

| | | | | | | | | | | |
|---------------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre Number | | | | | | Candidate Number | | | | |
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| | |
|---------------------|------|
| For Examiner's Use | |
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| TOTAL | |



General Certificate of Secondary Education
Foundation Tier
June 2015

Science A 2

SCA2FP

Unit 6

F

Friday 12 June 2015 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet booklet (enclosed).

Time allowed

- 1 hour 30 minutes

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(b) 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.



J U N 1 5 S C A 2 F P 0 1

G/TI/111158/Jun15/E4

SCA2FP

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



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

Biology Questions

1 (a) Animals have adaptations which help them to survive in their habitat.

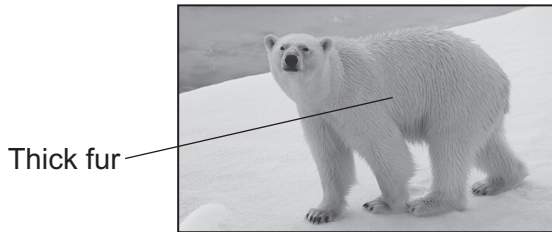
The pictures show adaptations of three animals.

Draw **one** line from each animal to how the labelled adaptation helps the animal to survive.

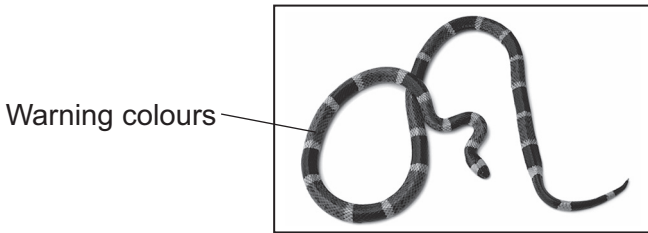
[3 marks]

Animal

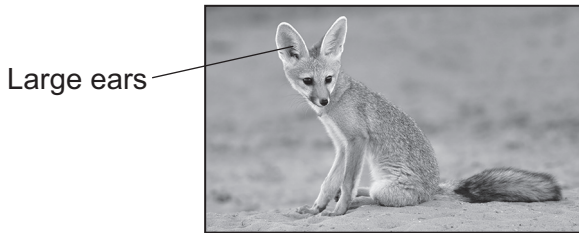
How the labelled adaptation helps the animal to survive



Deters predators



For insulation



For camouflage

Increases heat loss

1 (b) All organisms compete for resources to survive.

Give **two** resources animals compete for.

[2 marks]

1

2

5

Turn over ▶



2 (a) (i) Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

Simple life forms first developed on Earth more than

3 thousand years ago.

3 million years ago.

3 billion years ago.

2 (a) (ii) Darwin's theory of evolution was not accepted when he first suggested it.

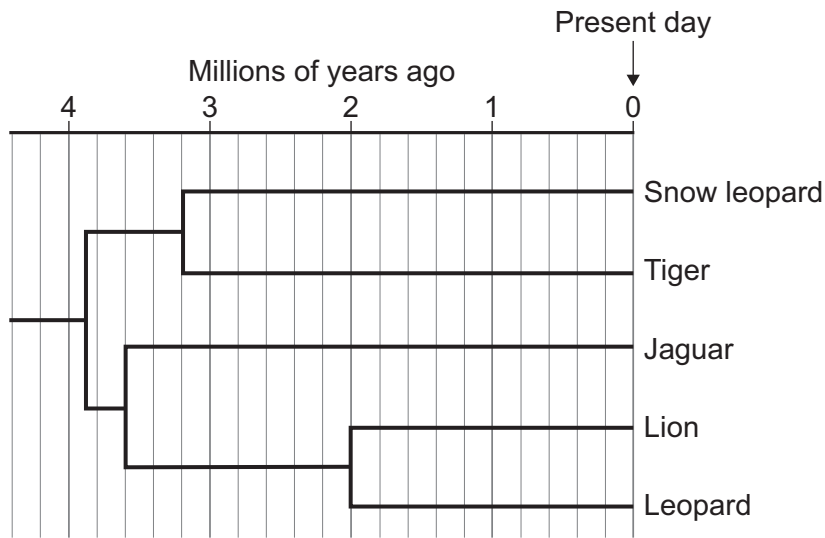
Give one reason why.

[1 mark]

.....
.....

2 (b) Figure 1 shows an evolutionary tree for the 'big cats'.

Figure 1



2 (b) (i) How long ago did the lion evolve?

[1 mark]

..... million years ago



2 (b) (ii) Which animal is the closest relative to the tiger?

[1 mark]

.....

2 (c) **Figure 2** shows a tiger. Tigers are large, striped animals. Tigers live and hunt in grassland and forest areas of Asia. They feed on animals such as deer.

Figure 2



Suggest how stripes help the tiger to survive in its habitat.

[1 mark]

.....

.....

| |
|---|
| |
| 5 |

Turn over for the next question

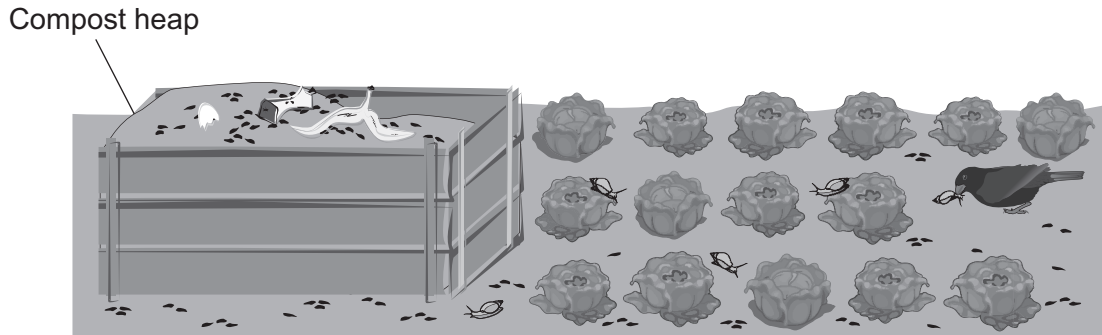
Turn over ►



- 3 A gardener grew some lettuces in his vegetable garden.
- Snails ate some of the lettuces.
- Blackbirds ate some of the snails.

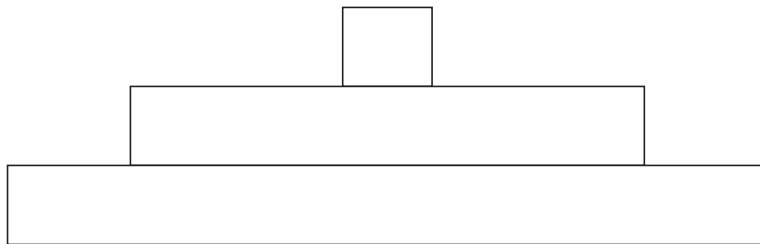
Figure 3 shows the vegetable garden.

Figure 3



- 3 (a) Label the pyramid of biomass to show the organisms in the food chain.

[2 marks]



- 3 (b) The gardener also decided to build a compost heap to recycle his vegetable peelings.

- 3 (b) (i) What type of organisms will break down the vegetable peelings and make them decay?

[1 mark]

.....



3 (b) (ii) What conditions help to speed up the process of decay?

[2 marks]

Tick (✓) **two** boxes.

Aerobic

Cold

Dry

Moist

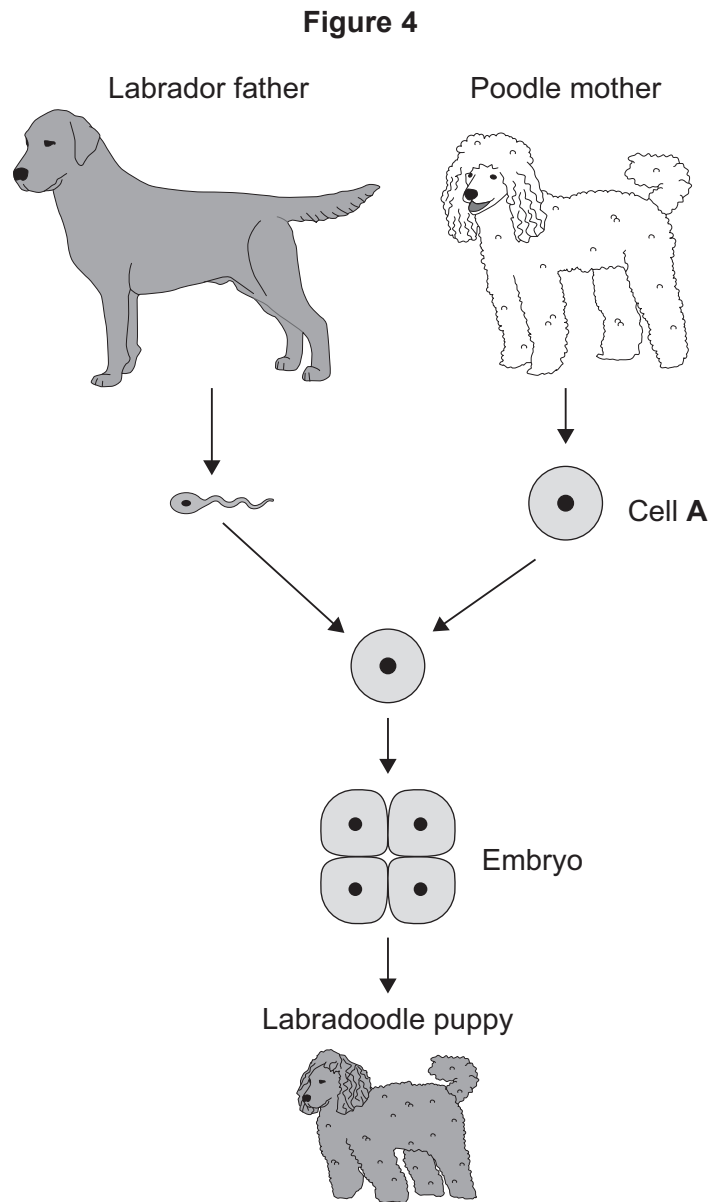
5

Turn over for the next question

Turn over ►



- 4 **Figure 4** shows how a Labrador can be crossed with a Poodle to produce a Labradoodle puppy.



- 4 (a) (i) What is the name of Cell A shown in **Figure 4**?

[1 mark]

.....



4 (a) (ii) Draw a ring around the correct answer to complete each sentence.

[2 marks]

The sperm cell and Cell A are types of

embryo.

gamete.

gene.

The type of reproduction shown in **Figure 4** is called

asexual reproduction.

tissue culture.

sexual reproduction.

4 (b) The Labradoodle puppy has some characteristics of each of its parents, but it is not identical to either parent.

4 (b) (i) Give **one** characteristic of the Labradoodle puppy which is similar to the Labrador father but **not** the Poodle mother.

[1 mark]

.....
.....

4 (b) (ii) Give **one** characteristic of the Labradoodle puppy which is similar to the Poodle mother but **not** the Labrador father.

[1 mark]

.....
.....

| |
|---|
| 5 |
|---|

Turn over for the next question

Turn over ►



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

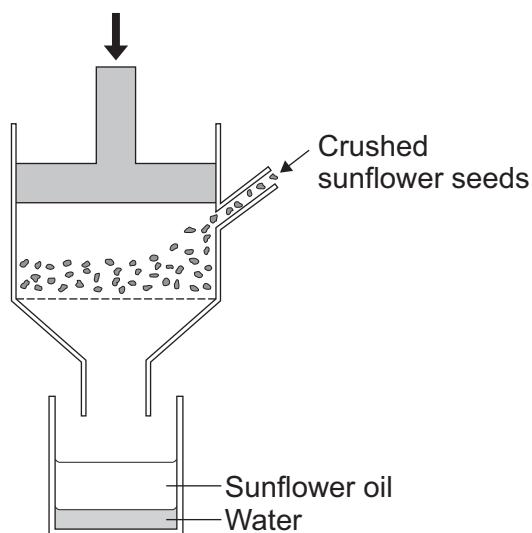


Chemistry Questions

5 Many plants produce vegetable oils.

Figure 5 shows the equipment used to extract sunflower oil from sunflower seeds.

Figure 5



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

[1 mark]

The process used to extract oil from sunflower seeds is called

evaporating.

filtering.

pressing.

5 (a) (ii) The sunflower oil floats on top of the water.

Give **two** conclusions you can make from this information.

[2 marks]

Conclusion 1

.....

Conclusion 2

.....

Question 5 continues on the next page

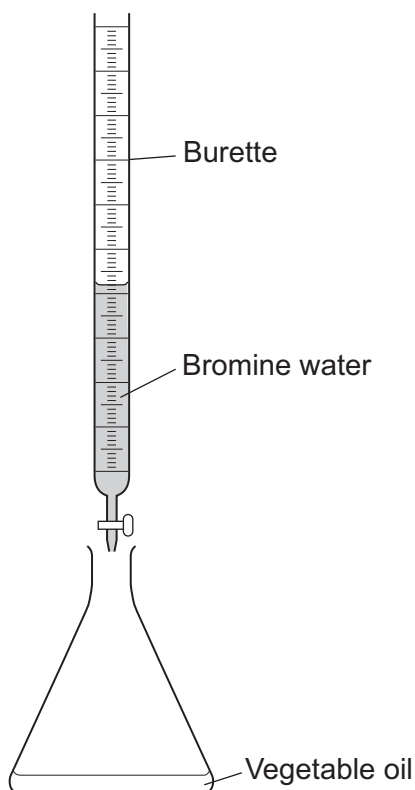
Turn over ►



5 (b) A student investigated unsaturation in three different vegetable oils.

Figure 6 shows the equipment the student used.

Figure 6



The student used this method:

- 1 Record the volume of bromine water in the burette at the start.
- 2 Add a few drops of bromine water to the vegetable oil in the flask.
- 3 Swirl the flask.
- 4 Repeat steps 2 and 3 until the bromine water does not change colour when added to the oil.
- 5 Record the final volume of bromine water in the burette.

5 (b) (i) Draw a ring around the correct answer to complete the sentence.

[1 mark]

When bromine water reacts with unsaturated oils, the bromine water changes colour from orange to

blue.

colourless.

green.

5 (b) (ii) State **one** variable the student should control to make this investigation a fair test.

[1 mark]

.....



5 (c) The results for the three different oils are shown in **Table 1**.

Table 1

| Vegetable oil | Volume of bromine water added in cm ³ until its colour does not change | | | | Percentage (%) of unsaturated oil |
|---------------|--------------------------------------------------------------------------------------|--------|--------|------|-----------------------------------------|
| | Test 1 | Test 2 | Test 3 | Mean | |
| A | 9.7 | 9.5 | 9.6 | 9.6 | 24 |
| B | 20.5 | 14.6 | 14.2 | 14.4 | 36 |
| C | 16.0 | 16.2 | 15.8 | 16.0 | 40 |

5 (c) (i) There is one anomalous result in **Table 1**. The student did **not** include the anomalous result when calculating the mean.

Draw a ring around the anomalous result in **Table 1**.

[1 mark]

5 (c) (ii) Suggest how the anomalous result in **Table 1** was caused.

[1 mark]

.....

.....

5 (c) (iii) Describe the pattern shown in **Table 1** between the volume of bromine water added and the percentage of unsaturated oil.

[1 mark]

.....

.....

5 (d) Which question can be answered by a scientific investigation alone?

[1 mark]

Tick (✓) **one** box.

| | Tick (✓) |
|-----------------------------------------------|----------|
| Which vegetable oil provides the most energy? | |
| Which vegetable oil is best for cooking? | |
| Which vegetable oil tastes best? | |

Turn over ►



- 6 Crude oil is separated into fractions by distillation.
Each fraction contains hydrocarbon molecules of a similar size.

Table 2 shows information about two fractions obtained when crude oil is distilled.

Table 2

| Fraction | Supply from distillation as percentage (%) of crude oil input | Demand by consumers as percentage (%) of crude oil input | Number of carbon atoms in hydrocarbon chain |
|----------|------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------|
| Petrol | 14 | 27 | $C_5 - C_{10}$ |
| Kerosene | 13 | 8 | $C_{11} - C_{15}$ |

- 6 (a) Some of the kerosene fraction is made into petrol.

Use **Table 2** to suggest **two** reasons why kerosene is used to make petrol.

[2 marks]

.....

.....

.....

.....

- 6 (b) Use the correct word from the box to complete each sentence.

[2 marks]

| | | | | |
|---------|----------|----------|------------|---------|
| boiling | catalyst | cracking | filtration | polymer |
|---------|----------|----------|------------|---------|

Kerosene is made into petrol by a process called

Kerosene is heated.

The hydrocarbons vaporise.

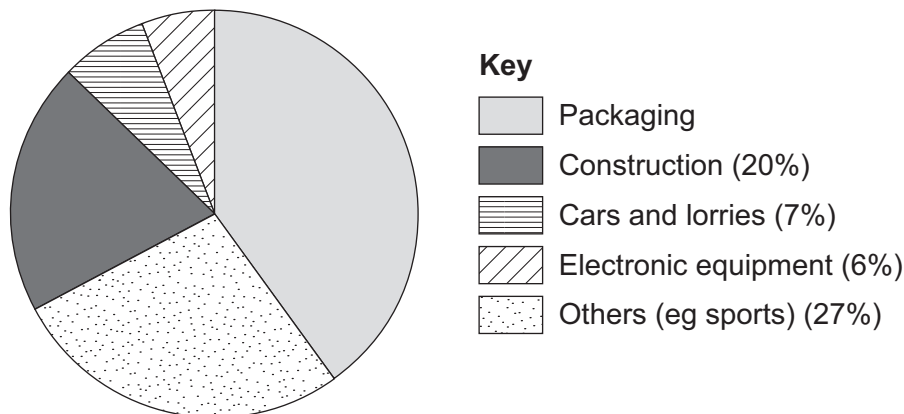
The gases are passed over a hot



7 Polymers have many important uses.

The pie chart in **Figure 7** shows the percentage (%) of polymers used in different ways.

Figure 7



7 (a) What is the percentage of polymers used for packaging?

[1 mark]

.....
Percentage of polymers used for packaging = %

7 (b) Some food is packaged in shrink-wrap. Shrink-wrap is a shape memory polymer.

Use the correct word from the box to complete the sentence.

[1 mark]

| | | |
|-----|-----------|-------|
| raw | renewable | smart |
|-----|-----------|-------|

Shape memory polymers are examples of materials.

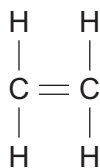
Question 7 continues on the next page

Turn over ►



7 (c) (i) Shrink-wrap is a form of poly(ethene). Poly(ethene) is produced from ethene.

The displayed structure of a molecule of ethene is



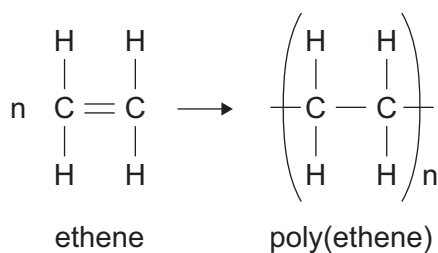
What is the chemical formula of a molecule of ethene?

[1 mark]

.....

7 (c) (ii) Poly(ethene) is produced from ethene in a polymerisation reaction.

The equation for the reaction is



Which **two** statements about the polymerisation reaction to form poly(ethene) are correct?

[2 marks]

Tick (✓) **two** boxes.

| | Tick (✓) |
|--------------------------------------|----------|
| A polymer is a small molecule. | |
| Many ethene molecules join together. | |
| Poly(ethene) contains a double bond. | |
| The monomer is ethene. | |



7 (d) Some plastic bags are now made from a polymer made from cornstarch.

Cornstarch comes from plants.

Give **one** advantage of making plastic bags from cornstarch instead of poly(ethene).

[1 mark]

Tick (✓) **one** box.

| | Tick (✓) |
|---------------------------------------------------|----------|
| Cornstarch is biodegradable. | |
| Cornstarch is made from a non-renewable resource. | |
| Landfill sites are filled more quickly. | |

7 (e) Another use for ethene is to produce ethanol. Ethanol is made by heating ethene with steam.

7 (e) (i) Complete the word equation for the reaction to produce ethanol.

[1 mark]

..... + water →

7 (e) (ii) Use the correct word from the box to complete the sentence.

[1 mark]

| | | |
|---------------------|---------------------|------------------|
| distillation | fermentation | hydration |
|---------------------|---------------------|------------------|

The process to produce ethanol from ethene is called

8

Turn over for the next question

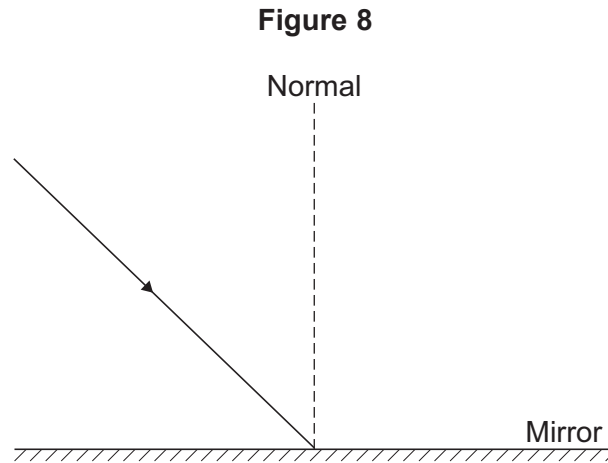
Turn over ►



Physics Questions

8 Visible light is part of the electromagnetic spectrum.

8 (a) **Figure 8** shows an incident ray striking a mirror.

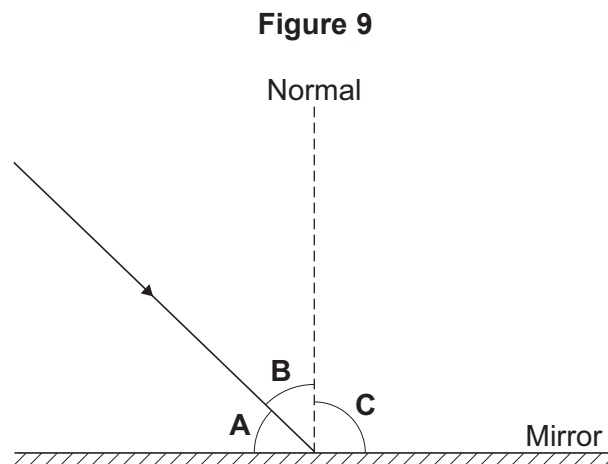


8 (a) (i) Visible light is reflected by a mirror.

Complete **Figure 8** to show the reflected ray.

[1 mark]

8 (a) (ii) **Figure 9** shows the same diagram but with three angles labelled **A**, **B** and **C**.



Which angle, **A**, **B** or **C**, is the angle of incidence?

[1 mark]



8 (b) (i) The electromagnetic spectrum is shown below.

| | | | | | | |
|-------|--|-------------|---------------|--|------------|--|
| Gamma | | Ultraviolet | Visible light | | Microwaves | |
|-------|--|-------------|---------------|--|------------|--|

Complete the spectrum using the correct words from the box.

[2 marks]

| | | |
|----------|-------------|--------|
| Infrared | Radio waves | X-rays |
|----------|-------------|--------|

8 (b) (ii) Which of the following statements are true for all electromagnetic waves?

[2 marks]

Tick (✓) **two** boxes.

They can travel through a vacuum.

They travel as longitudinal waves.

They travel at the same speed through space.

They are mechanical waves.

| |
|---|
| 6 |
|---|

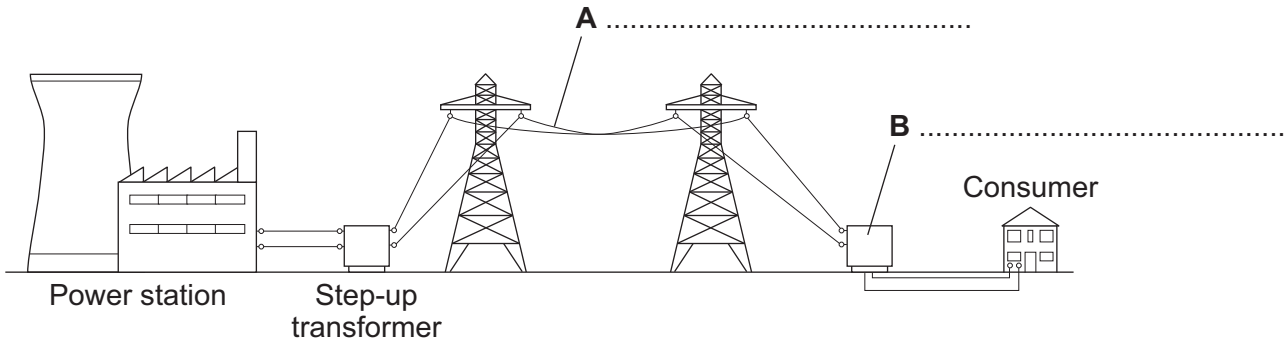
Turn over for the next question

Turn over ►



9 **Figure 10** shows how electricity is distributed from a power station and transmitted along the National Grid.

Figure 10



9 (a) Complete labels **A** and **B** on **Figure 10**.

[2 marks]

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

[2 marks]

decreased increased unchanged

The output voltage of the power station is by the step-up transformer.

The output current of the power station is decreased.

These changes mean that the energy losses between the power station and the consumer are



9 (c) Power stations may burn coal, gas or oil to generate electricity.

Table 3 gives information about three different types of power station.

Table 3

| Type of power station | Start-up time |
|-----------------------|---------------|
| Coal | Long |
| Gas | Short |
| Oil | Medium |

Which type of power station, coal, gas or oil, is used to meet a sudden demand for electricity?

Tick (✓) **one** box.

Coal

Gas

Oil

Give a reason for your answer.

[2 marks]

.....

.....

6

Turn over for the next question

Turn over ►



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**



10 **Figure 11** shows a street lamp with a panel of solar cells.

The panel of solar cells is used to transfer energy to a rechargeable battery. The street lamp is then powered by the battery.

Figure 11



10 (a) Name the source of energy the panel of solar cells uses.

[1 mark]

.....

10 (b) (i) Give **one** advantage of using solar cells rather than mains electricity to power the street lamp.

[1 mark]

.....
.....

10 (b) (ii) Suggest why a street lamp powered by a panel of solar cells needs a battery.

[1 mark]

.....
.....

Question 10 continues on the next page

Turn over ►



10 (c) A manufacturer measured the power output of a panel of solar cells with a surface area of 0.4 m^2 .

The power output was measured three times.

10 (c) (i) The measurements are given in **Table 4**.

Table 4

| Surface area in m^2 | Power output 1 in W | Power output 2 in W | Power output 3 in W |
|------------------------------|------------------------|------------------------|------------------------|
| 0.4 | 66 | 62 | 64 |

Calculate the mean power output.

[1 mark]

.....
.....

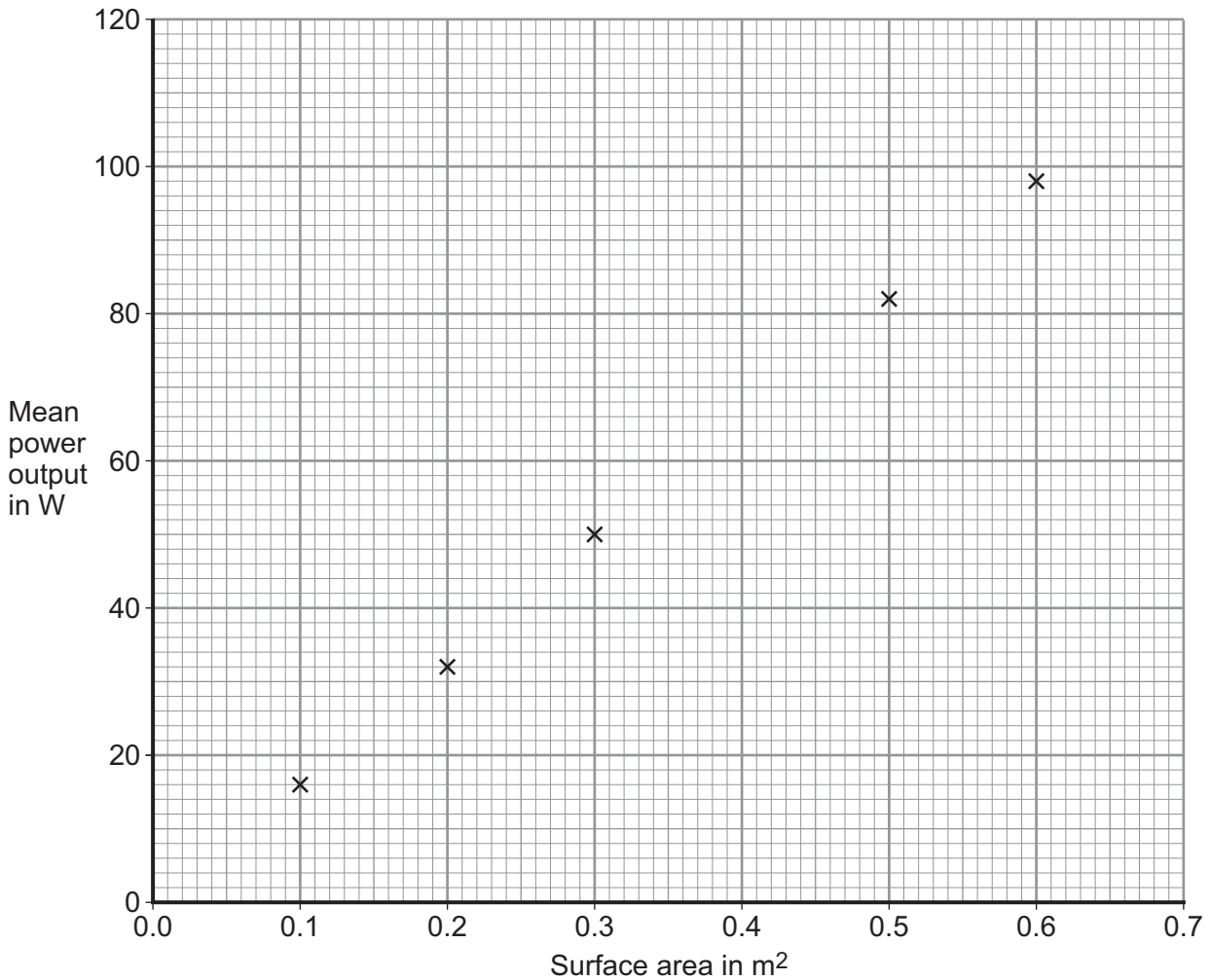
Mean power output = W



10 (c) (ii) The manufacturer measured the power output for panels of solar cells with different surface areas.

Figure 12 shows a graph of the results.

Figure 12



Plot the mean power output that you calculated in part (c)(i) on **Figure 12**.

Draw the line of best fit to complete the graph.

[2 marks]

10 (c) (iii) A panel of solar cells for a street lamp needs to provide a mean power output of 40 W.

Use **Figure 12** to suggest the minimum surface area to use for the street lamp.

[1 mark]

Surface area = m²

Question 10 continues on the next page

Turn over ►



10 (c) (iv) Suggest **one** reason, other than cost, for **not** using a panel of solar cells bigger than the one you suggested in part (c)(iii).

[1 mark]

.....
.....

10 (d) The manufacturer decides to make a street lamp with a panel of solar cells and a small wind turbine. This is shown in **Figure 13**.

Figure 13



Give **one** advantage of using a wind turbine as well as a solar cell.

[1 mark]

.....
.....

| |
|---|
| 9 |
|---|



Turn over for the next question

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►



Biology Questions

- 11 (a)** Living organisms can be used as indicators of pollution.

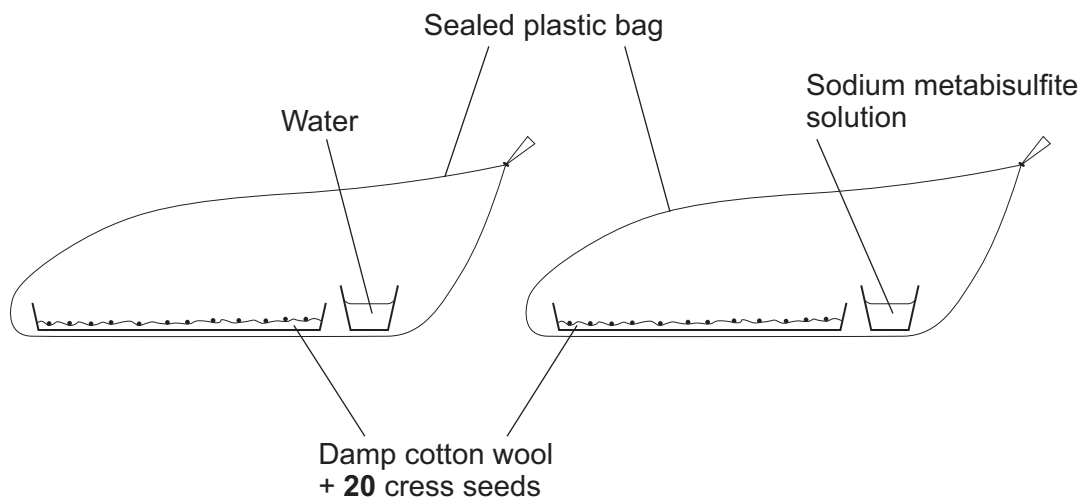
Name **one** type of organism that can be used to indicate the concentration of sulfur dioxide in the atmosphere.

[1 mark]

.....

- 11 (b)** **Figure 14** shows an investigation to find out if sulfur dioxide gas affects the growth of cress seeds.

Figure 14



Sodium metabisulfite solution gives off sulfur dioxide gas.

Both bags were left in a warm laboratory for several days. The number of seeds that grew in each bag was counted.

What was the dependent variable in this investigation?

[1 mark]

.....

.....



11 (c) The investigation was carried out five times.

Table 5 shows the five sets of results.

Table 5

| | Number of seeds that grew | | | | | Mean |
|----------------------------------------------|---------------------------|----|----|----|----|------|
| Bag containing water | 15 | 17 | 15 | 16 | 17 | 16 |
| Bag containing sodium metabisulfite solution | 5 | 9 | 8 | 5 | 8 | 7 |

11 (c) (i) The mean percentage of seeds that grew in the bag containing water was 80%.

Calculate the mean percentage of seeds that grew in the bag containing sodium metabisulfite solution.

[1 mark]

.....

 %

11 (c) (ii) Give **one** conclusion you can make from these results.

[1 mark]

.....

| |
|---|
| 4 |
|---|

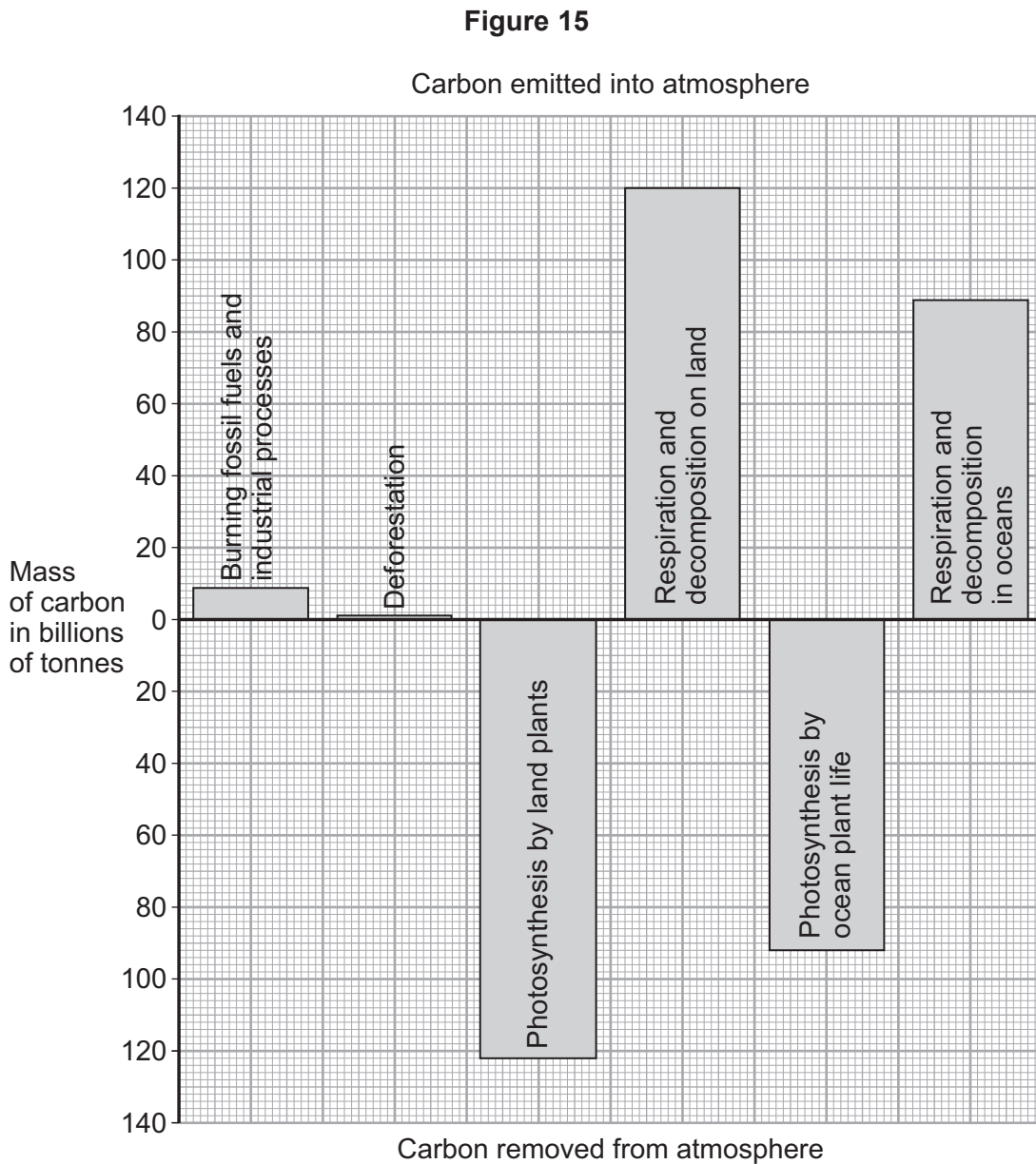
Turn over for the next question

Turn over ►



12 The amount of carbon in the atmosphere is increasing.

Figure 15 shows the mass of carbon in billions of tonnes involved in some processes in the carbon cycle each year.



12 (a) (i) Use information from Figure 15 to calculate the total mass of carbon removed from the atmosphere each year.

[2 marks]

.....

.....

..... billions of tonnes



12 (a) (ii) The mass of carbon in the atmosphere is increasing by 5 billion tonnes each year.

One tonne of carbon is equivalent to 3.67 tonnes of carbon dioxide.

Calculate the increase in the mass of carbon dioxide in the atmosphere each year.

[1 mark]

.....
.....

..... billion tonnes

12 (b) (i) Many scientists think the burning of fuels is the main cause of the increasing amount of carbon dioxide in the atmosphere. Other scientists disagree.

Use information from **Figure 15** to suggest why some scientists do **not** think that burning fuels is the main cause of the increase in carbon dioxide in the atmosphere.

[1 mark]

.....
.....
.....

12 (b) (ii) Some scientists think we should eat less meat and eat more food from plants.

Suggest how eating less meat and eating more food from plants could reduce the amount of carbon dioxide in the atmosphere.

[2 marks]

.....
.....
.....
.....

| |
|---|
| |
| 6 |

Turn over for the next question

Turn over ►



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

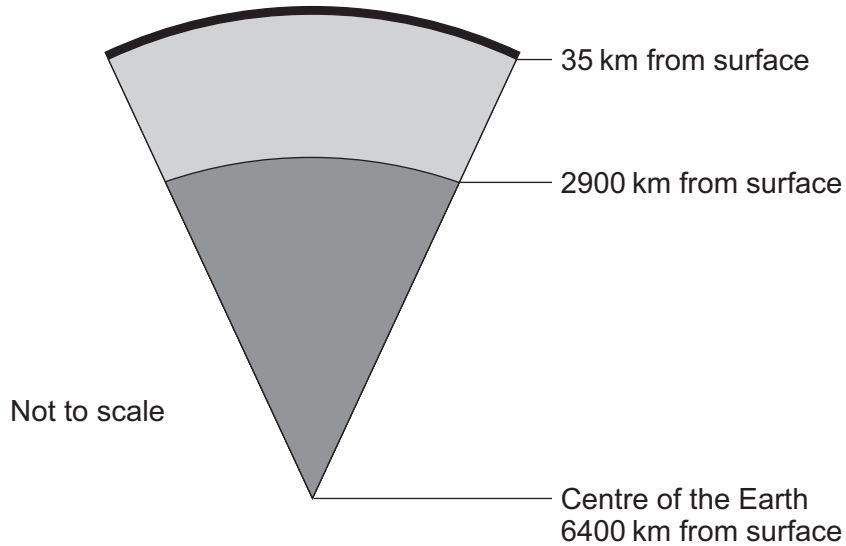


Chemistry Questions

13 (a) The Earth is made up of layers.

Figure 16 represents a section through the layers of the Earth.

Figure 16



Complete **Table 6** to show the names of the layers of the Earth and the thickness of the layers.

[3 marks]

Table 6

| Name of layer | Thickness in km |
|---------------|-----------------|
| | 35 |
| Mantle | |
| | 3500 |

Question 13 continues on the next page

Turn over ►



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

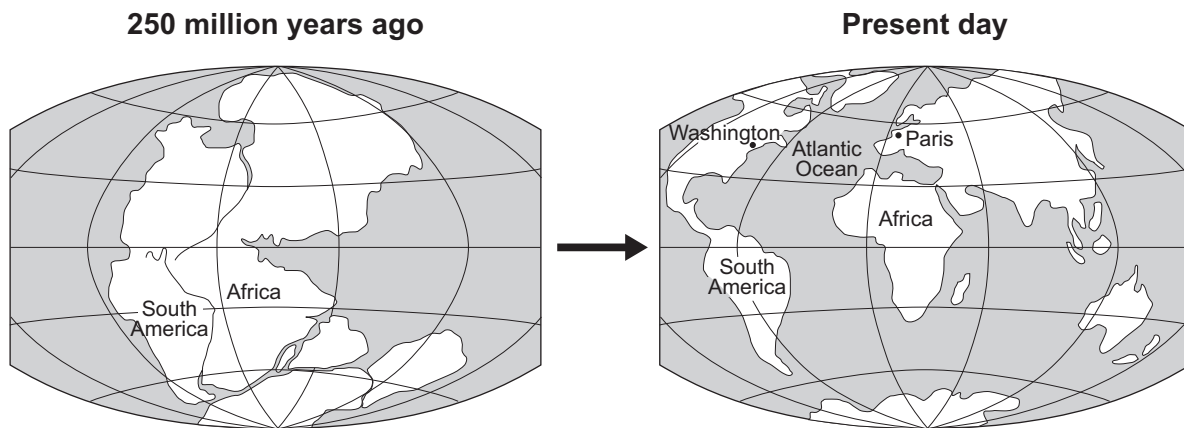
The Earth's surface has changed in the last 250 million years.

In 1912, Alfred Wegener observed that:

- the shapes of the coastlines of Africa and South America fitted together
- Paris and Washington were moving apart by a few centimetres each year.

Wegener suggested that the Earth's surface had changed as shown in **Figure 17**.

Figure 17



The tectonic plate theory is now used to explain the processes that caused the changes.

Describe the changes shown in **Figure 17** and describe the processes that caused these changes.

[6 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



.....

.....

Extra space

.....

.....

.....

.....

.....

.....

| |
|---|
| |
| 9 |

Turn over for the next question

Turn over ▶



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

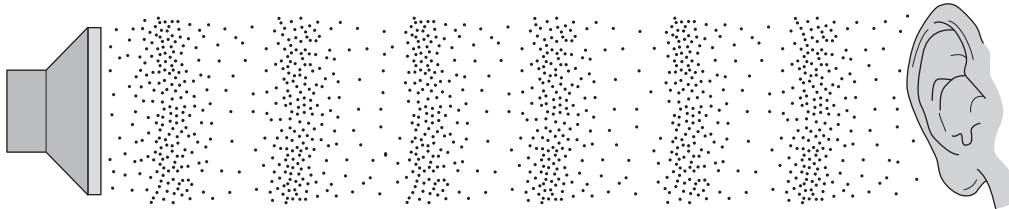


Physics Questions

14 A sound wave is an example of a longitudinal wave.

14 (a) Figure 18 shows the air particles in a sound wave as the wave travels from a loudspeaker to an ear.

Figure 18



Write a letter **R** on **Figure 18** to show an area of rarefaction.

[1 mark]

14 (b) Complete the sentence about longitudinal waves.

[1 mark]

The vibrations of the air particles are to the direction of energy transfer.

14 (c) A stationary car horn emits a sound wave of frequency 400 Hz.

The wavelength of the wave is 0.85 m.

Calculate the speed of sound.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Speed of sound = m/s

Question 14 continues on the next page

Turn over ►



14 (d) (i) The same car sounding its horn passes a person standing on the pavement. As the car moves towards the person the frequency the person hears seems to change.

State the name given to this effect.

[1 mark]

.....

14 (d) (ii) **Table 7** shows the frequency of sound the person hears as the car moves at different speeds towards and away from him.

Table 7

| Movement of the car | Speed of the car in m/s | Frequency the person hears in Hz |
|----------------------|-------------------------|----------------------------------|
| Towards the person | 10 | 412 |
| Towards the person | 20 | 424 |
| Away from the person | 10 | 388 |
| Away from the person | 20 | 376 |

The actual frequency of the sound wave emitted by the horn is 400 Hz.

Use the information in **Table 7** to make **two** conclusions about the frequency the person hears.

[2 marks]

Conclusion 1

.....

Conclusion 2

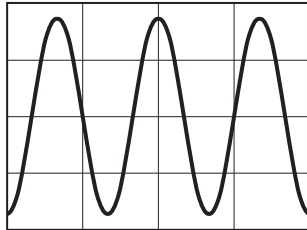
.....



14 (d) (iii) The person on the pavement has a microphone connected to a cathode ray oscilloscope (CRO).

Figure 19 shows the trace on the CRO of the sound wave detected from the horn when the car is stationary.

Figure 19



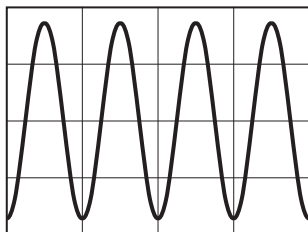
How many complete sound waves are shown in **Figure 19**?

[1 mark]

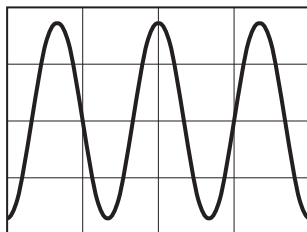
14 (d) (iv) The car then moves away from the person at a steady speed.

Figure 20 shows three possible CRO traces for the sound wave now detected.

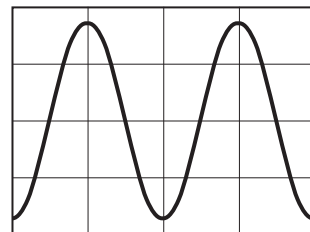
Figure 20



A



B



C

Which trace, **A**, **B** or **C**, would be seen on the CRO

as the car moves away?

[1 mark]

| |
|---|
| 9 |
|---|

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Acknowledgement of copyright-holders and publishers

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.

Question 1: Photographs of polar bear, snake and desert fox © Thinkstock.

Question 2, Figure 2: Photograph of tiger © Thinkstock.

Question 10, Figure 11 and Figure 13: Photographs of street lamps © Thinkstock.

Copyright © 2015 AQA and its licensors. All rights reserved.

