AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
SCIENCE A 1

F

Foundation Tier Unit 5

Tuesday 17 May 2016 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 15(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.

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

Biology Questions

1 Plants produce hormones that control growth.

1 (a) What is the name of **one** plant hormone?

[1 mark]

Tick (✓) **one** box.

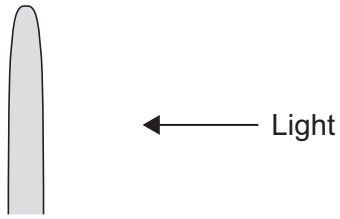
Auxin ☐

Cannabis ☐

Statin ☐

1 (b) **Figure 1** shows a plant shoot with light shining on it from the right.

Figure 1



1 (b) (i) In which direction would the plant shoot in **Figure 1** grow?

[1 mark]

Tick (✓) **one** box.

Away from the light ☐

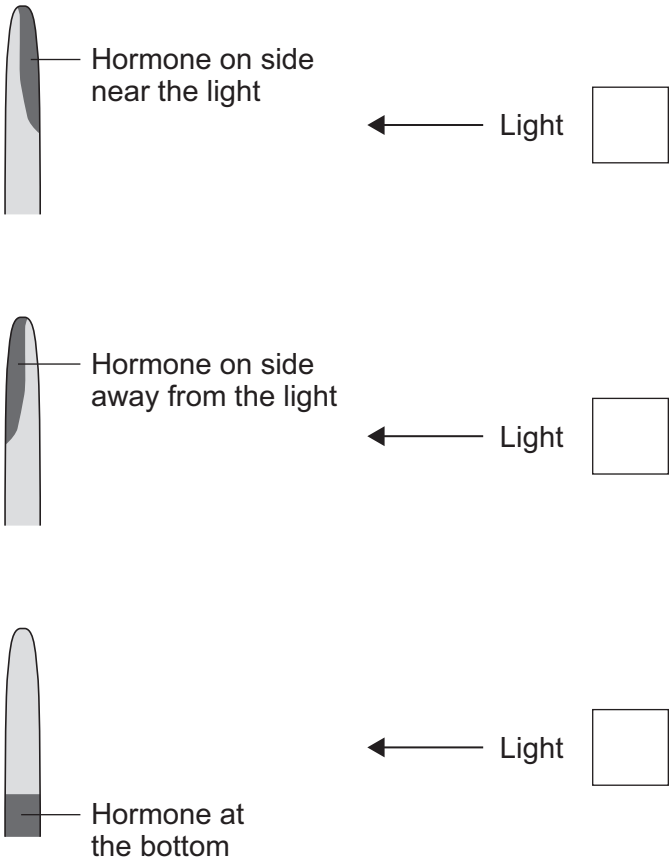
Straight upwards ☐

Towards the light ☐

1 (b) (ii) In the plant shoot shown in **Figure 1** where would the hormone that controls growth be found?

[1 mark]

Tick (✓) **one** box.



3

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

2 Students investigated the effect of age and gender on coordination skills.

The students used four groups of people:

- 5 boys aged 10 years
- 5 girls aged 10 years
- 5 boys aged 15 years
- 5 girls aged 15 years.

Each person had to bounce a ball from their right hand and catch it with their left hand.

The students recorded how many times the ball was caught in 1 minute.

Figure 2 shows one boy doing the test.

Figure 2

2 (a) One variable was the number of times the boy caught the ball.

What type of variable is this?

[1 mark]

Tick (✓) **one** box.

Control variable ☐

Dependent variable ☐

Independent variable ☐

Question 2 continues on the next page

2 (b) The results of the investigation are shown in **Table 1**.

Table 1

Group	Number of catches in 1 minute					Mean
	Person 1	Person 2	Person 3	Person 4	Person 5	
Boys aged 10 years	33	42	39	33	43	38
Girls aged 10 years	36	29	38	33	34	34
Boys aged 15 years	56	52	56	58	53	
Girls aged 15 years	57	47	59	55	52	54

2 (b) (i) Calculate the mean value for boys aged 15 years.

[1 mark]

_____

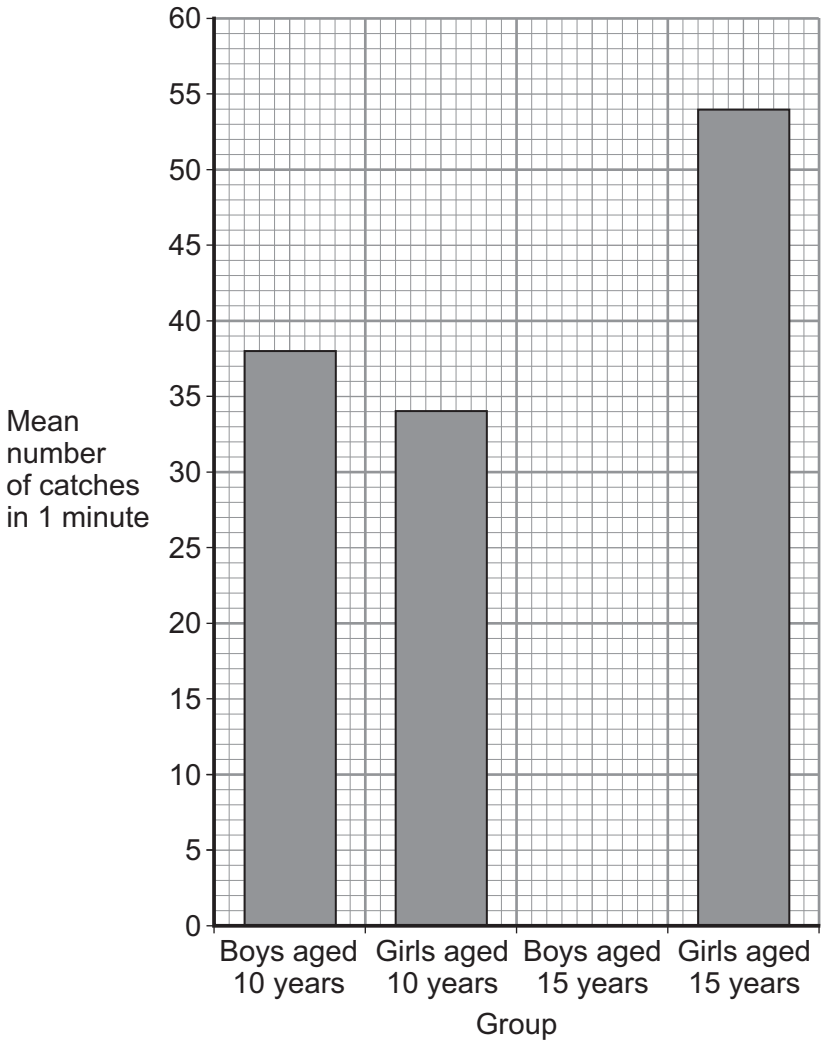
_____

Mean number of catches in 1 minute = _____

2 (b) (ii) Plot your answer to part **(b)(i)** on **Figure 3**.

[1 mark]

Figure 3



2 (b) (iii) Give **one** conclusion about coordination that you can make from these results.

[1 mark]

2 (c) Suggest **one** factor that could affect the number of catches made per minute.

Do **not** give age or gender.

[1 mark]

5

Turn over ▶

3 Many processes in the body are controlled by hormones.

The hormones FSH and oestrogen are involved in the menstrual cycle of a woman.

3 (a) Draw **one** line from each hormone to the organ that produces the hormone.

[2 marks]

Hormone	**Organ**
FSH	kidney
	ovary
Oestrogen	pituitary gland
	uterus

3 (b) Hormones are used in oral contraceptives.

Describe **one** advantage and **one** disadvantage of using oral contraceptives.

[2 marks]

Advantage _____

_____

Disadvantage _____

_____

4

4 Some athletes take drugs to improve their performance.

All performance enhancing drugs are banned by sporting regulations.

4 (a) Which type of drug stimulates muscle growth?

[1 mark]

Tick (✓) **one** box.

Alcohol ☐

Anabolic steroid ☐

Ecstasy ☐

Statin ☐

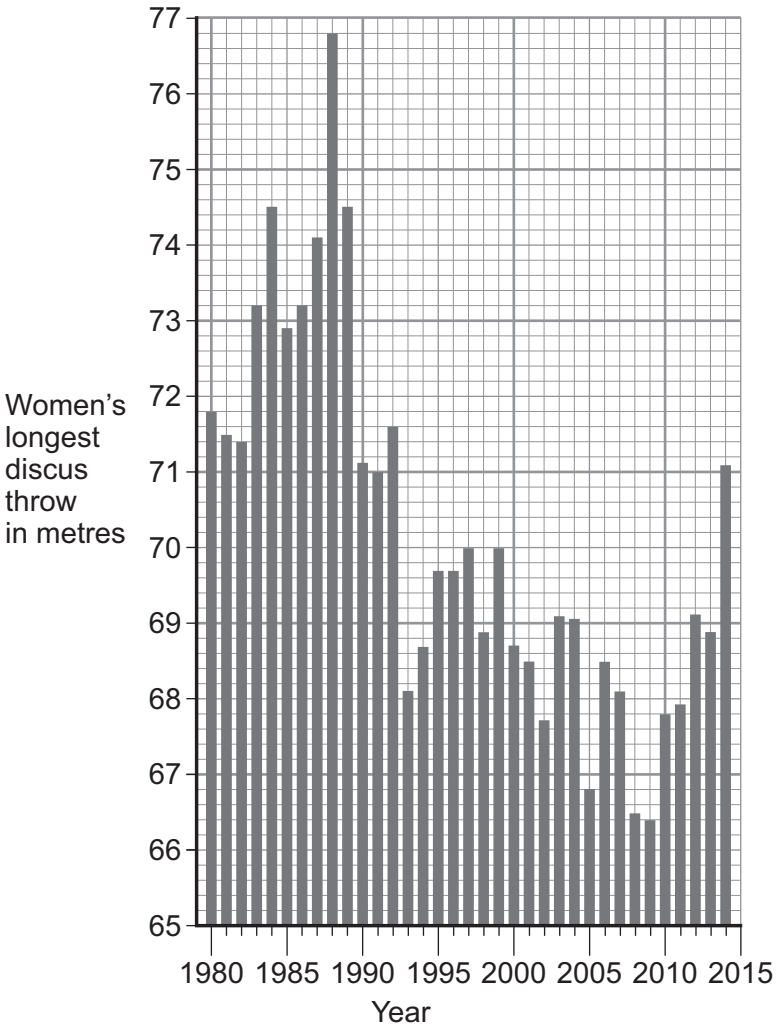
Question 4 continues on the next page

4 (b) Before 1988 athletes were only tested for drugs during competitions.

In 1988 athletes started to be tested for drugs at any time.

Figure 4 shows the longest distance thrown in women's discus each year from 1980 to 2014.

Figure 4



4 (b) (i) What is the longest distance thrown in women's discus?

[1 mark]

Longest distance thrown = _____ metres

4 (b) (ii) After 1988 the distances thrown by women decreased.

In what year was the shortest distance recorded?

[1 mark]

_____

4 (b) (iii) Suggest **one** reason why the distance thrown decreased after 1988.

[1 mark]

_____

_____

4

Turn over for the next question

5 Many people who smoke cigarettes would like to stop.

Smokers find it very difficult to stop smoking.

5 (a) Suggest why smokers find it difficult to stop smoking.

[1 mark]

5 (b) There are several treatments available to help people stop smoking.

Doctors investigated which treatments were most successful.

Smokers were given one of the following nicotine replacement treatments or given a placebo.

- Nicotine gum
- Nicotine skin patch
- Nicotine sweets
- Nicotine nasal spray
- Nicotine inhaler

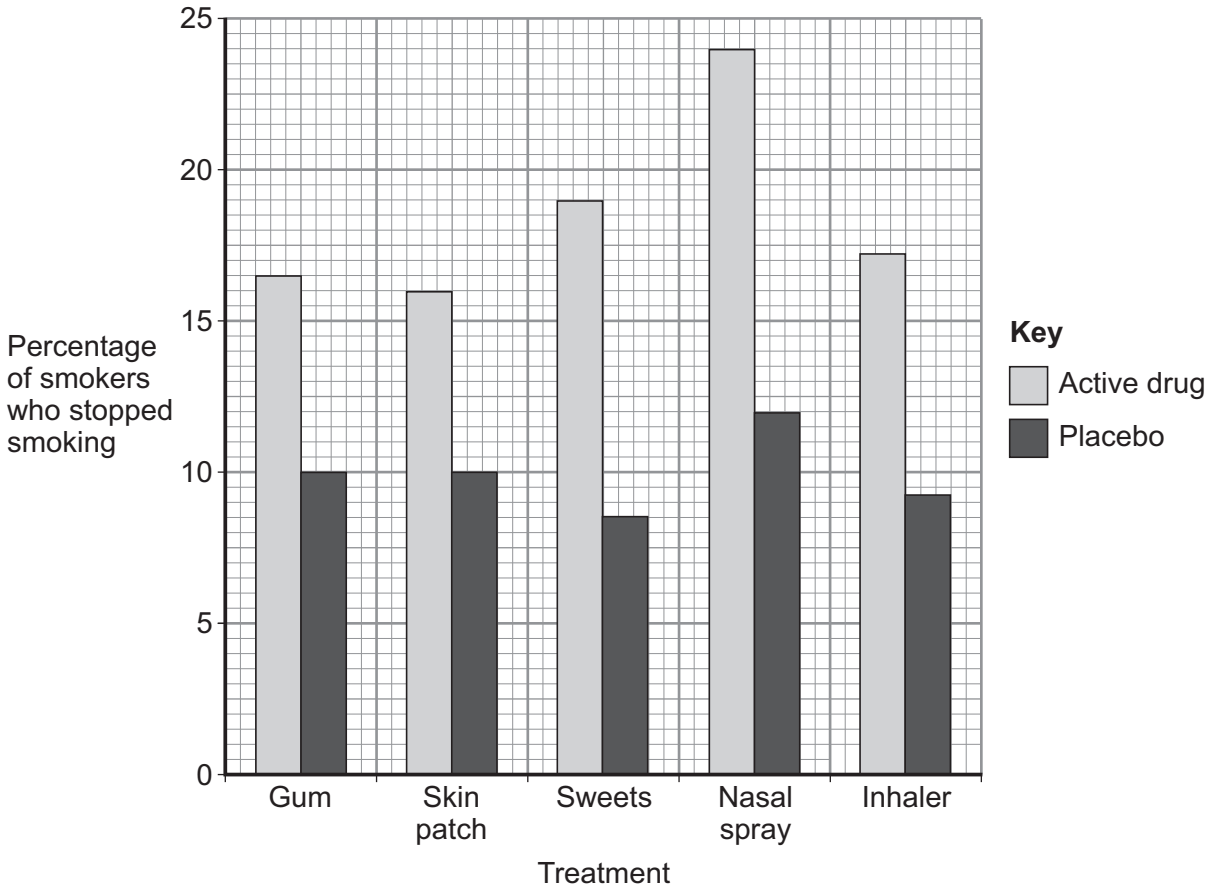
Smokers who had not smoked for six months after starting the treatment were recorded as having stopped.

5 (b) (i) What is a placebo?

[1 mark]

Figure 5 shows the results of the investigation.

Figure 5



5 (b) (ii) Give **two** conclusions from the results of the investigation.

[2 marks]

Conclusion 1 _____

_____

Conclusion 2 _____

_____

4

Chemistry Questions

6 This question is about oxygen and hydrogen.

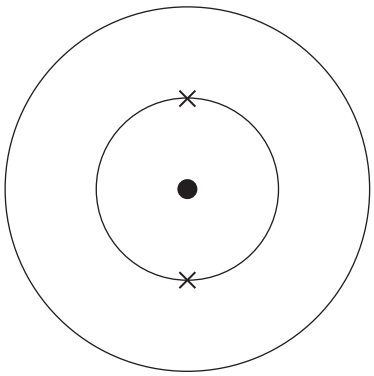
6 (a) (i) An oxygen atom has 8 electrons.

Complete **Figure 6** to show the electronic structure of oxygen.

Use × to represent an electron.

[1 mark]

Figure 6



6 (a) (ii) What is the relative electrical charge on an electron?

[1 mark]

Draw a ring around the correct answer.

+1 **0** **–1**

6 (b) An oxygen atom has 8 protons and 8 neutrons.

What is the mass number of this oxygen atom?

[1 mark]

Mass number = _____

6 (c) The diagrams below represent different types of substances.

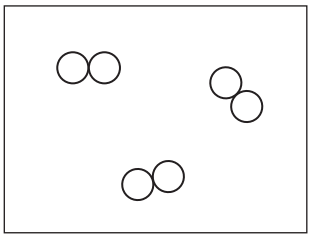
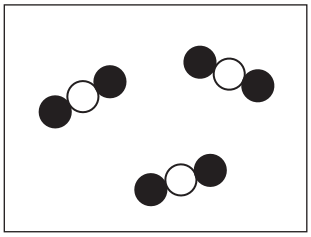
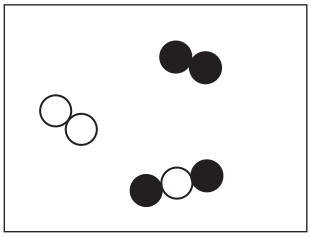
In the diagrams:

○ represents an oxygen atom

● represents a hydrogen atom.

Draw **one** line from each diagram to show the type of substance in each diagram.

[3 marks]

Diagram	**Type of substance**
	alloy
	compound
	element
	mixture

6

Turn over for the next question

7 This question is about metals.

Figure 7 shows how some metals are used in electricity transmission.

Figure 7

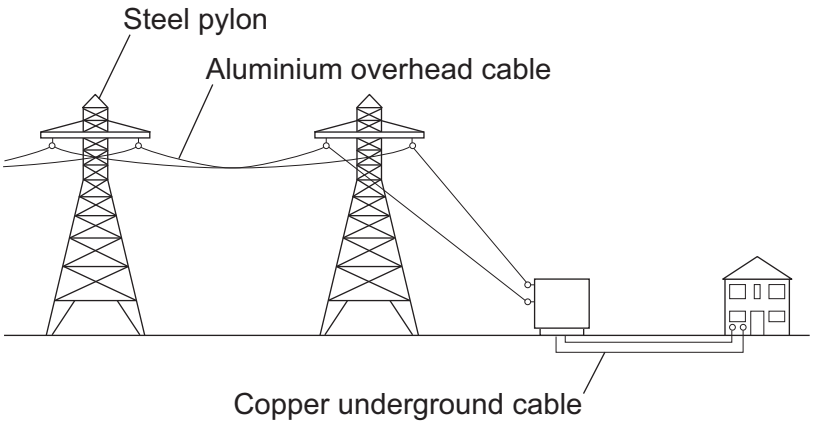


Table 2 shows some properties of aluminium and copper.

Table 2

Metal	**Density in g/cm^3**	**Relative conductivity**
Aluminium	2.70	0.64
Copper	8.92	1.00

7 (a) Give **one** advantage of using aluminium for overhead cables and **one** advantage of using copper for underground cables.

[2 marks]

Use information from **Table 2**.

Advantage of using aluminium for overhead cables

Advantage of using copper for underground cables

7 (b) The pylons are made of steel. Steel is produced from cast iron.

Why are the pylons **not** made from cast iron?

[1 mark]

Tick (✓) **one** box.

Cast iron is an alloy. ☐

Cast iron is brittle. ☐

Cast iron has many uses. ☐

7 (c) (i) **Table 3** shows information about copper and iron.

Table 3

Metal	Percentage (%) of metal in Earth's crust	Percentage (%) of metal in ore	Number of stages to extract metal from its ore
Copper	0.58	2.0	3
Iron	4.1	60	1

Copper is much more expensive than iron.

Use **Table 3** to suggest **two** reasons why.

[2 marks]

_____

_____

_____

_____

Question 7 continues on the next page

7 (c) (ii) Aluminium is more expensive than iron to extract.

Why is aluminium expensive to extract?

[1 mark]

Tick (✓) **one** box.

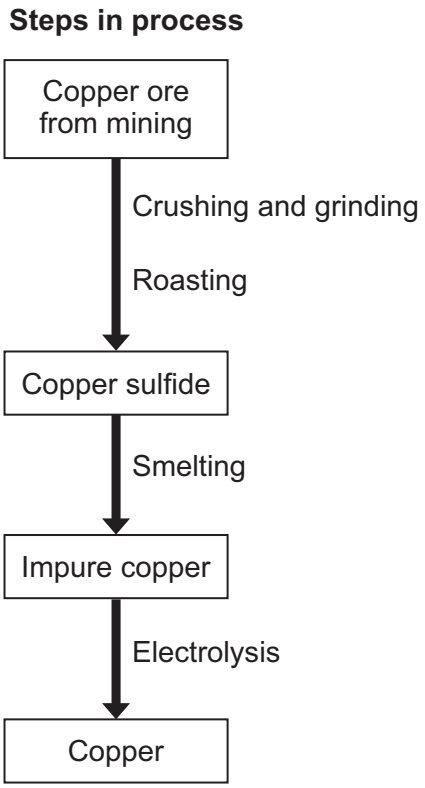
Aluminium is less reactive than iron. ☐

Aluminium is extracted using carbon. ☐

Aluminium extraction uses large amounts of energy. ☐

7 (d) **Figure 8** shows how copper is extracted from copper ore.

Figure 8



7 (d) (i) During smelting, copper sulfide reacts with oxygen to produce copper and sulfur dioxide.

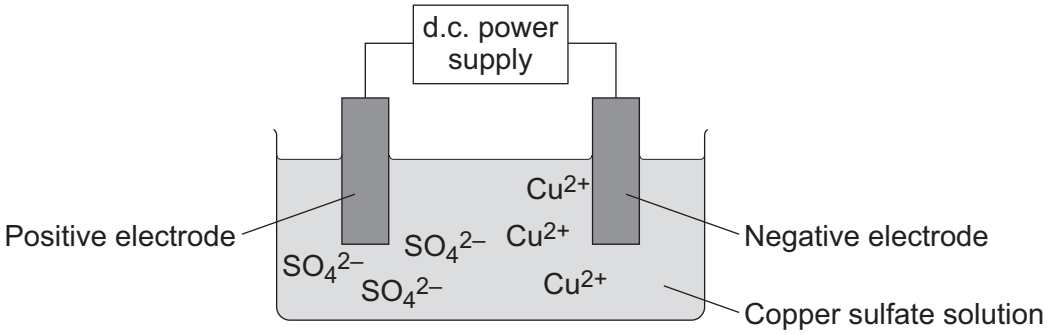
Complete the word equation for the reaction.

[1 mark]

copper sulfide + _____ ⟶ _____ + sulfur dioxide

7 (d) (ii) **Figure 9** shows the electrolysis of copper sulfate solution. Copper sulfate solution contains Cu^{2+} and SO_4^{2-} ions.

Figure 9



Copper ions collect at the negative electrode.

Explain why.

[2 marks]

7 (e) Copper compounds can be extracted from copper ore using bacteria.

What is this process called?

[1 mark]

Draw a ring around the correct answer.

bioleaching **displacement** **smelting**

7 (f) 40% of the copper we use is recycled.

Give **one** advantage of recycling copper.

[1 mark]

11

8 This question is about calcium compounds and limestone.

8 (a) Cement is made from limestone.

Cement can be used to make building materials.

Name **one** building material made from cement.

[1 mark]

_____

8 (b) Limestone (calcium carbonate) is heated strongly to produce calcium oxide and a gas.

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

[1 mark]

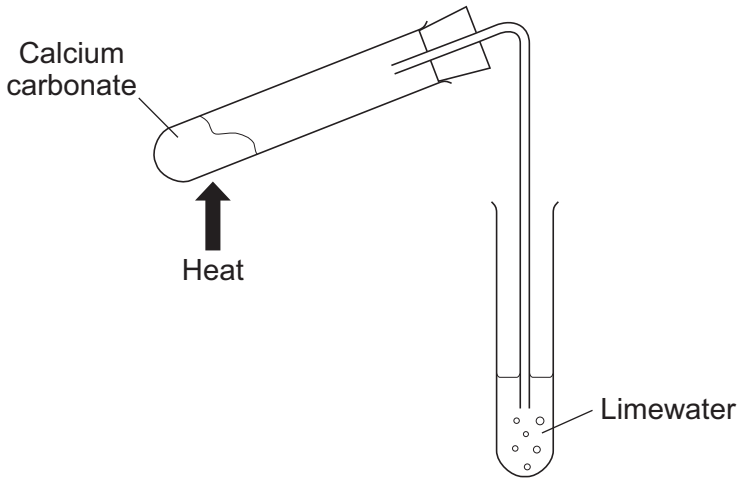
decomposition	**electrolysis**	**reduction**

This type of reaction is called thermal _____ .

8 (b) (ii) A student investigated heating calcium carbonate.

Figure 10 shows the apparatus the student used.

Figure 10



The limewater turned cloudy when the gas produced bubbled through.

Name the gas produced in the reaction.

[1 mark]

_____

8 (b) (iii) Limewater is a solution of calcium hydroxide in water.

Give **one** other use for calcium hydroxide.

[1 mark]

Tick (✓) **one** box.

As a fuel ☐

In fizzy drinks ☐

To neutralise acids ☐

4

Turn over for the next question

Physics Questions

9 **Figure 11** shows some clothes drying outside on a washing line.

Figure 11

9 (a) What process causes water particles to move from the clothes into the air?

[1 mark]

Draw a ring around the correct answer.

condensation **evaporation** **radiation**

9 (b) Give **two** changes in the weather that would cause the clothes to dry more quickly.

[2 marks]

1 _____

_____

2 _____

_____

3

Turn over for the next question

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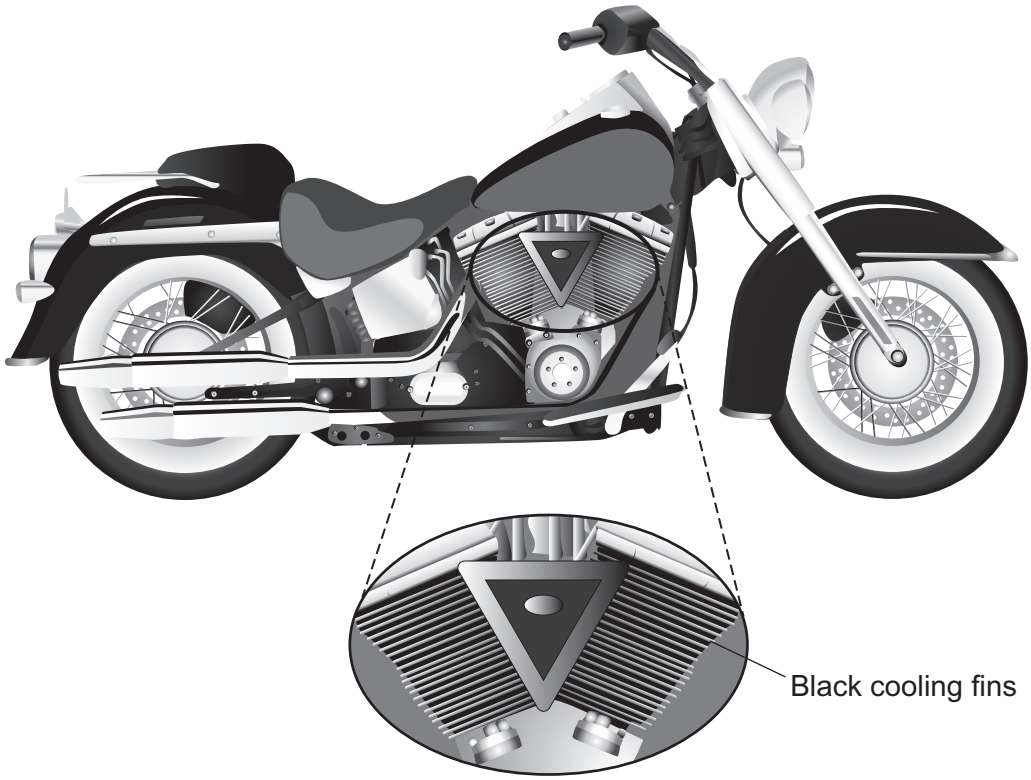
10 **Figure 12** shows cooling fins on a motorbike. Cooling fins help to stop the engine becoming too hot.

Figure 12



10 (a) (i) Complete the sentence.

[1 mark]

The cooling fins help to increase energy transfer because they have a

large surface _____ .

10 (a) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

conduction	**convection**	**radiation**

The fins are black to increase energy transfer by _____ .

10 (a) (iii) Use the correct answer from the box to complete the sentence.

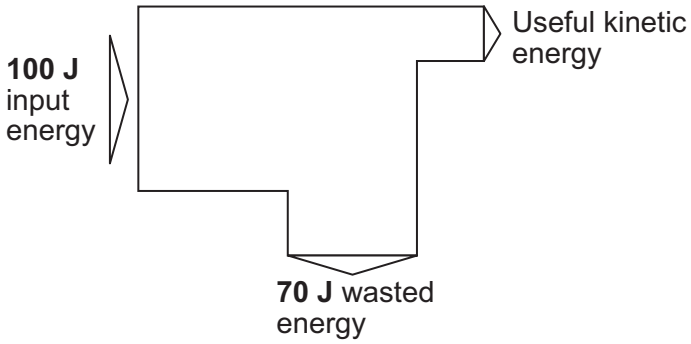
[1 mark]

at the same rate	**more quickly**	**more slowly**

As the engine heats up, the fins will transfer energy _____ .

10 (b) **Figure 13** shows a Sankey diagram for the motorbike.

Figure 13



10 (b) (i) Use **Figure 13** to calculate how much energy is transferred as useful kinetic energy.

[1 mark]

Useful kinetic energy transferred = _____ J

10 (b) (ii) Calculate the efficiency of the motorbike.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

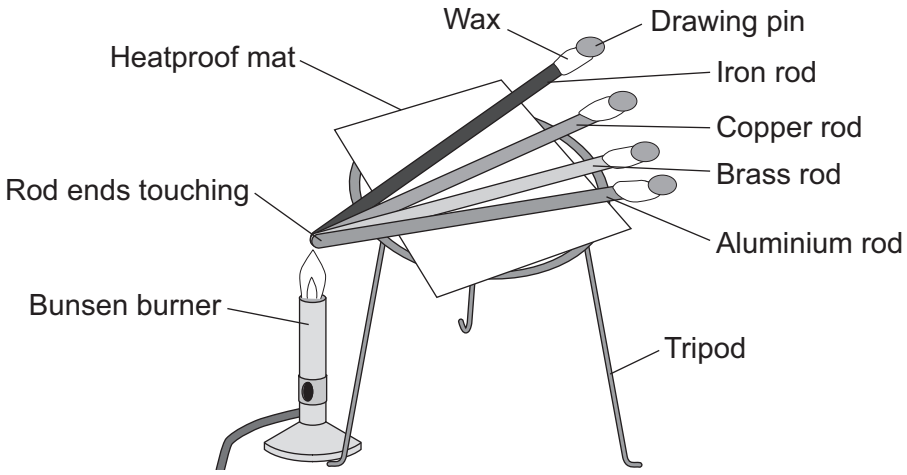
Efficiency = _____

6

Turn over for the next question

11 A student investigated conduction in metals. She set up the apparatus shown in **Figure 14** using rods made of four different metals. Each rod had a drawing pin attached using wax.

Figure 14



The student used the Bunsen burner to heat the rods at one end.

She recorded the time taken for the drawing pin to drop off each rod.

11 (a) Which **two** variables should be kept the same for this investigation?

[2 marks]

Tick (✓) **two** boxes.

Length of each metal rod ☐

Metal each rod is made from ☐

Thickness of each metal rod ☐

Time taken for each drawing pin to drop ☐

11 (b) **Table 4** shows the results of the investigation.

Table 4

Metal	**Time taken for the drawing pin to drop off in seconds**
Aluminium	32
Brass	40
Copper	20
Iron	45

11 (b) (i) The student concluded that copper is the best conductor.

Why is this a correct conclusion?

[1 mark]

11 (b) (ii) The student repeated the investigation but heated the rods more strongly.

What effect would this have on the results?

Give a reason for your answer.

[2 marks]

Question 11 continues on the next page

11 (c) Draw a ring around the correct answer to complete each sentence.

[3 marks]

Conduction takes place mostly in

gases. **liquids.** **solids.**

Conduction involves

particles. **radiation.** **reflectors.**

Metals are the best conductors because they contain free

atoms. **electrons.** **ions.**

8

Turn over for the next question

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12 A householder wants to reduce his energy bills.

12 (a) (i) On one day, the householder wants to use a maximum of 24 kWh of energy.

By lunchtime, the householder has used 25% of this maximum.

Calculate the number of kWh of energy the householder has used by lunchtime.

[1 mark]

Number of kWh = _____

12 (a) (ii) The cost of one kWh of energy is 20 p.

Calculate the cost of 24 kWh of energy.

[1 mark]

Cost = _____ p

12 (b) The householder wants to reduce his energy bills by installing insulation.

Table 5 shows the U-values of three insulators.

Table 5

Insulator	**U-value in W/m^2 °C**
Double glazing	2.8
Cavity wall insulation	1.6
Loft insulation	0.16

12 (b) (i) Which is the most effective insulator?

[1 mark]

12 (b) (ii) Cavity wall insulation costs £300 to install and reduces energy bills by £150 per year.

Calculate the payback time for cavity wall insulation.

[1 mark]

Payback time = _____ years

12 (b) (iii) Although double glazing reduces energy bills, it has a very long payback time.

Suggest **one** other reason why many people still fit double glazing.

[1 mark]

5

Turn over for the next question

Biology Questions

13 Body mass index (BMI) is a measure of whether a person has a healthy mass for their height.

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

Table 6 shows how the BMI value is used to describe a person.

Table 6

BMI	Description
Less than 18.5	Underweight
18.5 – 24.9	Healthy weight
25 – 29.9	Overweight
30 – 39.9	Obese
40 and above	Severely obese

13 (a) A woman is 1.62 m tall and has a mass of 64 kg.

Which description in **Table 6** is correct for this woman?

You should include a calculation in your answer.

[2 marks]

_____

_____

Description of woman = _____

13 (b) A person's body mass can be affected by their metabolic rate.

13 (b) (i) What does metabolic rate mean?

[1 mark]

Tick (✓) **one** box.

A person's heart rate ☐

A person's breathing rate ☐

The rate of all the chemical reactions in a person's body ☐

The rate of doing work ☐

13 (b) (ii) Give **one** factor that can affect the metabolic rate.

[1 mark]

_____

_____

4

Turn over for the next question

14 Some microorganisms can cause disease.

14 (a) What name is given to microorganisms that cause disease?

[1 mark]

14 (b) Describe **three** ways white blood cells defend the body against microorganisms.

[3 marks]

14 (c) After someone has had chicken pox, they usually develop immunity to the chicken pox virus.

Describe how the white blood cells provide immunity against the chicken pox virus in the future.

[2 marks]

6

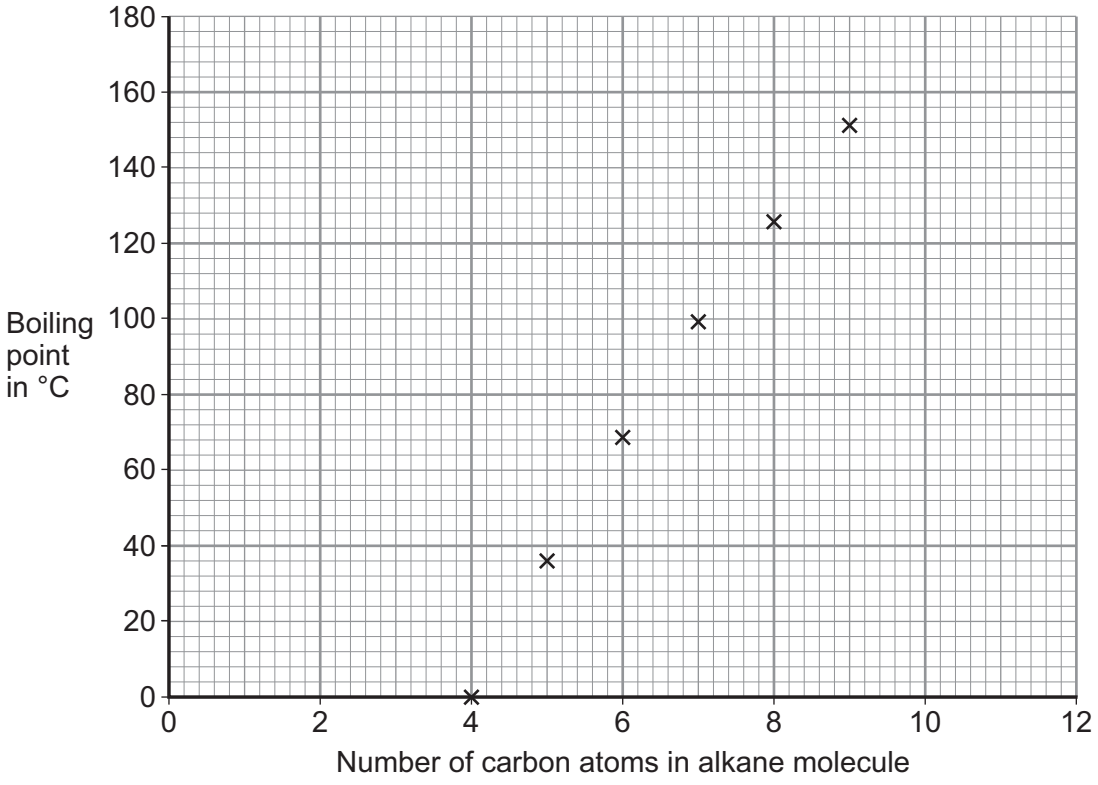
Chemistry Questions

15 This question is about fuels.

15 (a) Many fuels contain alkanes.

Figure 15 shows the boiling points of alkanes plotted against the number of carbon atoms in their molecules.

Figure 15



15 (a) (i) Use **Figure 15** to predict the boiling point of an alkane with 10 carbon atoms.

[1 mark]

_____

15 (a) (ii) The general formula for an alkane is C_nH_{2n+2}

What is the molecular formula of the alkane with 10 carbon atoms?

[1 mark]

Draw a ring around the correct answer.

$C_{10}H_{12}$ **$C_{10}H_{20}$** **$C_{10}H_{22}$** **$C_{10}H_{24}$**

Question 15 continues on the next page

15 (a) (iii) Alkanes are hydrocarbons.

What is meant by a hydrocarbon?

[1 mark]

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

Biodiesel is produced from plants, for example, rapeseed.
Large areas of farmland are being converted into fields growing rapeseed.

Petroleum diesel is produced from crude oil.

Table 7 shows the relative amounts of pollutants released when biodiesel and petroleum diesel are used as fuels.

Table 7

Fuel type	Relative amounts of pollutants released		
	Carbon dioxide	Oxides of nitrogen	Particulates
Biodiesel	0.28	1.13	0.44
Petroleum diesel	1.00	1.00	1.00

Use **Table 7** and your own knowledge to give advantages and disadvantages of using biodiesel instead of petroleum diesel as a fuel.

[6 marks]

Extra space

9

Turn over for the next question

Physics Questions

16 **Figure 16** shows a tablet. The tablet is powered by a rechargeable battery.

Figure 16

16 (a) (i) Complete the sentences to describe the energy transfers in the tablet.

[2 marks]

The battery transfers chemical energy into _____ energy.

The tablet transfers this energy into useful _____ energy.

16 (a) (ii) Some of the energy is not usefully transferred.

What happens to the energy which is not usefully transferred and what effect does this have?

[2 marks]

_____

_____

_____

_____

16 (b) The battery life is the time that a battery can be used to power a device before the battery is flat.

16 (b) (i) The tablet uses a power of 3 W and has a battery life of 8 hours.

Calculate the energy in joules stored in the battery when it is fully charged.

One hour = 3600 seconds.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Energy stored = _____ joules

16 (b) (ii) A laptop battery stores the same amount of energy as the tablet battery.

The laptop has a power of 50 W.

Explain how the battery life of the laptop will differ from the battery life of the tablet.

[2 marks]

8

END OF QUESTIONS

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