AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE BIOLOGY

F

Foundation Tier Paper 2F

Friday 7 June 2019 Afternoon Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

Answer **all** questions in the spaces provided.

Do not write outside the box

0 1 The nervous system allows a person to detect stimuli.

0 1 . 1 Draw **one** line from each stimulus to the sense organ that detects the stimulus.

[2 marks]

Stimulus	Sense organ
Chemicals	Ear
Light	Eye
	Tongue

Moving a hand away from a hot object is an example of a reflex action.

0 1 . 2 What is a reflex action?

[2 marks]

Do not write outside the box

0 1 . 3 A muscle in the arm moves the hand away from the hot object.

How does the arm muscle do this?

[1 mark]

Tick (✓) **one** box.

The muscle contracts. ☐

The muscle expands. ☐

The muscle relaxes. ☐

The muscle shrinks. ☐

Question 1 continues on the next page

Two students investigated the effect of drinking coffee on reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 1**.
2. Student **A** lets go of the metre rule.
3. Student **B** catches the metre rule as quickly as possible.
4. Student **A** writes down the reading from the scale on the metre rule.
5. Students **A** and **B** repeat steps 1–4 another four times.
6. Student **B** then drinks a cup of coffee.
7. After 15 minutes, students **A** and **B** repeat steps 1–5.

Figure 1

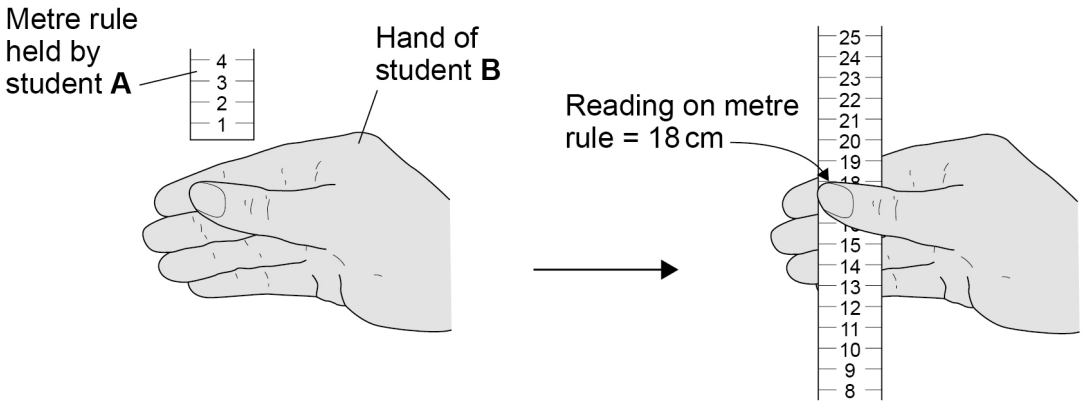


Table 1 shows some of the results.

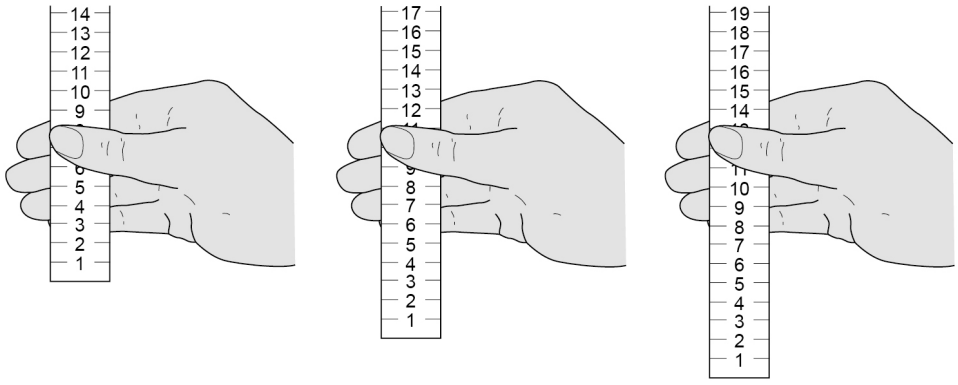
Table 1

Test	Reading from scale on metre rule in cm	
	Before drinking coffee	**After drinking coffee**
1	18	10
2	21	14
3	15	
4	12	
5	19	

Do not write outside the box

Figure 2 shows the results **after** drinking the coffee for tests **3**, **4** and **5**.

Figure 2



Test 3 **Test 4** **Test 5**

0 1 . 4 Complete **Table 1**.

Use results from **Figure 2**.

[2 marks]

The students made the following conclusion:

'Drinking coffee speeds up reactions.'

0 1 . 5 Give evidence from **Table 1** to support the students' conclusion.

[1 mark]

_____

_____

0 1 . 6 The students' conclusion may **not** be valid.

Suggest **two** improvements the students could make to their method.

[2 marks]

1 _____

_____

2 _____

_____

10

Turn over ►

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ANSWER IN THE SPACES PROVIDED

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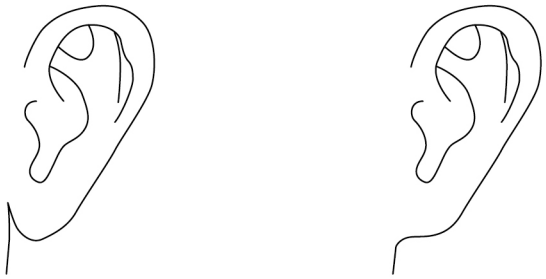
0 2 The shape of a person's earlobes is controlled by a gene.

Figure 3 shows two types of earlobe.

Figure 3



Free earlobe **Attached earlobe**

A dominant allele codes for free earlobes.

0 2 . 1 What is a dominant allele?

[1 mark]

Tick (✓) **one** box.

An allele expressed even if a person only has one copy of the allele ☐

An allele expressed only if a person has two copies of the allele ☐

An allele expressed only if a person has no recessive allele ☐

An allele expressed only if it is inherited from the male parent ☐

Question 2 continues on the next page

Do not write outside the box

0 2 . 2 A man with free earlobes and a woman with attached earlobes have children together.

Complete **Figure 4** to show the possible genotypes of the children.

Use the symbols:

E = allele for free earlobes
e = allele for attached earlobes

[2 marks]

Figure 4

Woman

Man		**e**	**e**
	E	**Ee**	
	e		

0 2 . 3 What is the probability that one of the children would have attached earlobes?

Use **Figure 4**.

[1 mark]

Tick (✓) **one** box.

0.125 ☐ 0.25 ☐ 0.5 ☐ 0.75 ☐

Do not write outside the box

0 2 . 4 **Figure 5** shows the inheritance of the sex chromosomes, **X** and **Y**.

Complete **Figure 5** to show the sex chromosomes in the gametes of the man and the woman.

[2 marks]

Figure 5

		Woman	
Man		**XX**	**XX**
		XY	**XY**

0 2 . 5 Calculate the probability that the man and the woman's next child will be a girl with attached earlobes.

[2 marks]

Use the equation:

probability of a girl with attached earlobes

= probability of attached earlobes × probability of being a girl

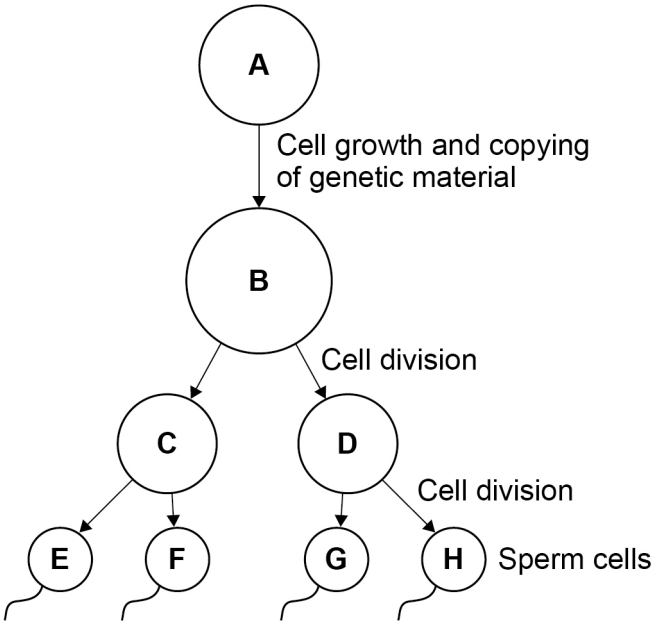
Probability of a girl with attached earlobes = _____

8

Do not write outside the box

0 3 **Figure 6** shows the production of sperm cells in humans.

Figure 6



0 3 . 1 Cell **A** is a normal body cell.

How many chromosomes are there in cell **A**?

[1 mark]

Tick (✓) **one** box.

23 ☐ 46 ☐ 48 ☐ 92 ☐

0 3 . 2 What is the mass of DNA in cell **E**?

[1 mark]

Tick (✓) **one** box.

A quarter of the mass of the DNA in cell **A** ☐

Half the mass of the DNA in cell **A** ☐

The same mass as the DNA in cell **A** ☐

Twice the mass of the DNA in cell **A** ☐

Do not write outside the box

0 3 . 3 What type of cell division produces sperm cells?

[1 mark]

Tick (✓) **one** box.

Binary fission ☐

Differentiation ☐

Meiosis ☐

0 3 . 4 Sometimes there are errors in copying the genetic material.

What term describes an error in the genetic material?

[1 mark]

Tick (✓) **one** box.

Absorption ☐

Fertilisation ☐

Mitosis ☐

Mutation ☐

0 3 . 5 A woman has three children, aged 4, 6 and 9 years.

Why are the children **not** genetically identical?

[2 marks]

Do not write outside the box

In sexual reproduction, a sperm cell fuses with an egg cell to form a new single cell.

An embryo develops from the single cell.

The cell divides three times to produce the embryo.

0 3 . 6 How many cells are there in the embryo after three cell divisions?

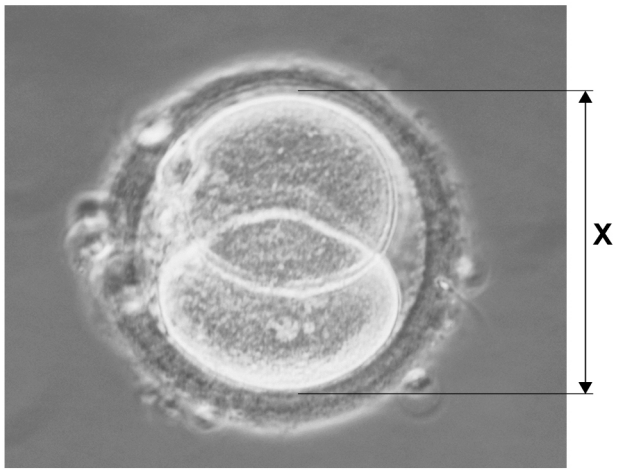
[1 mark]

Tick (✓) **one** box.

3 ☐ 6 ☐ 8 ☐ 9 ☐

Figure 7 shows a different human embryo.

Figure 7



0 3 . 7 Measure image length **X** on **Figure 7**.

[1 mark]

Give your answer in millimetres (mm).

X = _____ mm

Do not write outside the box

0 3 . 8 The image in **Figure 7** has been magnified ×500

Calculate the real length of the embryo.

Use the equation:

$$\text{real length of the embryo} = \frac{\text{image length}}{\text{magnification}}$$

Give your answer in micrometres (μm).

1 mm = 1000 μm

[3 marks]

Real length of the embryo = _____ μm

0 3 . 9 The embryo may **not** implant in the lining of the uterus.

The embryo will then be lost from the woman's body several days later.

Explain why the woman may **not** notice this has happened.

[2 marks]

13

Turn over for the next question

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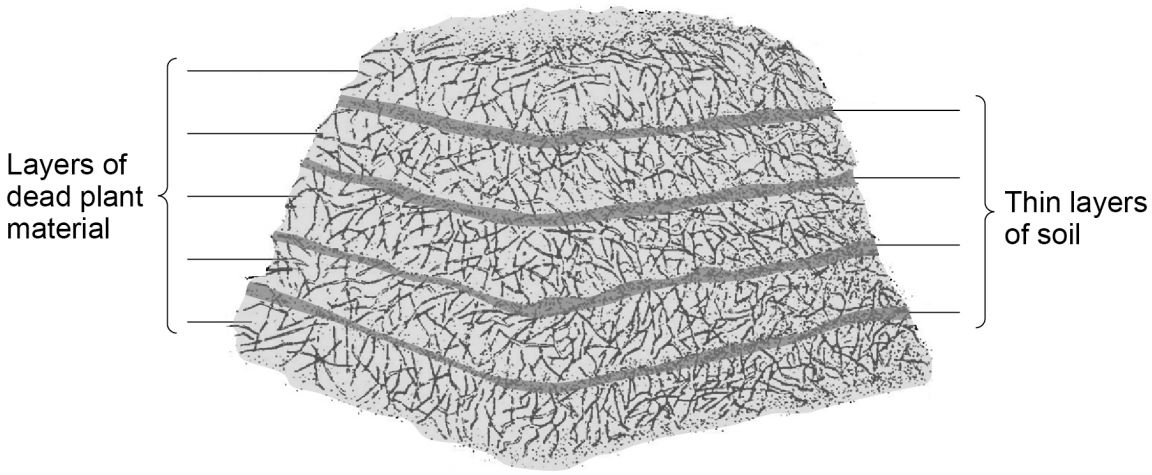
0 4 Gardeners sometimes make compost heaps from dead plant material.

The dead plants decay in the compost heap.

Figure 8 shows a compost heap.

Figure 8



0 4 . 1 The thin layers of soil contain organisms that cause decay.

Which **two** types of organism cause decay?

[2 marks]

Tick (✓) **two** boxes.

Bacteria ☐

Fungi ☐

Grass ☐

Insects ☐

Worms ☐

Do not write outside the box

The rate of decay in the compost heap depends on several environmental factors.

0 4 . 2 Explain how the rate of decay would be affected by:

- an increase in oxygen concentration
- a temperature increase from 5 °C to 25 °C

[3 marks]

0 4 . 3 Give **one** environmental factor needed for decay.

Do **not** refer to oxygen or temperature in your answer.

[1 mark]

Question 4 continues on the next page

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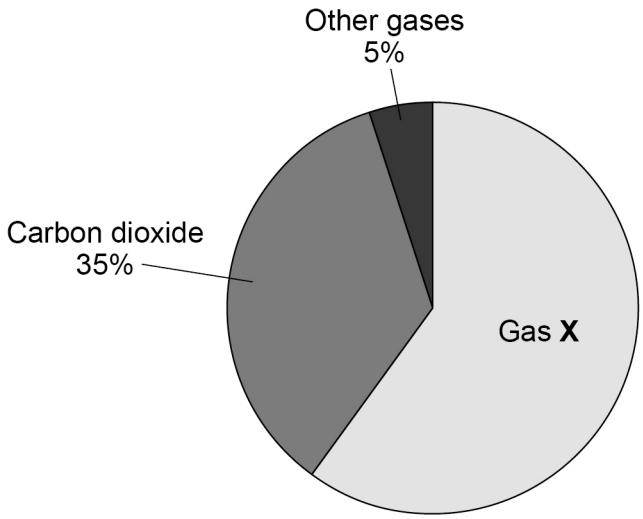
Dead plant material can also be decayed in a biogas generator.

Figure 9 shows the percentages of the gases found in a sample of biogas.

Figure 9



0 4 . 4 Gas **X** is the main fuel gas found in the biogas.

What is gas **X**?

[1 mark]

Tick (✓) **one** box.

Carbon monoxide ☐

Hydrogen ☐

Methane ☐

Nitrogen ☐

Do not write outside the box

0 4 . 5 What is the percentage of gas **X** in the biogas?

[1 mark]

Percentage = _____ %

0 4 . 6 The dead plant material in the compost heap and biogas generator does **not** decay completely.

Explain why a farmer might spread the remaining dead plant material onto his fields.

[2 marks]

10

Turn over for the next question

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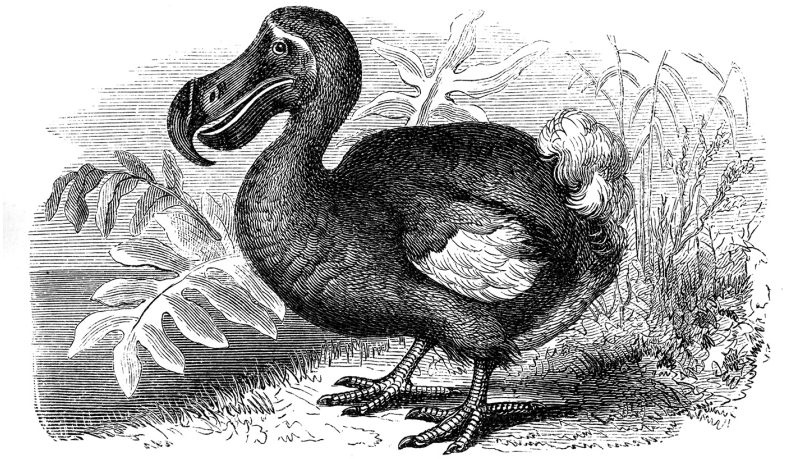
0 5 **Figure 10** shows a flightless bird called the dodo (*Raphus cucullatus*).

Figure 10



The dodo:

- was 1 m tall
- had a mass of 20 kg
- lived in rainforests on a tropical island
- ate fruits
- made its nest on the ground.

A female dodo laid only one egg each year.

Humans arrived on the island in the year 1507. By 1681 the dodo was extinct.

0 5 . 1 What is the genus of the dodo?

[1 mark]

Tick (✓) **one** box.

Animal ☐

Bird ☐

Raphus ☐

Do not write outside the box

0 5 . 2 Before the arrival of humans, there were no other large animals living on the island.

Suggest **two** reasons why the dodo became extinct soon after the arrival of humans.

[2 marks]

1 _____

_____

2 _____

_____

Today, humans are cutting down large areas of tropical rainforests.

0 5 . 3 Suggest **one** use of the land after the trees have been removed.

[1 mark]

_____

_____

0 5 . 4 Why does the removal of trees cause an increase in carbon dioxide in the atmosphere?

[2 marks]

Tick (✓) **two** boxes.

There are fewer animals. ☐

There is less photosynthesis. ☐

There is less respiration. ☐

The soil dries out. ☐

The trees are burned. ☐

Do not write outside the box

0 5 . 5 What effect would an increase in carbon dioxide in the atmosphere have on global air temperature?

[1 mark]

Tick (✓) **one** box.

Decrease ☐

Increase ☐

Stay the same ☐

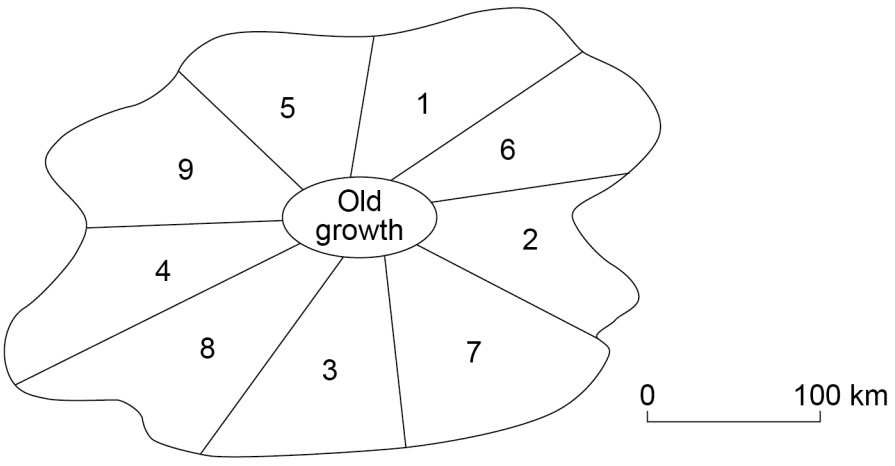
'Sustainable forestry' reduces the harmful effects of cutting down trees on the environment.

Figure 11 shows a method of 'sustainable forestry'.

Numbers 1–9 show different parts of a rainforest.

Figure 11

Map of the rainforest



The trees are cut down in the sequence 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9

- The trees are cut down in only one area at any one time.
- It takes 30 years to cut down the trees in each area.
- The trees in the 'Old growth' area are never cut down.

Do not write outside the box

0 5 . 6 How many years would it take to cut down the trees in all of the numbered areas in **Figure 11**?

[2 marks]

Number of years = _____

0 5 . 7 The rainforest contains:

- 750 species of trees
- 400 species of birds
- 150 species of butterflies
- many other species of plants and animals.

Explain how the pattern of cutting down trees shown in **Figure 11** stops the biodiversity of the rainforest being reduced.

[4 marks]

13

Do not write outside the box

0 6 Two of the substances the body excretes are urea and carbon dioxide.

0 6 . 1 Complete the sentence.

[1 mark]

Choose the answer from the box.

carbohydrate	**lipid**	**protein**	**salt**

A person makes a lot of urea if the person's diet contains

a lot of _____.

0 6 . 2 Why must urea be excreted from the body?

[1 mark]

_____

_____

0 6 . 3 A person produces more carbon dioxide during exercise than when resting.

Complete the sentences.

[2 marks]

Choose answers from the box.

breathing	**digestion**	**egestion**
osmosis	**respiration**	

The process that makes carbon dioxide is _____.

During exercise, extra carbon dioxide can be removed from the body by increasing

the rate of _____.

Do not write outside the box

0 6 . 4 Excess water must also be removed from the body.

If a person sweats a lot, less water will be excreted in the urine.

A healthy person did the same amount of exercise on each of 3 days.

Table 2 shows information for the 3 days.

Table 2

Day	Air temperature in °C	Volume of water consumed in cm^3	Relative amount of urine produced by the kidneys
1	30	1500	
2	20	1500	
3	15	2000	

Complete **Table 2**.

[2 marks]

Choose answers from the box.

least	medium	most

Question 6 continues on the next page

Do not write outside the box

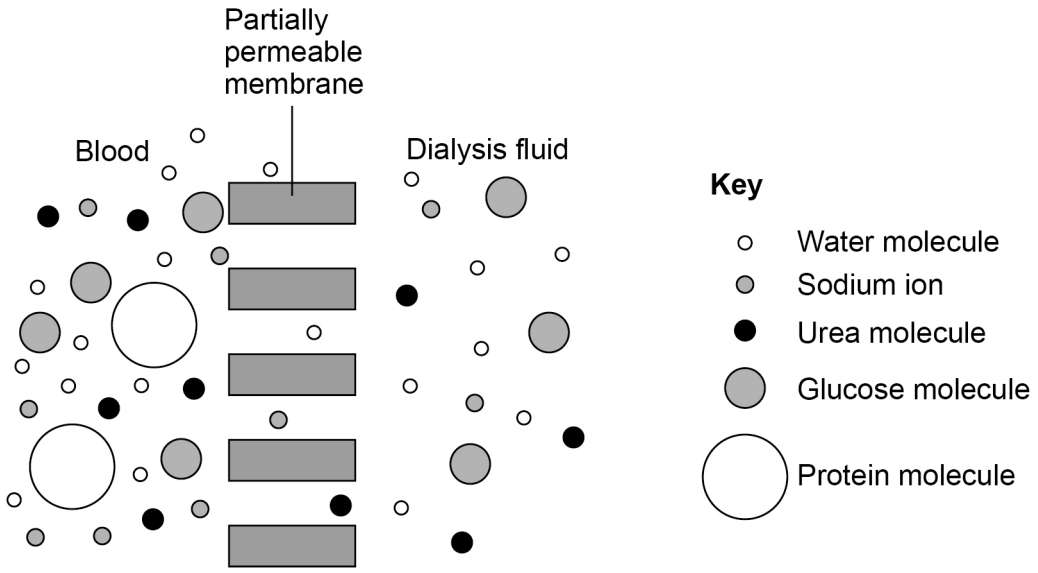
Some people have kidney disease.

Kidney disease may be treated by dialysis or by having a kidney transplant operation.

- During dialysis, a person is connected to a machine that filters the blood.
- Each dialysis session lasts about 6 hours.
- The person has several dialysis sessions each week.

Figure 12 shows how dialysis works.

Figure 12



0 6 . 5 How does urea move out of the blood during dialysis?

[1 mark]

Tick (✓) **one** box.

Diffusion ☐

Digestion ☐

Osmosis ☐

Respiration ☐

Do not write outside the box

0 6 . 6 Which substance in **Figure 12** does **not** pass from the blood into the dialysis fluid?

Give the reason for your answer.

[2 marks]

Substance _____

Reason _____

_____

Question 6 continues on the next page

Do not write outside the box

Two people have kidney disease.

- Person **A** is treated by dialysis.
- Person **B** has had a kidney transplant.

Figure 13 shows changes in the urea concentration in the blood of each person over 2 weeks.

Figure 13

0 6 . 7 How many dialysis sessions did person **A** have **each week**?

[1 mark]

_____

0 6 . 8 What happens to the concentration of urea in the blood between dialysis sessions?

[1 mark]

_____

0 6 . 9 Give **two** reasons why a kidney transplant is a better method for treating kidney disease than dialysis.

[2 marks]

1 _____

_____

2 _____

_____

13

Do not write outside the box

Turn over for the next question

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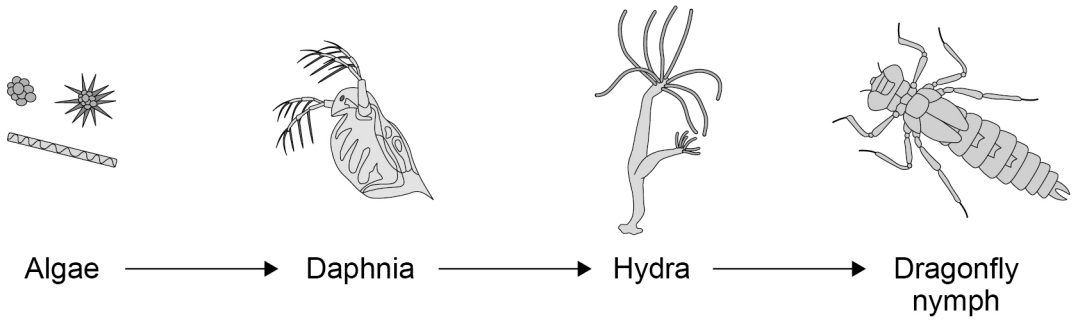
0 7 **Figure 14** shows a food chain in a pond.

Figure 14



0 7 . 1 Which term describes the Daphnia in this food chain?

[1 mark]

Tick (✓) **one** box.

Apex predator ☐

Primary consumer ☐

Producer ☐

Secondary consumer ☐

Do not write outside the box

0 7 . 2 Draw a pyramid of biomass for the food chain.

Label each trophic level.

[2 marks]

0 7 . 3 Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

[1 mark]

Question 7 continues on the next page

Do not write outside the box

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

Table 3 shows the results.

Table 3

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

0 7 . 4 Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

[2 marks]

Mean number of Daphnia in 1 m^3 of pond water = _____

Do not write outside the box

0 7 . 5 The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from Question **07.4**.

Give your answer in standard form.

[4 marks]

Number of Daphnia in the pond = _____

Question 7 continues on the next page

Do not write outside the box

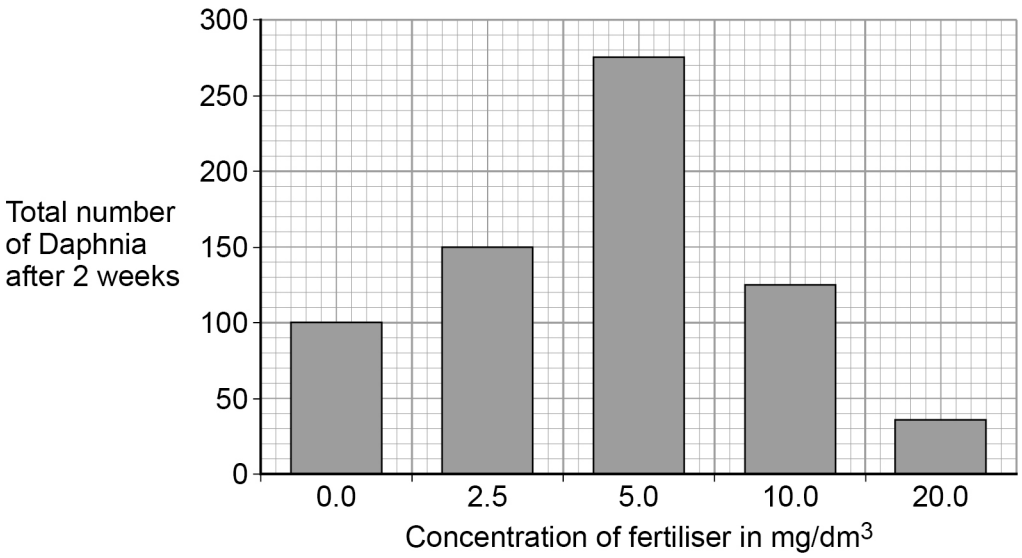
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 15 shows the results.

Figure 15



0 7 . 6 A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

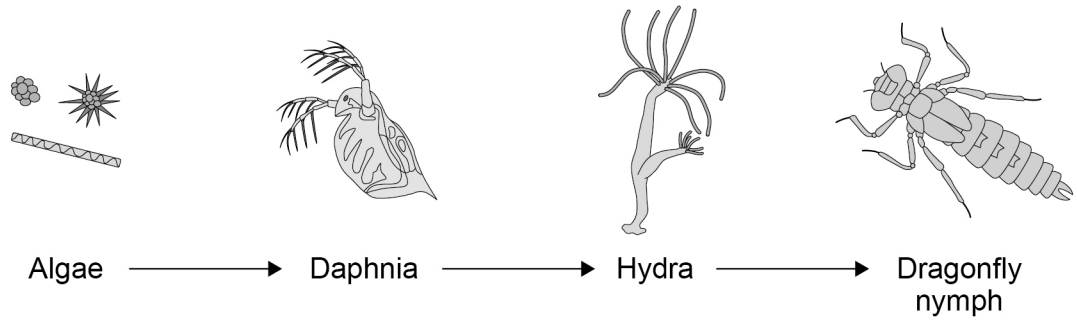
Explain why.

[2 marks]

Do not write outside the box

0 7 . 7 **Figure 14** is repeated below.

Figure 14



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

[2 marks]

14

Turn over for the next question

Do not write outside the box

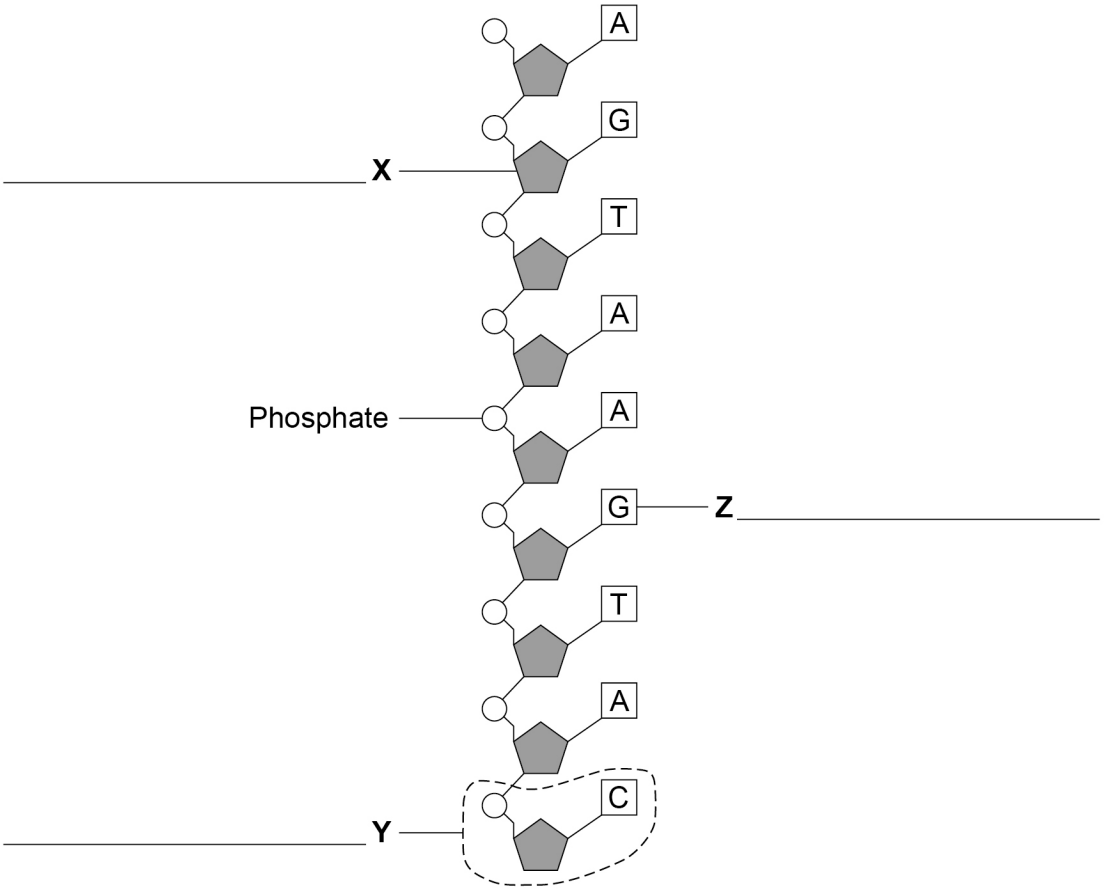
0 8 Genetic material is made of DNA.

0 8 . 1 Which structures in the nucleus of a human cell contain DNA?

[1 mark]

Figure 16 shows part of one strand of a DNA molecule.

Figure 16



0 8 . 2 Label parts **X**, **Y** and **Z** on **Figure 16**.

[3 marks]

Choose answers from the box.

Base	**Fatty acid**	**Nucleotide**	**Sugar**	**Glycerol**

Do not write outside the box

0 8 . 3 A complete DNA molecule is made of two strands twisted around each other.

What scientific term describes this structure?

[1 mark]

_____

0 8 . 4 DNA codes for the production of proteins.

A protein molecule is a long chain of amino acids.

How many amino acids could be coded for by the piece of DNA shown in **Figure 16**?

[1 mark]

Tick (✓) **one** box.

2 ☐ 3 ☐ 9 ☐ 18 ☐

0 8 . 5 Scientists have now studied the whole human genome.

Give **two** benefits of understanding the human genome.

[2 marks]

1 _____

_____

2 _____

_____

8

Turn over for the next question

Do not write outside the box

0 9 Phototropism is a growth response by part of a plant to light.

0 9 . 1 Name **one** other tropism.

Give the stimulus the plant responds to in the tropism you have named.

[2 marks]

Tropism _____

Stimulus _____

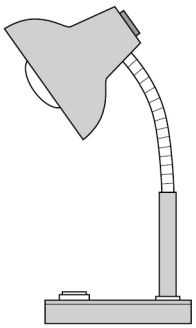
0 9 . 2 Plan an investigation to show the effect of light from one direction on the growth of plant seedlings.

Include details of any controls needed.

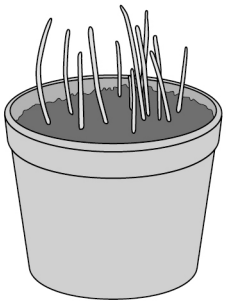
You may use some of the equipment shown in **Figure 17** and any other laboratory apparatus.

[6 marks]

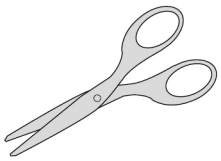
Figure 17



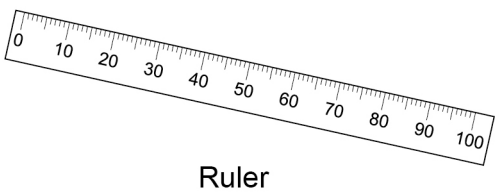
Lamp



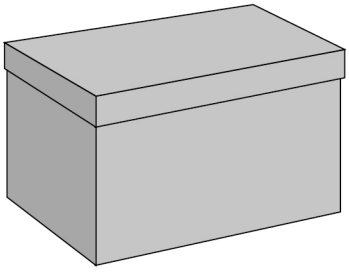
Several pots of seedlings



Scissors



Ruler



Cardboard boxes with lids

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0 9 . 3 Explain how phototropism in a plant shoot helps the plant to survive.

[3 marks]

11

END OF QUESTIONS

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