sentences about how animals disperse them.

Fruit ..... is dispersed by animals.

Animals disperse this fruit by .....

.....

Fruit ..... is also dispersed by animals.

Animals disperse this fruit by .....

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[4]

(b) Explain the advantage to plants of fruit dispersal.

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..... [2]

[Total: 6]

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2 Figure 2.1 shows a tube labelled **P** leading into air sacs in the lungs.

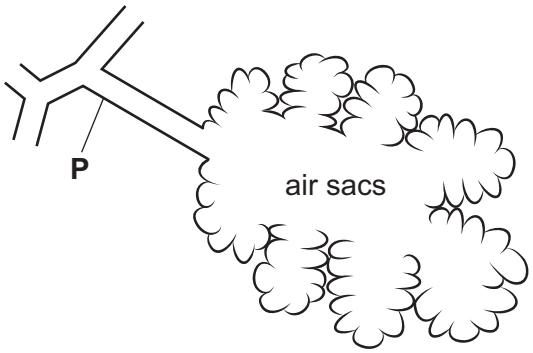


Figure 2.1

(a) Name the type of tube labelled **P** in Figure 2.1.

..... [1]

(b) **(i)** Complete these sentences about how muscles in the chest work to move air into the lungs.

The process of moving air into the lungs occurs because of the contraction of the

.... muscles between the ribs.

These actions cause the ribs to move ..... and

..... .

A sheet of muscle called the ..... also contracts.

[3]

(ii) Explain how the changes described in **2(b)(i)** cause air to move into the lungs.

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..... [2]

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(c) (i) Figure 2.2 shows the lining of tube **P**.

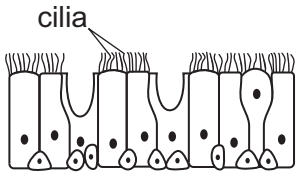


Figure 2.2

Explain how the lining of tube **P** helps to prevent infection in the lungs.

.....

.....

.....

..... [2]

(ii) Describe the effects of smoking tobacco on the lining of tube **P**.

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..... [3]

[Total: 11]

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3 **(a)** In the spaces provided, name biological molecules that fit these descriptions.

a sugar that is transported in the phloem of plants .....

a carbohydrate that is used to build plant cell walls .....

a vitamin that is needed in the human diet to prevent rickets .....

an excretory molecule that is made in the liver from excess amino acids .....

[4]

(b) Complete these sentences to state the functions of the biological molecules glycogen and glucagon.

Glycogen is .....

.....

Glucagon is .....

.....

[2]

(c) Enzymes are biological molecules with a precise shape.

Explain why the shape of enzyme molecules is important for their function.

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..... [3]

[Total: 9]

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4 **(a)** Figure 4.1 shows a food web from the Antarctic Ocean.

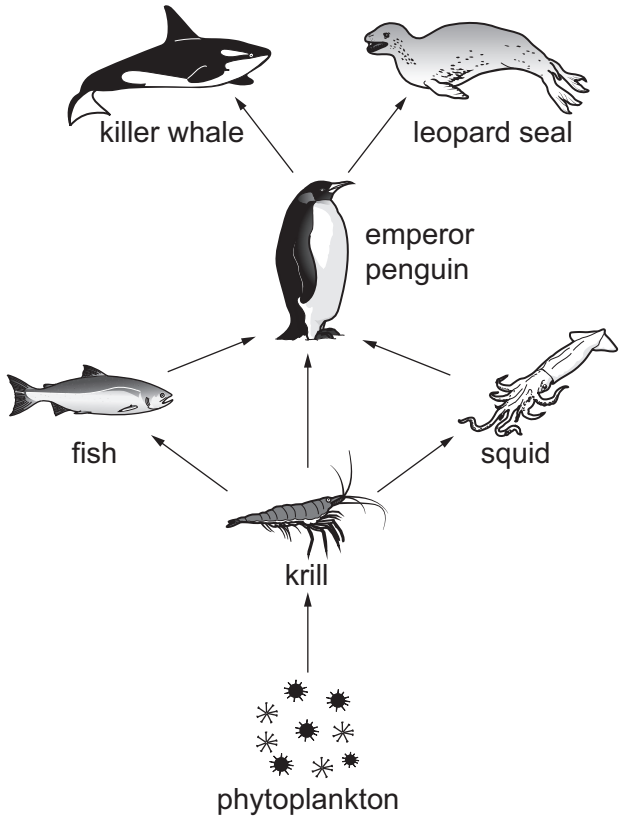


Figure 4.1

(i) Give the name of the herbivore in this food web.

..... [1]

(ii) How many food chains containing five organisms can be drawn from this food web?

..... [1]

(iii) Large numbers of squids are caught by fishing boats.

Explain the possible effects of this overfishing on the krill population.

.....

.....

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..... [2]

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(b) Most penguins have dark feathers on their backs and white feathers on their fronts.

Penguins can be born with white feathers all over. This is caused by a recessive allele **a**.

The dominant allele for having both black and white feathers is **A**.

(i) A heterozygous penguin with both black and white feathers mates with an all-white penguin to produce one chick.

Complete the genetic diagram to calculate the probability that the chick will have both black and white feathers.

		all-white penguin	
		a	**a**
black and white penguin			

probability = ... [3]

(ii) Seals hunt penguins when both are swimming in the sea.

When seals are swimming above the penguins and looking down at them, the background of the sea looks dark.

When seals are swimming below the penguins and looking up at them, the sky in the background looks light.

Populations of penguins are made up almost entirely of individuals with both black and white feathers. All-white penguins are extremely rare.

Explain why populations of penguins are made up almost entirely of black and white individuals.

Use ideas about natural selection in your answer.

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..... [4]

[Total: 11]

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5 Coronary heart disease (CHD) affects many people.

(a) Explain how CHD affects the functioning of heart muscle.

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.....

..... [3]

(b) There are a number of risk factors that can affect the chance of developing CHD.

Table 5.1 lists some of these risk factors and gives them points.

The more points a person has, the greater the chance of developing CHD.

Table 5.1

	number of points			
risk factor	**1**	**2**	**3**	**4**
age in years	less than 20	21 to 30	31 to 40	41 to 50
body mass	low	medium	high	very high
number of cigarettes smoked a day	0	1–10	11–20	over 20
blood cholesterol level	low	medium	high	very high
number of parents with CHD	0	1	2	-

(i) State **one** risk factor for CHD that is not included in Table 5.1.

..... [1]

(ii) State the reason why having parents with CHD counts as a risk factor.

.....

..... [1]

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(iii) Two people, **A** and **B**, are discussing their chance of developing CHD.

Person **A** uses Table 5.1 and calculates that they have scored 12 points by adding together the points for each of their risk factors.

Person **B** is 32 years old, has high body mass, does not smoke, has a high blood cholesterol level and has one parent with CHD.

Use Table 5.1 to compare the chances of developing CHD for person **B** and person **A**.

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..... [2]

[Total: 7]

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6 **(a)** Figure 6.1 shows a pathogen called CMV.

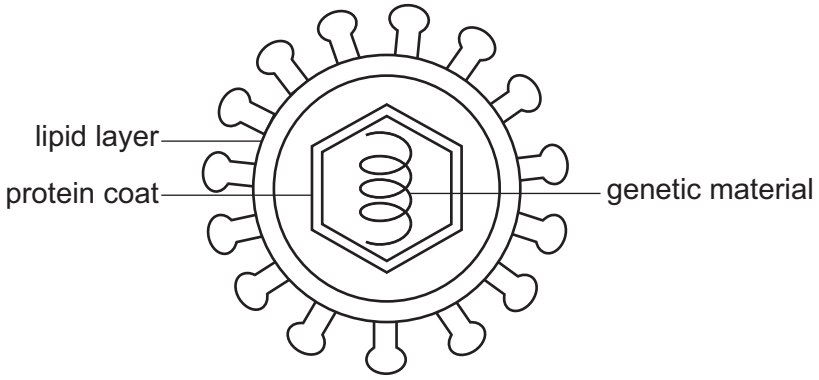


Figure 6.1

(i) What type of pathogen is CMV?

Circle the correct answer in this list.

bacterium **fungus** **protoctist** **virus**

[1]

(ii) CMV can be found in the saliva, urine, and blood of infected people.

Suggest why babies can be born already infected with CMV.

.....

.....

.....

..... [2]

(b) CMV does not cause serious health problems for most people who are infected.

However, in young babies and people with HIV, it can cause more serious symptoms.

Suggest why CMV can cause more serious symptoms in people who have HIV.

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..... [2]

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(c) After an infection, CMV can remain inside cells in the body for many years.

For this reason, donated blood can only be given to young babies if the donor has not been infected by CMV.

(i) To see if a person can donate blood to a young baby, doctors test the potential donor's blood for a specific antibody.

Suggest why they do this.

.....

.....

.....

..... [2]

(ii) In the United Kingdom, 24 million people can donate blood but only 2% actually do.

60% of all people are infected with CMV.

Calculate how many people in the United Kingdom donate blood that can be given to young babies.

Space for working.

number of people = ... [3]

[Total: 10]

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7 **(a)** Different structures in the excretory system transport different substances.

Draw a line from each **structure** to the substance that it **transports**.

structure	transports
renal artery	urine to the bladder
renal vein	urine from the bladder
ureter	deoxygenated blood
urethra	oxygenated blood

[3]

(b) Figure 7.1 shows one kidney nephron that has been stretched out. It also shows changes in the composition of fluid inside this nephron.

Lines **X** and **Y** show how two different environmental conditions affect the composition of the fluid inside this nephron.

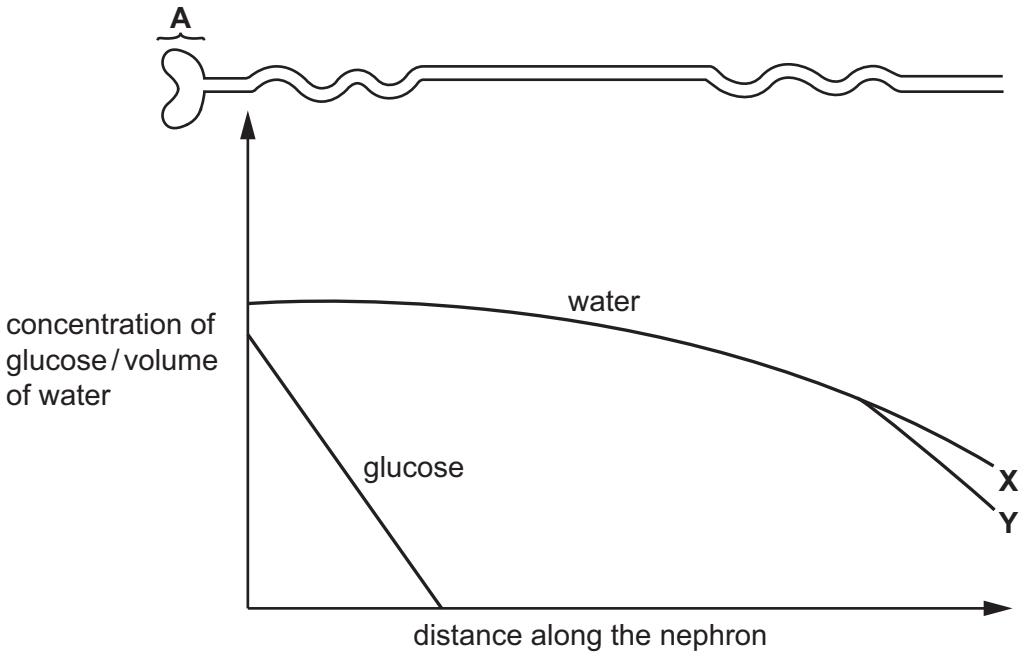


Figure 7.1

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(i) Name the part of the nephron labelled **A**.

..... [1]

(ii) Explain the change in the concentration of glucose as it passes down the nephron.

.....

.....

.....

..... [2]

(iii) Line **X** shows the volume of water in the fluid when the person is in an area where the temperature is low.

Line **Y** shows the volume of water in the fluid when the person is in an area where the temperature is high.

Suggest why there is a difference between line **X** and line **Y**.

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..... [2]

[Total: 8]

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8 A person needs energy to survive even if they are not moving.

(a) Give **two** uses of energy in a person who is **not** moving.

1 .....

2 .....

[2]

(b) The energy needed by a person who is not moving is called the basal metabolic rate.

Table 8.1 shows the basal metabolic rate for females of different ages.

Table 8.1

age /years	basal metabolic rate /kJ per kg of body mass per hour
10	5.5
30	4.2
50	3.8
70	3.6

(i) Identify the best description for how the basal metabolic rate changes as females get older.

Tick (✓) **one** box.

drops at a decreasing rate	
drops at a steady rate	
drops at an increasing rate	

[1]

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(ii) The energy needed for the basal metabolic rate is released in respiration.

6.5 kJ of energy is released per gram of glucose.

Complete the balanced symbol equation for aerobic respiration.

$C_6H_{12}O_6$ + ... → ..... + ...

[2]

(iii) A 30-year-old female has a body mass of 50 kg.

Calculate how many grams of glucose they would have to eat in one hour to provide the energy for their basal metabolic rate.

Use the information in Table 8.1 **and** in **8(b)(ii)** to help you.

Give your answer to **three** significant figures.

Space for working.

answer = ... g [3]

[Total: 8]

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9 Figure 9.1 shows a manatee.

Manatees are large animals that live in the waters around America.

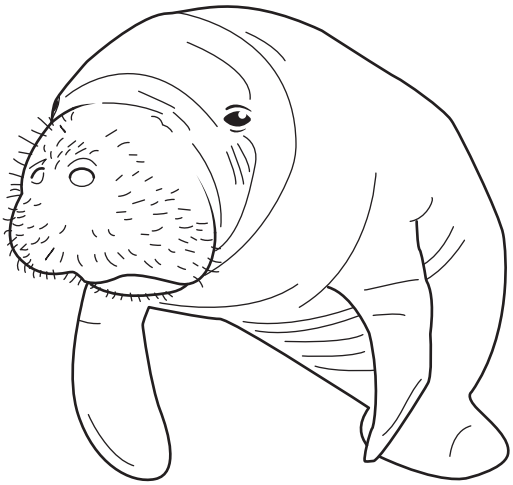


Figure 9.1

(a) Manatees are mammals.

State **three** features common to most mammals.

1 .....

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2 .....

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3 .....

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[3]

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(b) Manatee numbers are low.

They can only survive in water above 20 °C.

Much of their natural habitat has been destroyed, so many of them live in rivers near power stations.

These power stations:

- generate electricity by burning fossil fuels
- release minerals containing nitrogen into the rivers
- pump warm water into the rivers as a waste product of making electricity.

Many people want to close these power stations and use renewable ways to generate electricity.

Discuss possible advantages and disadvantages for the environment of closing these power stations.

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[Total: 10]

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