AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
SCIENCE A 2

F

Foundation Tier Unit 6

Wednesday 24 May 2017 Afternoon Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet booklet (enclosed).

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 13(a) should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
TOTAL	

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

Biology Questions

1 Green plants are at the start of food chains.

1 (a) Complete the following sentences using the correct answers from the box.

[3 marks]

chemical	**heat**	**light**	**photosynthesis**	**reproduction**	**respiration**

Green plants absorb _____ energy from the Sun.

Plants transfer this energy into _____ energy in a process called _____ .

1 (b) **Figure 1** shows a food chain.

Figure 1

lettuce ⟶ slug ⟶ hedgehog ⟶ fox

1 (b) (i) Give **one** piece of information shown by this food chain.

[1 mark]

_____

_____

1 (b) (ii) Which organism in this food chain would have the greatest biomass?

[1 mark]

Tick (✓) **one** box.

lettuce ☐

slug ☐

hedgehog ☐

fox ☐

1 (b) (iii) Give **one** way biomass is lost from a food chain.

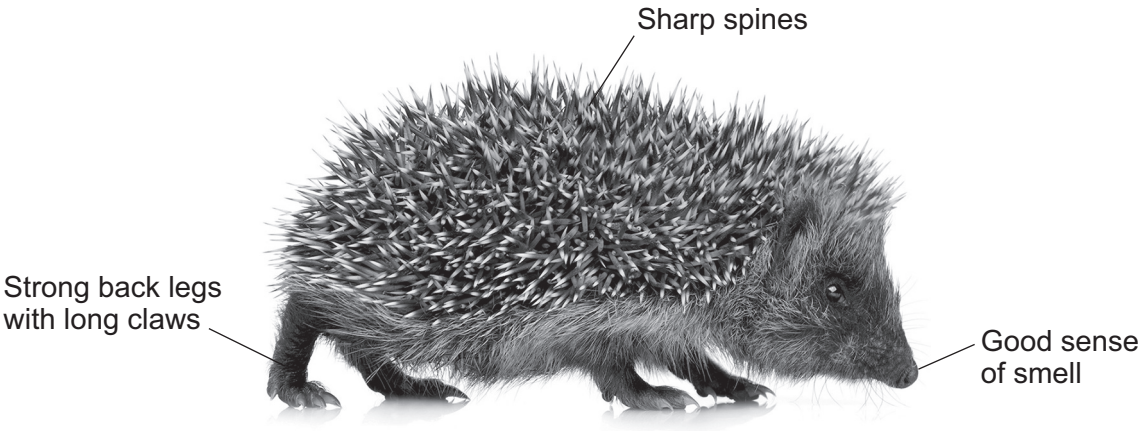
[1 mark]

_____

_____

1 (c) **Figure 2** shows some adaptations of the hedgehog.

Figure 2



1 (c) (i) How does each adaptation help the hedgehog to survive?

[3 marks]

Sharp spines _____

_____

Strong back legs with long claws _____

_____

Good sense of smell _____

_____

1 (c) (ii) In winter, hedgehogs usually hibernate. During hibernation they become inactive and their body temperature drops from about 35 °C to about 10 °C.

Suggest **one** reason why hedgehogs usually hibernate during very cold winters.

[1 mark]

_____

_____

10

2 (a) People with Type 1 diabetes do not produce the hormone insulin.

These people need to inject themselves with insulin.

Genetically engineered bacteria are used to produce large amounts of human insulin.

2 (a) (i) Draw a ring around the correct answer to complete each sentence.

[3 marks]

The gene that codes for the production of insulin is cut from the chromosome of a

bacterial cell. **fungal cell.** **human cell.** **plant cell.**

This is done using

a clone. **an embryo.** **an enzyme.** **a microorganism.**

The gene is then transferred into a

bacterial cell. **human cell.** **liver cell.** **plant cell.**

2 (a) (ii) Before genetic engineering was developed, insulin was extracted from pigs.

Suggest **one** advantage of using genetic engineering to produce insulin, instead of extracting it from pigs.

[1 mark]

_____

_____

2 (b) Every year, about 500 000 children become blind due to vitamin A deficiency.

Scientists have genetically engineered rice plants to produce rice that contains a lot of vitamin A. The rice is called Golden rice, because the rice grains are gold in colour.

Golden rice could save the sight of many children, but some people think we should **not** grow Golden rice.

Why might some people object to Golden rice being grown?

[2 marks]

Tick (✓) **two** boxes.

Not many people eat rice. ☐

Rice should not look golden. ☐

The gene may be transferred into other plant species. ☐

The rice may be harmful when eaten. ☐

Vitamin A can cause blindness. ☐

6

Turn over for the next question

3 Over time, organisms can evolve to have different characteristics.

3 (a) What is the name of the scientist who proposed the theory of evolution by natural selection?

[1 mark]

_____

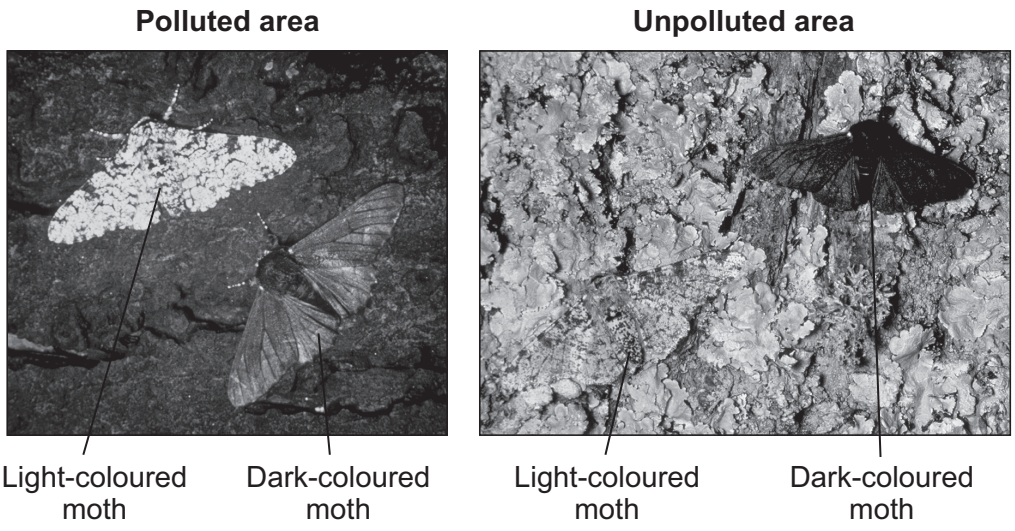
3 (b) There are many peppered moths all over Britain. Birds eat peppered moths.

Before 1848 there were only light-coloured peppered moths.

The first dark-coloured peppered moth was seen in 1848.

Figure 3 shows the two forms of peppered moth on the bark of trees in a polluted area and in an unpolluted area.

Figure 3



3 (b) (i) The dark form of peppered moth was caused by a mutation.

What is a mutation?

[1 mark]

_____

_____

3 (b) (ii) By 1895, 98% of peppered moths in Manchester were dark-coloured. Only 2% were light-coloured moths.

Use information from part **(b)** to suggest why this happened.

[3 marks]

5

Turn over for the next question

Chemistry Questions

4 This question is about the Earth and its atmosphere.

4 (a) The Earth has existed for about 4.6 billion years.

The gases in the early atmosphere came from intense volcanic activity.

When did this volcanic activity happen?

[1 mark]

Tick (✓) **one** box.

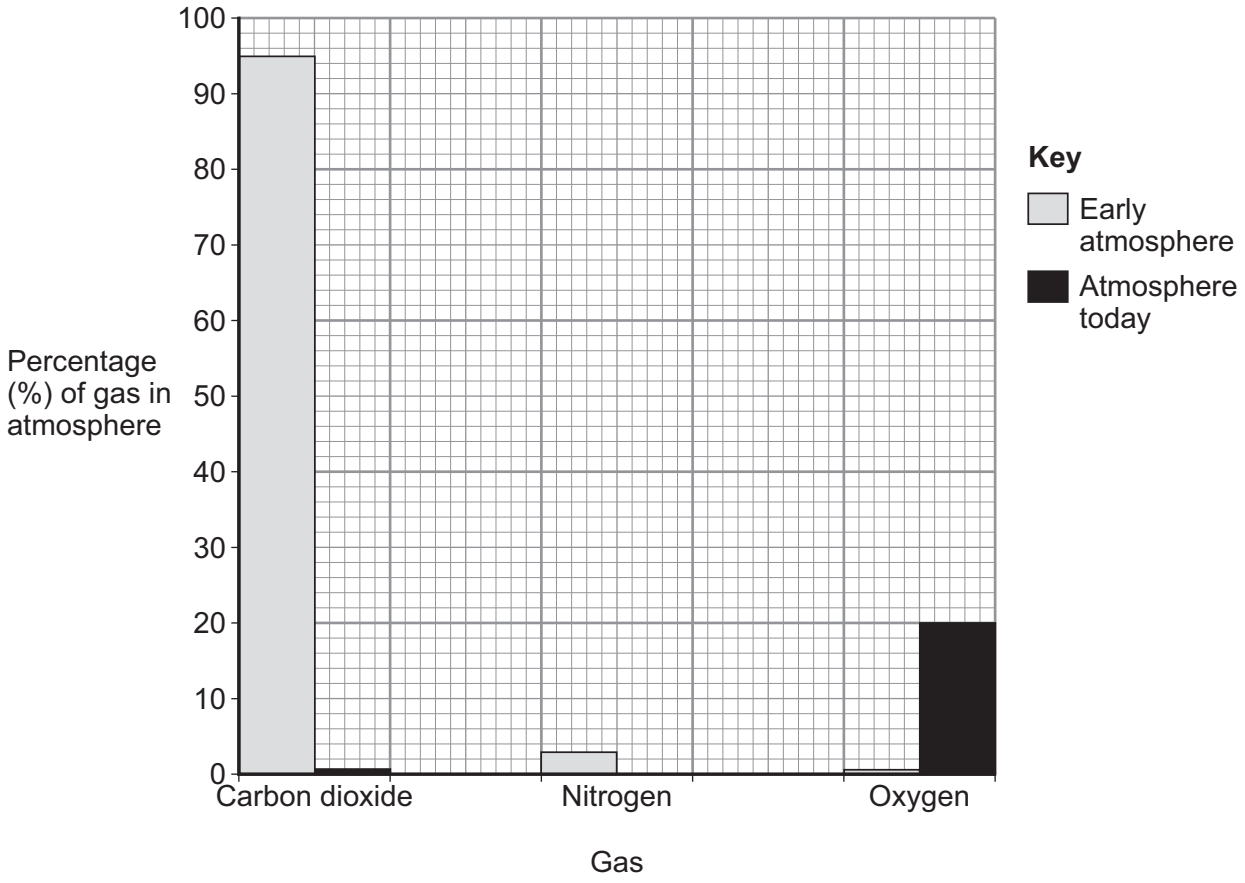
In the first billion years of the Earth's existence. ☐

In the last billion years of the Earth's existence. ☐

In the last million years of the Earth's existence. ☐

4 (b) **Figure 4** shows the percentages of gases in the Earth's early atmosphere and in the atmosphere today.

Figure 4



4 (b) (i) The atmosphere today contains 78% nitrogen.

Complete the bar chart in **Figure 4** to show the percentage of nitrogen today.

[1 mark]

4 (b) (ii) The percentage of carbon dioxide has **decreased** since the early atmosphere.

Give **two** reasons why.

[2 marks]

Tick (✓) **two** boxes.

burning of fossil fuels ☐

continental drift ☐

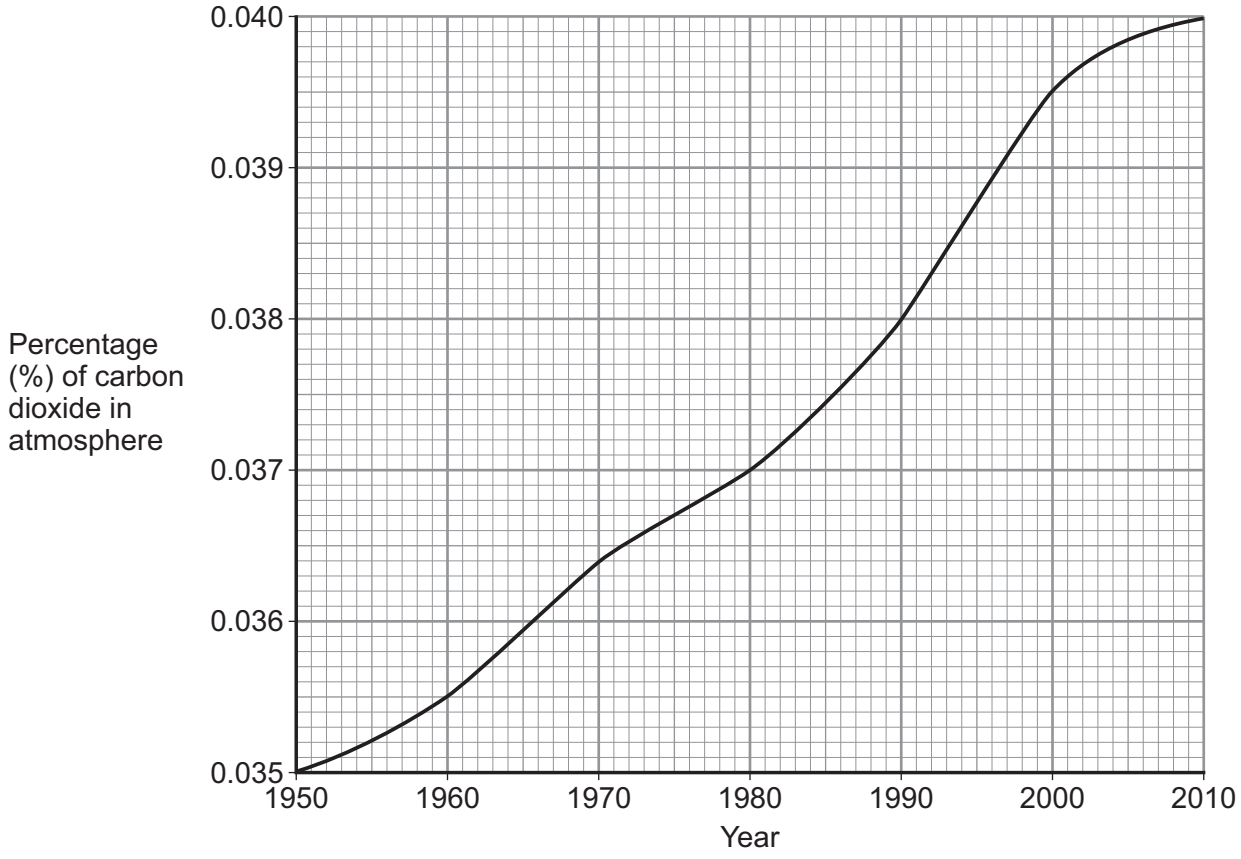
dissolved in oceans ☐

locked up in rocks ☐

Question 4 continues on the next page

4 (c) **Figure 5** shows the percentage of carbon dioxide in the atmosphere from 1950 to 2010.

Figure 5



Describe the pattern shown in **Figure 5**.

[2 marks]

4 (d) (i) Use the correct answers from the box to complete the sentence.

[2 marks]

atmosphere	**core**	**crust**	**mantle**

Tectonic plates were formed by the cracking of the Earth's

_____ and upper part of the _____ .

4 (d) (ii) On the Earth today, volcanoes are found at the boundaries between tectonic plates.

Name **one** other event that takes place at the boundaries between tectonic plates.

[1 mark]

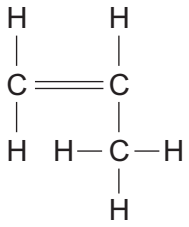
_____

9

Turn over for the next question

5 (a) **Figure 6** shows the displayed formula of propene.

Figure 6



5 (a) (i) Complete the molecular formula of propene.

[1 mark]

C_3

5 (a) (ii) What does C ═ C represent?

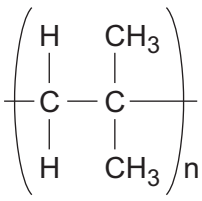
[1 mark]

5 (a) (iii) Poly(propene) is produced from propene.

Which diagram shows the structure of poly(propene)?

[1 mark]

Tick (✓) **one** box.



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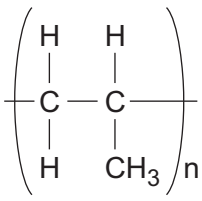

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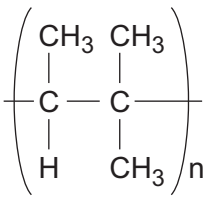
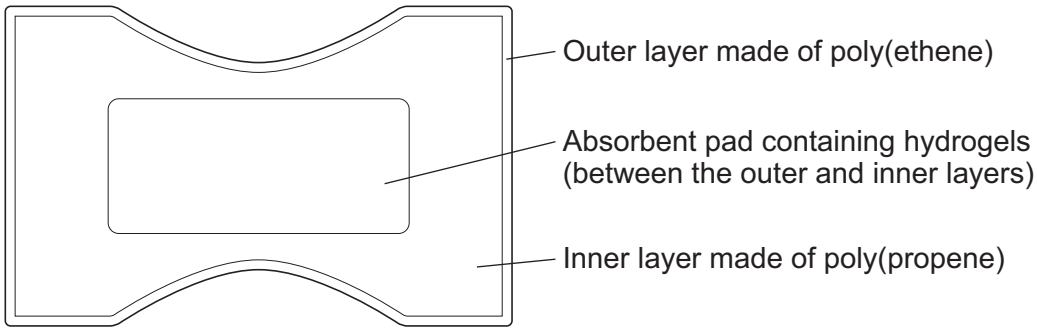


☐

5 (b) Disposable nappies are used to absorb a baby's urine.

Figure 7 shows the structure of a disposable nappy.

Figure 7



Disposable nappies are only used once.

360 000 tonnes of disposable nappies are sent to landfill sites every year.

Some disposable nappies now use a plastic made from cornstarch as the outer layer rather than poly(ethene).

5 (b) (i) What is the name of the monomer used to make poly(ethene)?

[1 mark]

_____

5 (b) (ii) The raw material for poly(ethene) is crude oil. Cornstarch comes from plants.

Explain **two** environmental advantages of using a plastic made from cornstarch rather than poly(ethene).

You should use the terms biodegradable, landfill and renewable in your answer.

[4 marks]

Advantage 1 _____

_____

_____

_____

Advantage 2 _____

_____

_____

_____

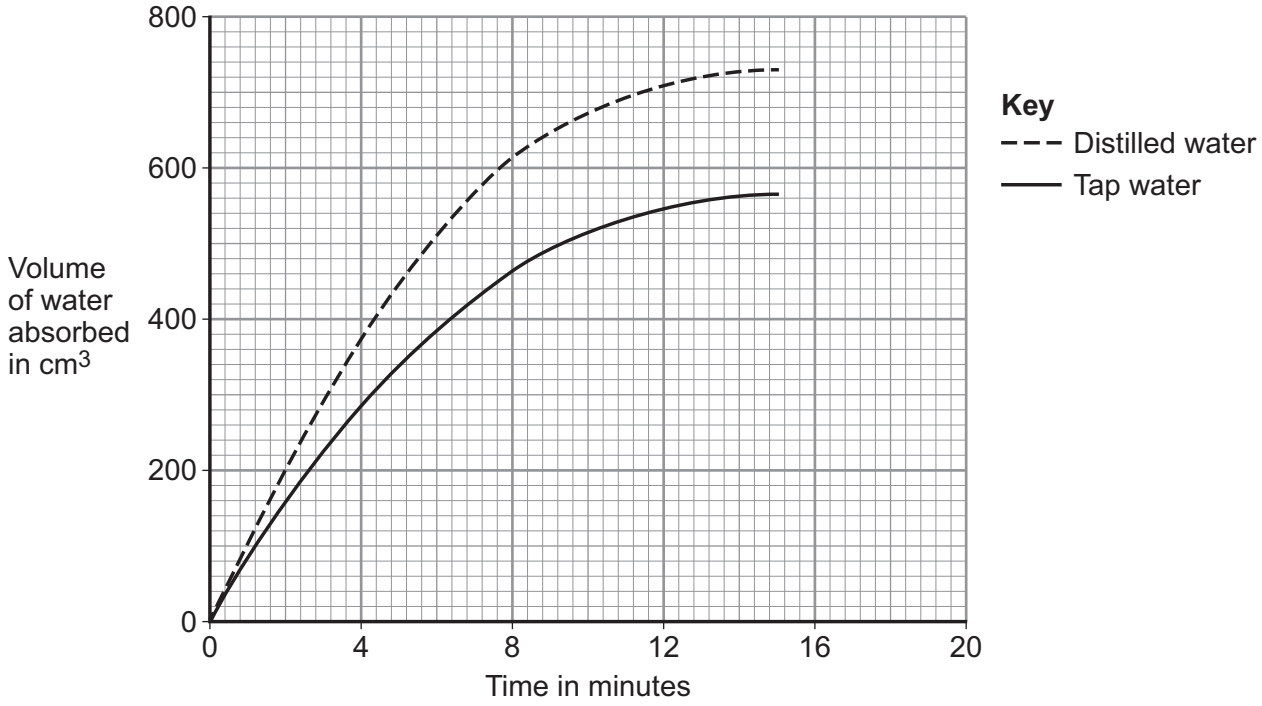
5 (c) A student investigated the volume of water absorbed by one type of hydrogel.

The student used two types of water, distilled water and tap water.

The water was at body temperature.

Figure 8 shows the student's results.

Figure 8



5 (c) (i) The student controlled some variables.

These variables were kept the same to make the investigation a fair test.

Which **one** is a control variable in this investigation?

[1 mark]

Tick (✓) **one** box.

mass of hydrogel used ☐

type of water ☐

volume of water absorbed ☐

5 (c) (ii) Give **two** conclusions that can be made from the graph in **Figure 8**.

[2 marks]

1 _____

_____

2 _____

_____

5 (c) (iii) How could the investigation be changed to make the results useful to a manufacturer of disposable nappies?

[1 mark]

Tick (✓) **one** box.

Continue the investigation for 20 minutes. ☐

Do the investigation at different temperatures. ☐

Do the investigation using urine. ☐

12

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

Physics Questions

6 Fossil fuels are used in many power stations to generate electricity.

6 (a) Use the correct answer from the box to complete each sentence.

[3 marks]

boiler	**generator**	**reactor**	**turbine**

In a fossil fuel power station, water is heated to make steam in the

_____ .

The steam is used to drive the _____ .

Electricity is produced in the _____ .

6 (b) Fossil fuels are called non-renewable energy sources because they will run out one day.

Hydroelectric power is called a renewable energy source because it will not run out.

Give **two** other examples of renewable energy sources.

[2 marks]

1 _____

2 _____

5

Turn over for the next question

7 Water waves, light and sound are examples of waves.

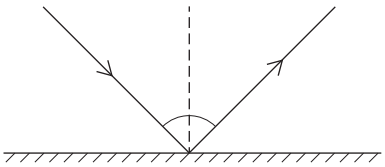
Waves can be diffracted, reflected and refracted.

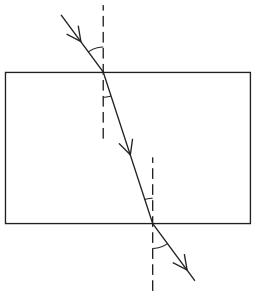
7 (a) A teacher draws three diagrams to show diffraction, reflection and refraction.

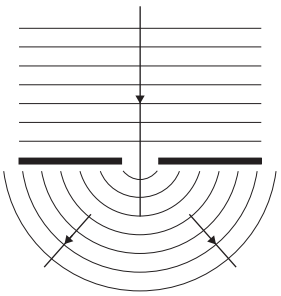
Use the correct word from the box to label each diagram.

[2 marks]

Diffraction	**Reflection**	**Refraction**







_____ _____ _____

7 (b) Sound waves can be diffracted, reflected and refracted.

Which statement below is also true for sound waves?

[1 mark]

Tick (✓) **one** box.

Sound waves are electromagnetic waves. ☐

Sound waves travel as transverse waves. ☐

Sound waves all have the same amplitude. ☐

Sound waves need particles to travel. ☐

7 (c) **Table 1** shows the speed of sound in different materials.

Table 1

Material	Speed of sound in m/s
Oxygen	326
Carbon dioxide	267
Steel	5900
Wood	4000

7 (c) (i) From the information in **Table 1**, what conclusion can you make about the speed of sound in solids compared to gases?

[1 mark]

_____

_____

7 (c) (ii) A sound wave has a frequency of 1600 Hz and a wavelength of 2.5 m in a material.

Calculate the speed of sound in this material.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

_____

Speed of sound = _____ m/s

7 (c) (iii) Use **Table 1** to determine which material the sound wave in part **(c)(ii)** is passing through.

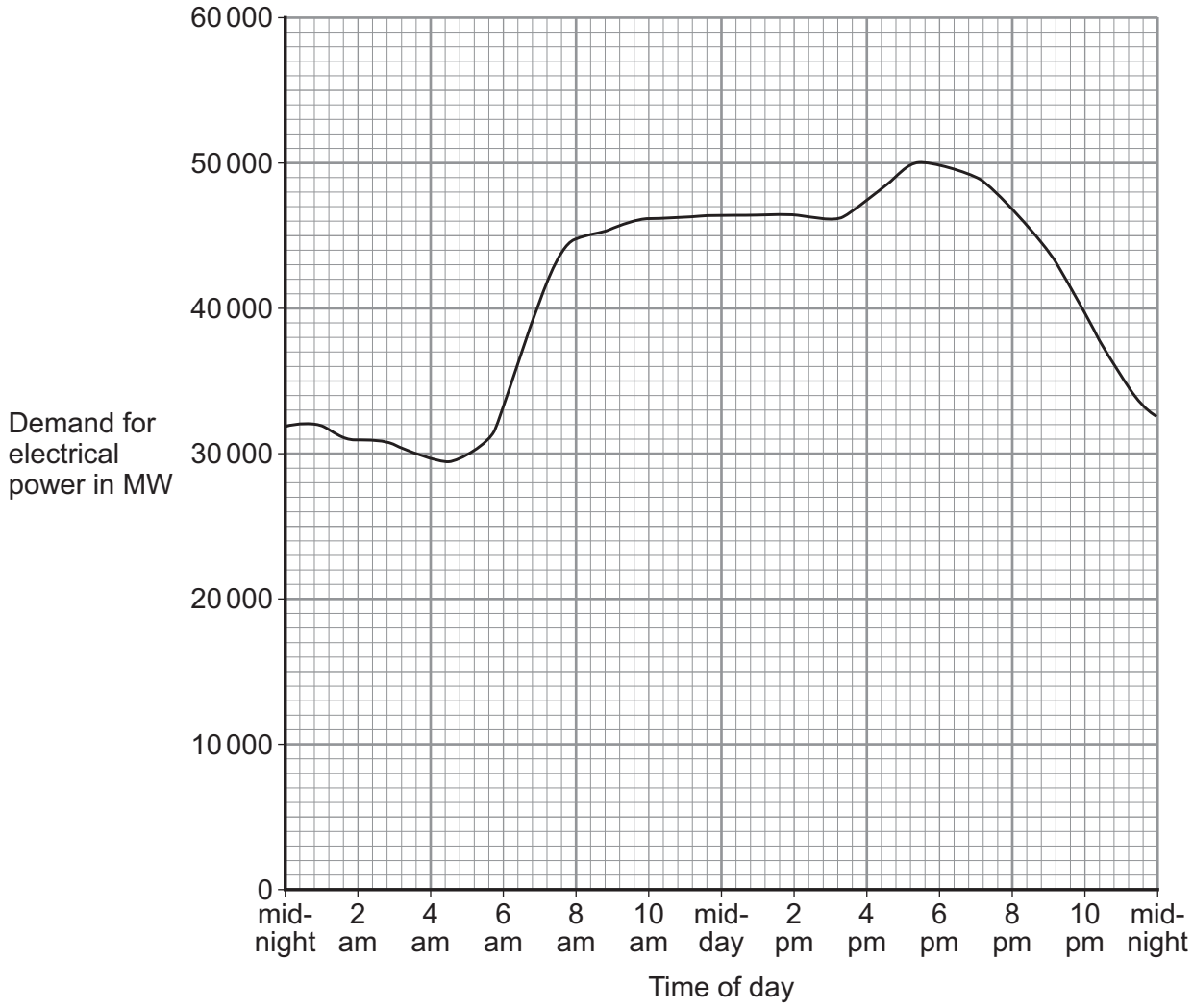
[1 mark]

Material = _____

7

8 **Figure 9** shows the demand for electrical power in the UK for one day in January.

Figure 9



8 (a) (i) What is the maximum power demand during the day?

[1 mark]

Maximum power demand = _____ MW

8 (a) (ii) Suggest **one** reason why there is a sudden increase in power demand between 6 am and 8 am.

[1 mark]

_____

_____

8 (a) (iii) Suggest why hydroelectric power can be used to meet this sudden power demand.

[1 mark]

8 (b) The power demand would be different for a day in July.

Suggest how the power demand would be different.

Give a reason for your answer.

[2 marks]

5

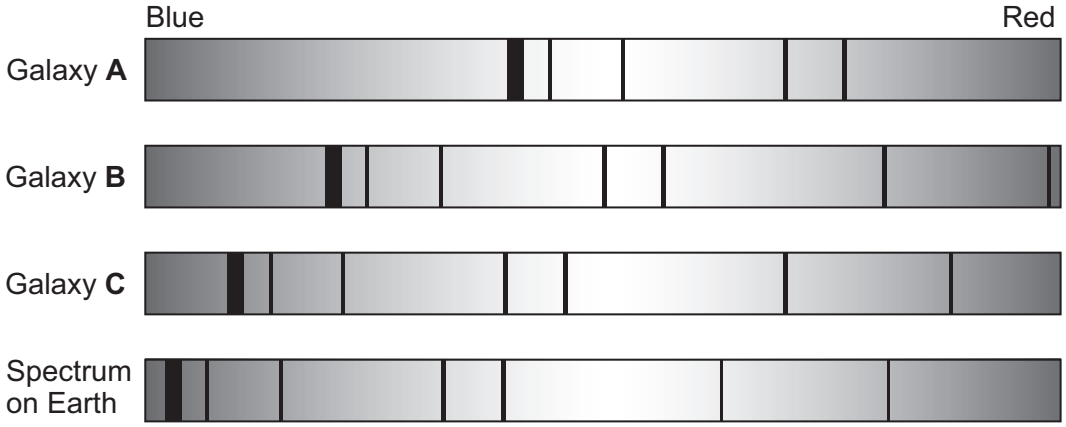
Turn over for the next question

9 **Figure 10** shows:

- the spectra of light received on Earth from distant galaxies, **A**, **B** and **C**
- the spectrum of light from a source on Earth.

The light from distant galaxies is red-shifted.

Figure 10



9 (a) (i) What does red-shift tell us about the movement of these galaxies?

[1 mark]

Tick (✓) **one** box.

They are moving towards the Earth. ☐

They are moving away from the Earth. ☐

They are not moving relative to the Earth. ☐

9 (a) (ii) Red-shift also gives us information about the speed at which galaxies are moving.

Which galaxy, **A**, **B** or **C**, is moving the fastest?

[2 marks]

Galaxy _____

Give a reason for your answer.

_____

_____

9 (b) Use the correct answer from the box to complete the sentence.

[1 mark]

contracting	**expanding**	**staying the same size**

The movement of these galaxies gives scientists evidence that the

Universe is _____ .

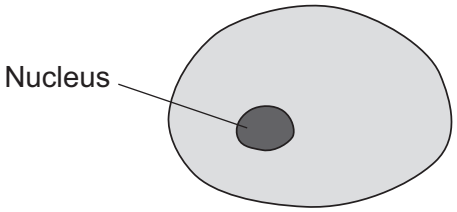
4

Turn over for the next question

Biology Questions

10 **Figure 11** shows an animal cell.

Figure 11



10 (a) Describe what is inside the nucleus.

[2 marks]

10 (b) Give **one** function of the nucleus.

[1 mark]

3

11 Scientists investigated the distribution of one type of lichen growing on the bark of red fir trees and white fir trees.

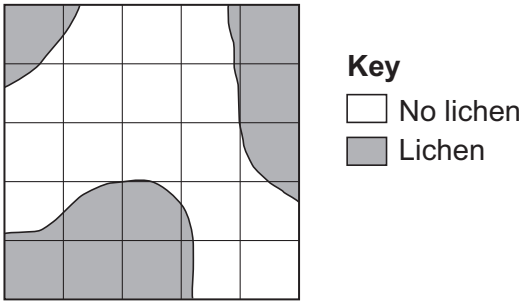
The scientists used a sampling square called a quadrat to estimate the percentage cover of lichen.

Each quadrat was divided into 25 smaller squares.

Only the squares in which the lichen covered more than half the square were counted. This number of squares was then used to calculate the percentage cover of lichen in the whole quadrat.

Figure 12 shows the lichen growing in one quadrat.

Figure 12



11 (a) Count the number of squares in which the lichen covered more than half the square.

Use this number to calculate the percentage cover of lichen in the quadrat shown in **Figure 12**.

[2 marks]

Percentage cover = _____ %

Question 11 continues on the next page

11 (b) The scientists:

- sampled 20 red fir trees and 20 white fir trees
- measured the percentage cover of lichen three times on the north-east, south-east, south-west and north-west sides of each tree
- calculated the mean percentage cover for each side.

Figure 13 shows the sides of the trees sampled.

Figure 13

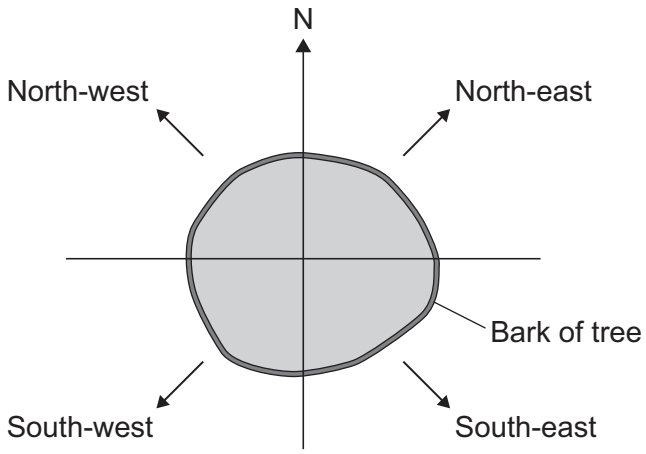
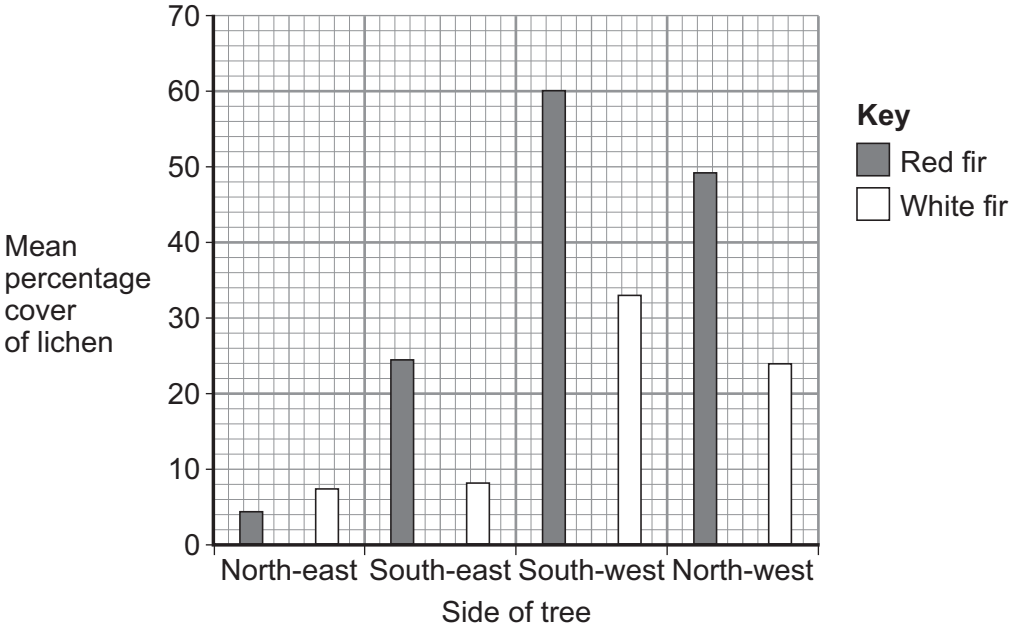


Figure 14 shows the scientists' results.

Figure 14



11 (b) (i) Look at **Figure 14**.

Where on the trees was there the most lichen?

[1 mark]

Tick (✓) **one** box.

North side ☐

South side ☐

East side ☐

West side ☐

11 (b) (ii) The direction the bark is facing affects the distribution of the lichen growing on the trees.

Give **one** other conclusion that can be made from **Figure 14**.

[1 mark]

_____

_____

11 (b) (iii) Suggest **two** factors that could affect the distribution of the lichen growing on the trees.

[2 marks]

1 _____

2 _____

6

Turn over for the next question

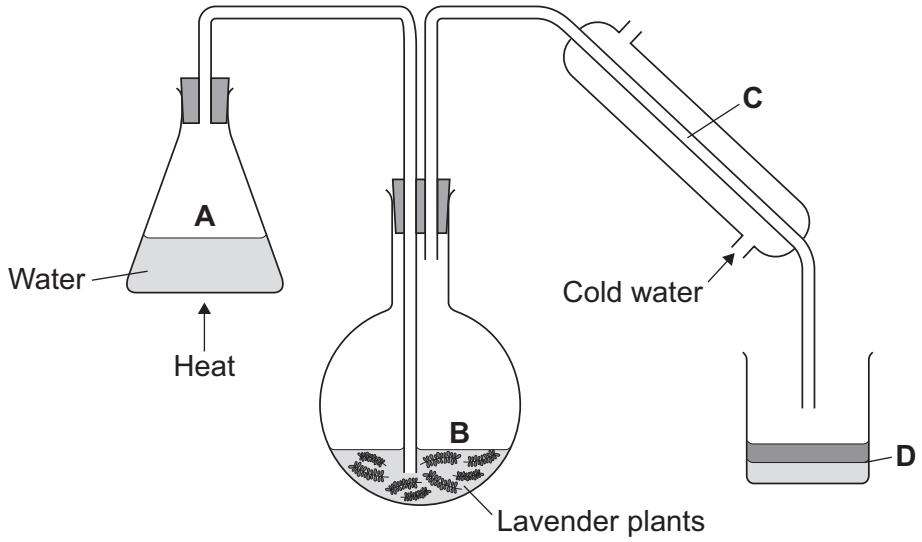
Chemistry Questions

12 This question is about plant oils.

12 (a) Lavender oil can be separated from lavender plants by steam distillation.

Figure 15 shows the apparatus used in steam distillation.

Figure 15



At **B**, the lavender oils are vaporised.

12 (a) (i) What is produced at **A**?

[1 mark]

_____

12 (a) (ii) Which process happens at **C**?

[1 mark]

_____

12 (a) (iii) Describe what happens at **D**.

[1 mark]

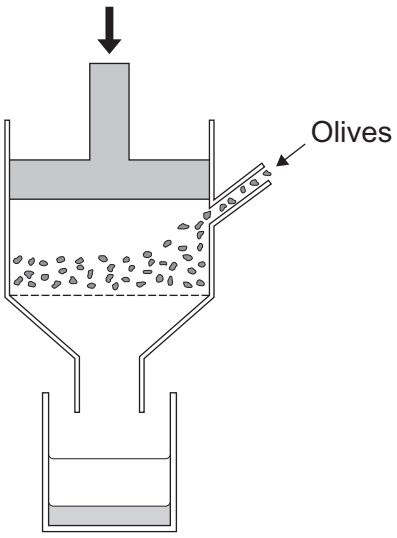
_____

_____

12 (b) Olive oil is separated by a different method.

Figure 16 shows the apparatus used.

Figure 16



What is the name of this method?

[1 mark]

Question 12 continues on the next page

12 (c) Evidence suggests that unsaturated oils are healthier to eat than saturated oils.

A student investigated the amount of unsaturation in different samples of olive oil using bromine water.

12 (c) (i) What is the colour change when bromine water reacts with an unsaturated oil?

Complete the sentence.

[1 mark]

Bromine water changes from _____ to colourless.

12 (c) (ii) **Figure 17** shows the apparatus the student used.

Figure 17

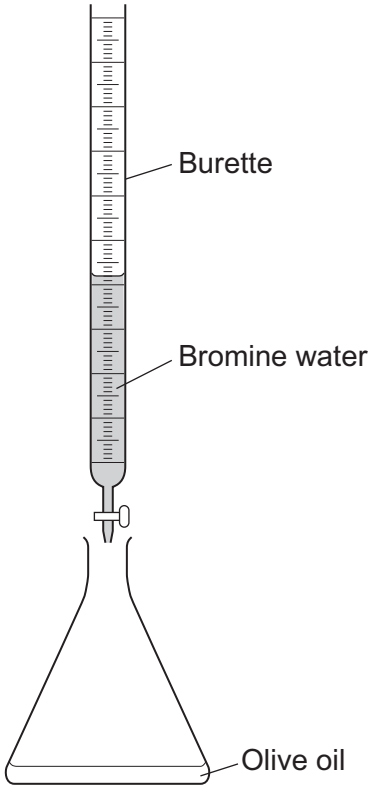


Table 2 shows the student's results.

Table 2

Olive oil sample	Number of drops of bromine water added until olive oil changes colour				
	Test 1	**Test 2**	**Test 3**	**Test 4**	**Mean**
A	20	21	19	20	20
B	25	14	26	24	25
C	12	15	16	13	14

Describe how the student calculated the mean for olive oil **B**.

[2 marks]

12 (c) (iii) The student concluded:

'Olive oil **C** is the healthiest to use because it is the most unsaturated.'

The student's conclusion is **not** correct.

Explain why.

[2 marks]

9

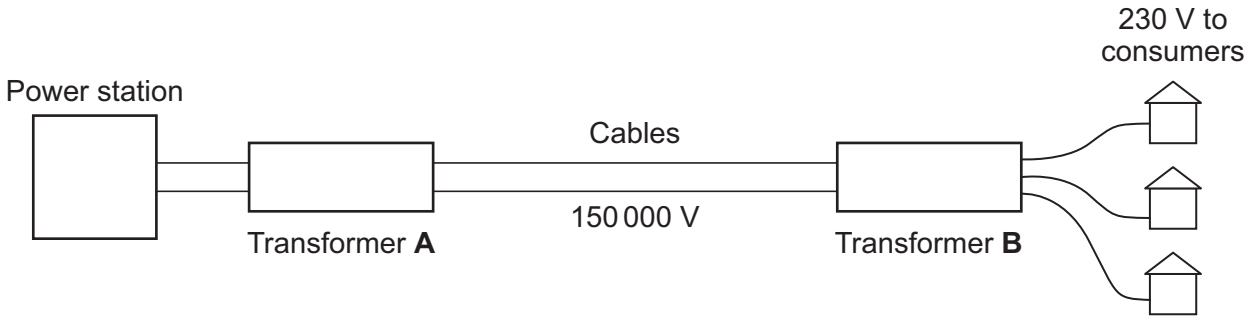
Turn over for the next question

Physics Questions

13 The National Grid is used to distribute electricity from power stations to consumers.

Figure 18 shows the main parts of the National Grid.

Figure 18



13 (a) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe how electrical energy from the power station is distributed to consumers via the National Grid.

In your answer you should explain why the National Grid includes transformers **A** and **B**.

[6 marks]

Extra space _____

13 (b) Some cables in the National Grid are placed underground.

Give **one** advantage of using underground cables instead of overhead cables.

[1 mark]

13 (c) Some people who live near overhead cables are concerned about the possible effects on their health.

Suggest what should be done to investigate these concerns.

[2 marks]

9

END OF QUESTIONS

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