AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
ADDITIONAL SCIENCE

F

Foundation Tier Unit 5

Friday 10 June 2016 Morning 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(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.

Do not write outside the box

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

Biology Questions

1 The digestive system is made up of organs.

Each organ has a different function.

1 (a) Draw **one** line from each organ to the function of that organ.

[3 marks]

Organ	Function
	Produces digestive juices
Pancreas	
	Produces faeces
Liver	
	Absorbs most of the soluble food
Large intestine	
	Produces bile

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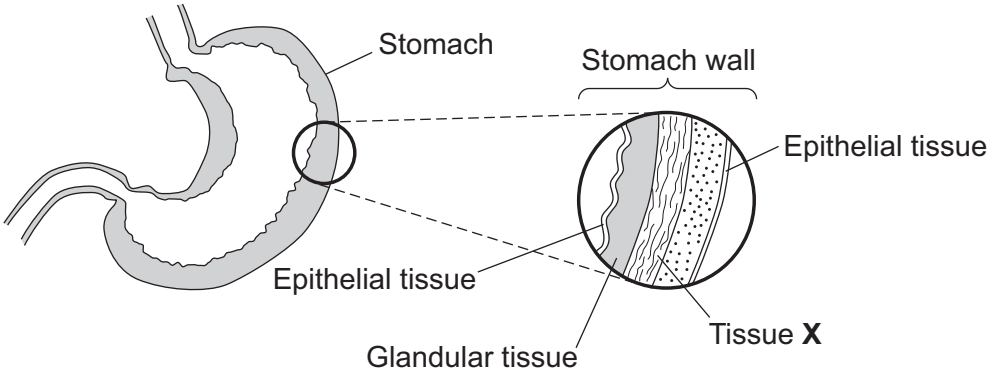
1 (b) **Figure 1** shows the stomach and the stomach wall.

The stomach wall is made of different types of tissue.

Figure 1



Tissue **X**, in the stomach wall, is able to contract.

1 (b) (i) What type of tissue is Tissue **X**?

[1 mark]

Draw a ring around the correct answer.

mesophyll **muscle** **phloem**

1 (b) (ii) Why is Tissue **X** important in the stomach?

[1 mark]

_____

_____

1 (b) (iii) Name **one** substance produced by the glandular tissue in the stomach wall.

[1 mark]

_____

6

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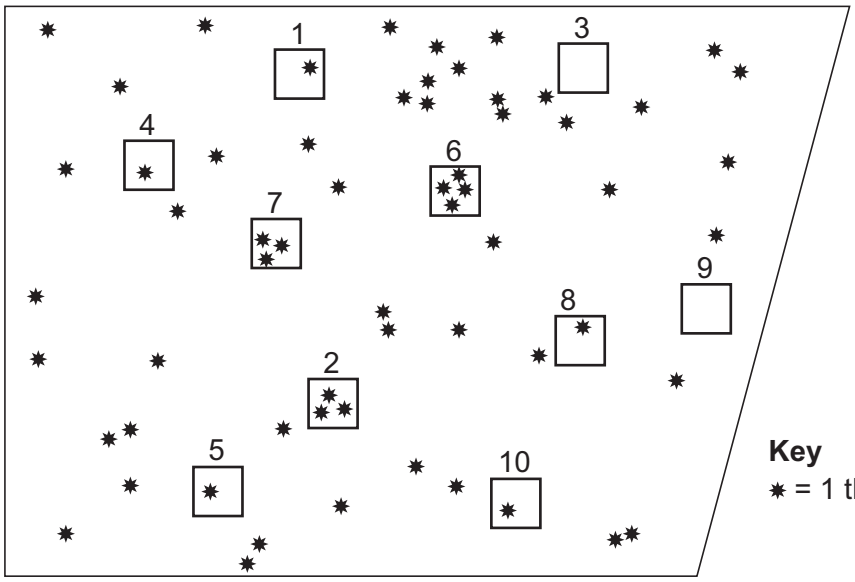
2 Students estimated the number of thistle plants in a garden.

The students sampled the garden using ten quadrats.

The quadrats were placed randomly.

Figure 2 shows the results. The positions of the quadrats are numbered 1–10.

Figure 2



2 (a) Describe how the students could have placed the quadrats randomly in the garden.

[1 mark]

2 (b) The students counted the number of thistle plants in each quadrat.

2 (b) (i) Complete **Table 1** to show the results for each quadrat.

Calculate the total for all ten quadrats.

The results for quadrat numbers 1–3 have been done for you.

Use information from **Figure 2**.

[2 marks]

Do not write outside the box

Table 1

Quadrat number	Number of thistle plants
1	1
2	3
3	0
4	
5	
6	
7	
8	
9	
10	
Total =	

2 (b) (ii) Calculate the mean number of thistle plants per quadrat.

[1 mark]

Use information from **Table 1** to help you.

Mean number = _____

2 (b) (iii) Each quadrat is 1 m^2

The area of the garden is 200 m^2

Estimate the total number of thistle plants in the garden.

Use information from **Table 1** to help you.

[1 mark]

_____

Total number of thistle plants = _____

2 (b) (iv) What is the **mode** for the number of thistle plants in the ten quadrats?

[1 mark]

_____

Mode = _____

Question 2 continues on the next page

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2 (c) (i) Suggest **one** way the students could have improved their investigation so that their estimate is more accurate.

[1 mark]

2 (c) (ii) What is the advantage of estimating the number of plants in a habitat, instead of counting them all?

[1 mark]

2 (d) Give **one** factor that might affect where thistle plants grow in the garden.

[1 mark]

9

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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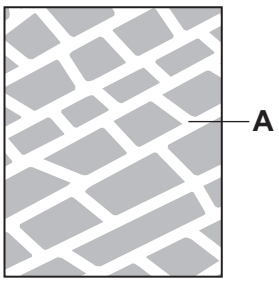
3 In 1653 Robert Hooke discovered plant cells using a simple microscope.

Figure 3 shows some cells from the drawing Hooke made.

Figure 3



3 (a) Using the microscope, Hooke only saw the part of a cell labelled **A**.

What part of a plant cell is part **A**?

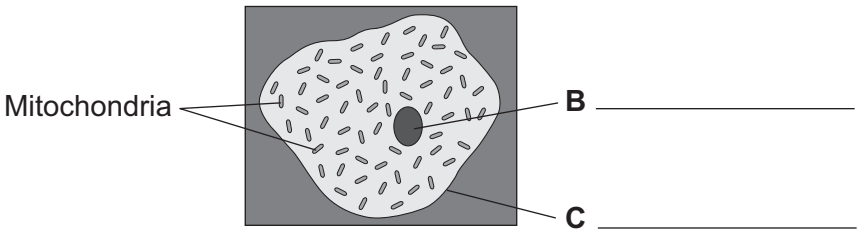
[1 mark]

Draw a ring around the correct answer.

cell wall **chloroplast** **cytoplasm**

3 (b) **Figure 4** shows a drawing of an animal cell seen through a light microscope, in 1980.

Figure 4



3 (b) (i) Use words from the box below to label parts **B** and **C** on **Figure 4**.

[2 marks]

Cell membrane	**Chloroplast**	**Nucleus**	**Vacuole**

Do not write outside the box

3 (b) (ii) Mitochondria can be seen in the cytoplasm in **Figure 4**.

Describe why mitochondria are important in cells.

[2 marks]

3 (b) (iii) Ribosomes **cannot** be seen in **Figure 4**.

Why can **no** ribosomes be seen in **Figure 4**?

[1 mark]

Tick (✓) **one** box.

Ribosomes had not been discovered in 1980. ☐

The magnification of the microscope was not great enough. ☐

Animal cells do not contain ribosomes. ☐

6

Turn over for the next question

Do not write outside the box

Chemistry Questions

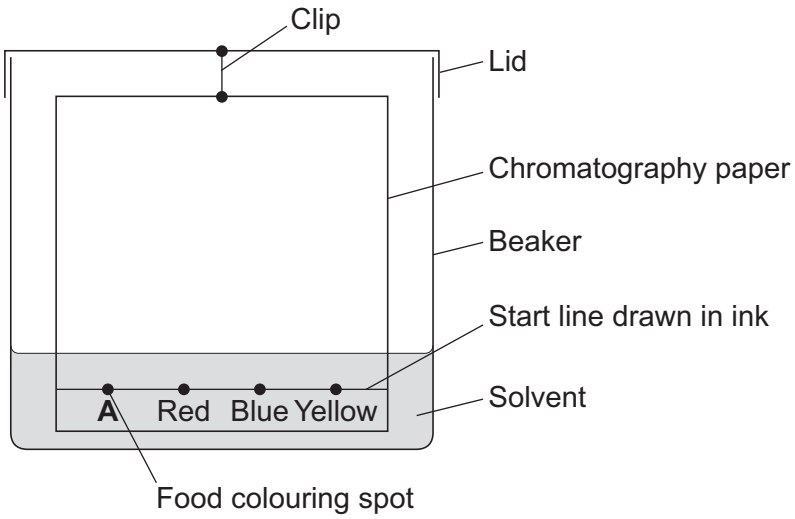
4 This question is about chromatography.

Students investigated food colouring **A**.

The students compared food colouring **A** with red, blue and yellow food colours.

4 (a) **Figure 5** shows how one student set up the apparatus.

Figure 5



What **two** errors did the student make setting up the apparatus?

[2 marks]

Tick (✓) **two** boxes.

A lid was put on the beaker. ☐

The chromatography paper did not touch the bottom of the beaker. ☐

The solvent in the beaker was above the start line. ☐

The start line was drawn in ink. ☐

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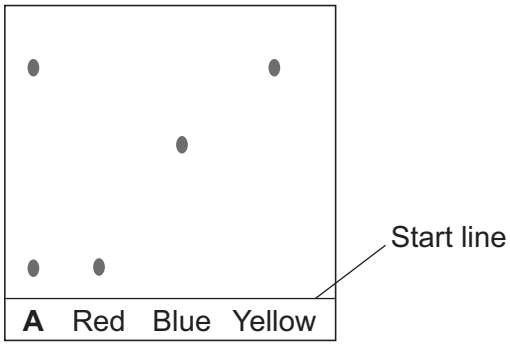
4 (b) Another student set up the apparatus correctly.

Figure 6 shows this student's results.

Figure 6



4 (b) (i) How many colours are in food colouring **A**?

[1 mark]

_____

4 (b) (ii) Which colour is **not** in food colouring **A**?

[1 mark]

Draw a ring around the correct answer.

blue **red** **yellow**

4

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ANSWER IN THE SPACES PROVIDED

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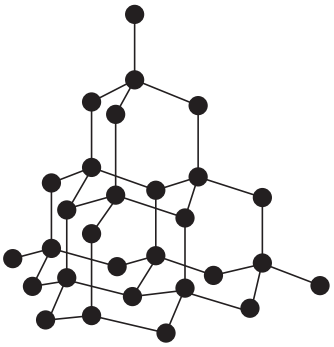
5 This question is about diamond and gold.

Figure 7 shows a ring made of diamond and gold.

Figure 7

Figure 8 shows the structure of diamond.

Figure 8



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

[1 mark]

carbon	oxygen	silver

Diamond is made of atoms of _____ .

Question 5 continues on the next page

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

[1 mark]

covalent	ionic	metallic

Diamond is very hard because diamond has _____ bonds.

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

[1 mark]

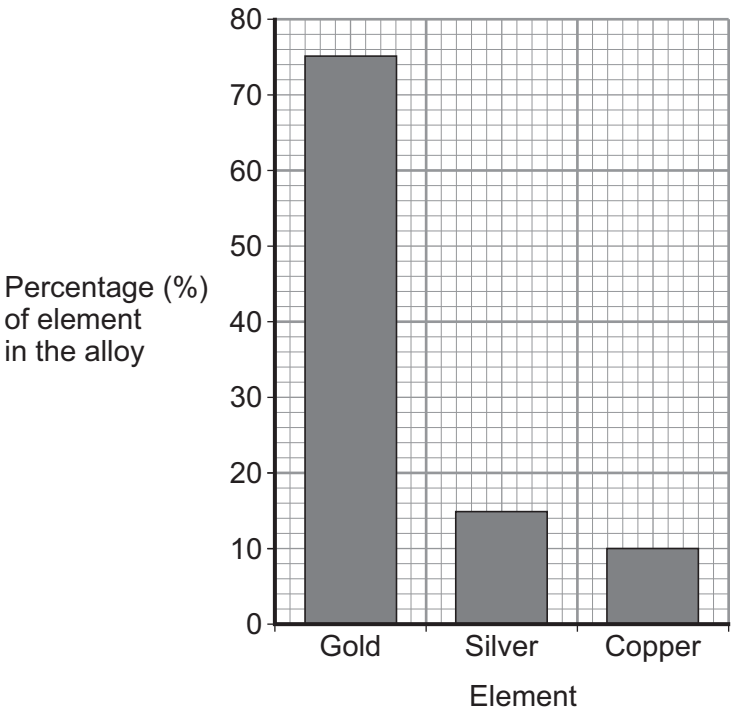
flexible	strong	weak

The bonds in diamond are very _____ .

5 (c) The ring is made from an alloy of gold.

Figure 9 shows the composition of this alloy of gold.

Figure 9



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5 (c) (i) What is an alloy?

[1 mark]

_____

_____

5 (c) (ii) Use the data in **Figure 9** to describe the composition of this alloy of gold.

[2 marks]

_____

_____

_____

_____

5 (c) (iii) Suggest **one** reason why an alloy of gold rather than pure gold is used in jewellery.

[1 mark]

_____

_____

5 (d) Some catalysts are made from gold nanoparticles.

5 (d) (i) What is the range in size of nanoparticles?

[1 mark]

Complete the following sentence.

Nanoparticles are 1 nm to _____ nm in size.

5 (d) (ii) Gold nanoparticles are used as catalysts.

Give **two** reasons why nanoparticles are better as catalysts than normal-sized particles.

[2 marks]

Tick (✓) **two** boxes.

Because nanoparticles are less reactive ☐

Because nanoparticles have a higher boiling point ☐

Because nanoparticles have a higher surface area to volume ratio ☐

Because using nanoparticles requires less gold to be used ☐

10

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6 This question is about sodium and sodium compounds.

6 (a) (i) A sodium atom can be represented as

$$^{23}_{11}Na$$

How many protons are there in a sodium atom?

[1 mark]

_____

6 (a) (ii) Complete the following sentence.

[1 mark]

The mass number is the total number of protons and _____ in an atom.

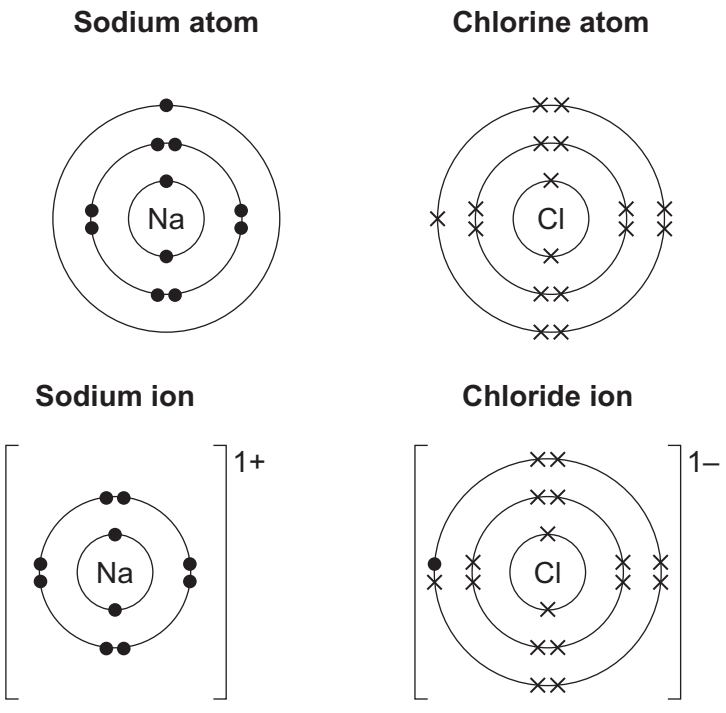
6 (b) Sodium reacts with chlorine to produce sodium chloride.

6 (b) (i) When sodium atoms and chlorine atoms react to produce sodium chloride, sodium ions and chloride ions are formed.

Figure 10 shows the electron arrangements in the atoms and ions.

The symbols ● and × are used to represent electrons.

Figure 10



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Use **Figure 10** to help you answer this question.

Describe, as fully as you can, what happens when a sodium atom reacts with a chlorine atom to produce sodium chloride.

[4 marks]

6 (b) (ii) Which element has atoms with the same electronic structure as a chloride ion?

[1 mark]

Draw a ring around the correct answer.

argon **potassium** **sulfur**

7

Turn over for the next question

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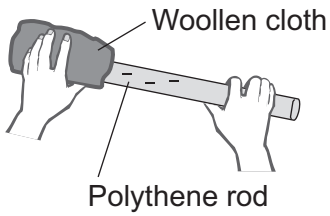
Physics Questions

7 **Figure 11** shows a student rubbing a polythene rod with a woollen cloth.

The polythene rod becomes negatively charged.

Figure 11



7 (a) (i) Why does the rod become negatively charged?

[1 mark]

Tick (✓) **one** box.

The rod gains electrons from the cloth. ☐

The rod loses protons to the cloth. ☐

The rod loses electrons to the cloth. ☐

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

[1 mark]

more than	**less than**	**the same as**

The amount of positive charge on the cloth is _____ the amount of negative charge on the rod.

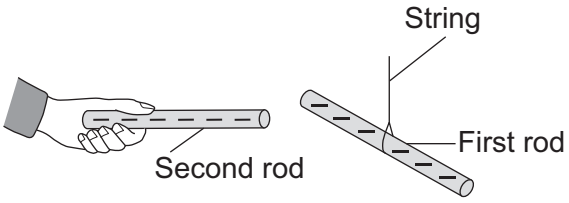
Do not write outside the box

7 (b) The student hangs the negatively charged rod from a piece of string.

The student moves a second negatively charged rod towards one end of the first rod.

This is shown in **Figure 12**.

Figure 12



7 (b) (i) Describe the movement of the first rod.

[1 mark]

_____

_____

7 (b) (ii) Give a reason for your answer to part **(b)(i)**.

[1 mark]

_____

_____

4

Turn over for the next question

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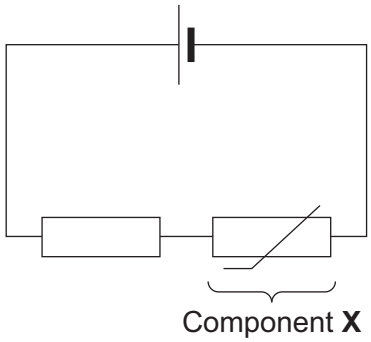
8 **Figure 13** shows part of the circuit in a temperature sensor.

Figure 13



8 (a) What is Component **X** in **Figure 13**?

[1 mark]

Tick (✓) **one** box.

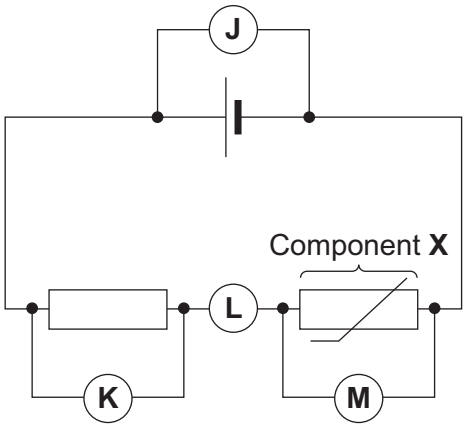
A light-dependent resistor ☐

A thermistor ☐

A variable resistor ☐

8 (b) **Figure 14** shows four positions, **J**, **K**, **L** and **M**, in the circuit.

Figure 14



8 (b) (i) In which position, **J**, **K**, **L** or **M**, should an ammeter be placed to measure the current through Component **X**?

[1 mark]

Write the correct answer in the box. ☐

Do not write outside the box

8 (b) (ii) In which position, **J**, **K**, **L** or **M**, should a voltmeter be placed to measure the potential difference across Component **X**?

[1 mark]

Write the correct answer in the box.

8 (c) **Table 2** shows data from the temperature sensor over 4 hours.

Table 2

Time of day	Temperature in °C	Resistance of Component X
10 am	18	12 000
11 am	20	9 000
12 noon	22	7 000
1 pm	24	6 000
2 pm	24	5 000

8 (c) (i) The unit of resistance has **not** been included in **Table 2**.

What is the unit of resistance?

[1 mark]

Draw a ring around the correct answer.

amps **ohms** **volts**

8 (c) (ii) The resistance value in **Table 2** for 2 pm is **not** correct.

What is the correct value for the resistance at 2 pm?

[2 marks]

Draw a ring around the correct answer.

7000 **6000** **3000**

Give a reason for your answer.

_____

_____

6

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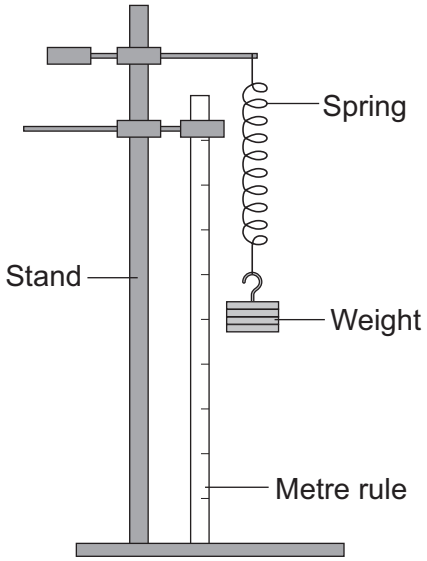
9 A student investigated the extension of a spring.

Figure 15 shows the equipment the student used.

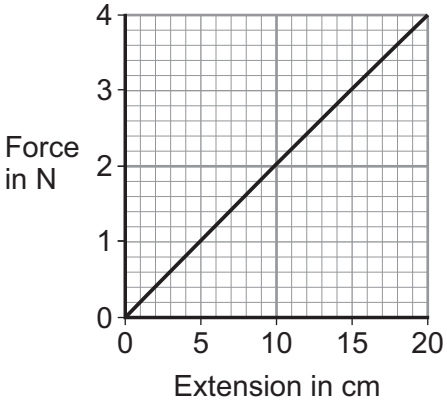
Figure 15



The student changed the force applied to the spring by adding different weights.

9 (a) **Figure 16** shows the student's results plotted as a graph.

Figure 16



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9 (a) (i) What was the extension for a force of 3 N?

[1 mark]

Extension = _____ cm

9 (a) (ii) Describe how the extension of the spring changed as the force increased between 0 N and 4 N.

[2 marks]

_____

_____

_____

_____

9 (a) (iii) The student removed all of the weights. What happened to the length of the spring when all of the force was removed?

[1 mark]

Tick (✓) **one** box.

The extension stayed at 20 cm ☐

The extension became greater than 20 cm ☐

The extension went back to 0 cm ☐

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

[1 mark]

accurate	**valid**	**reproducible**

A second student did the same investigation and obtained the same results.

This shows that the investigation is _____ .

Question 9 continues on the next page

Do not write outside the box

9 (b) When a spring is stretched it stores energy.

What type of energy does a stretched spring store?

[1 mark]

Tick (✓) **one** box.

Elastic potential energy ☐

Kinetic energy ☐

Thermal energy ☐

6

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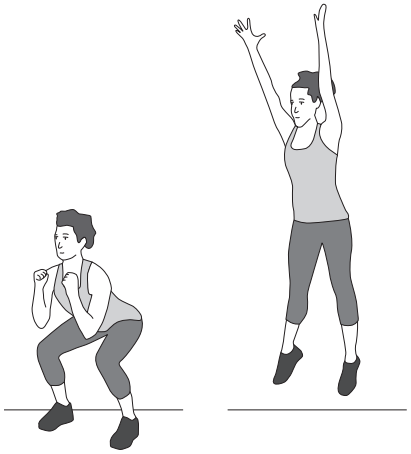
10 This question is about work and power.

An athlete is exercising by jumping into the air as shown in **Figure 17**.

Figure 17



10 (a) Work is done when the athlete jumps up.

Explain why work is being done when the athlete jumps up.

[2 marks]

Question 10 continues on the next page

Do not write outside the box

10 (b) Power is the work done in a given time.

The athlete calculates her work done and power during two sets of jumps.

Table 3 shows the athlete's data.

Table 3

Set	Work done in joules	Time in seconds	Power in watts
1	5700	60	95
2	6000	60	100

Why is the athlete's power greater in the second set of jumps?

You should use information from **Table 3** to help you.

[1 mark]

Do not write outside the box

10 (c) The athlete calculates her power during five sets of jumps in a training session.

Table 4 shows the athlete's data.

Table 4

Set	Time in seconds	Power in watts
1	60	95
2	60	100
3	60	105
4	60	30
5	60	100

Describe how the athlete should use the data in **Table 4** to calculate the mean power she produces.

[2 marks]

5

Turn over for the next question

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Biology Questions

11 Mars has a lower air pressure than Earth.

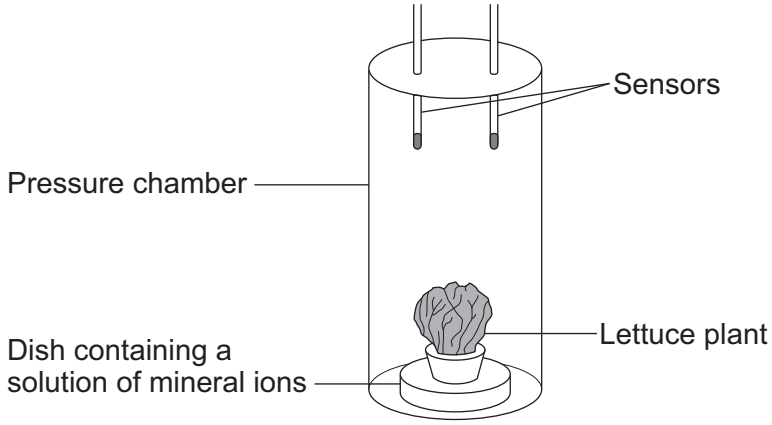
Scientists investigated the growth of plants in low air pressure.

Figure 18 shows a pressure chamber.

A pressure chamber is a transparent sealed container.

The air pressure inside the chamber can be changed.

Figure 18



11 (a) (i) To allow the lettuce plant to grow, the pressure chamber is transparent.

Explain why.

[2 marks]

11 (a) (ii) The solution in the dish contains nitrate ions.

Which chemical do plants produce using nitrate ions?

[1 mark]

Draw a ring around the correct answer.

starch **sugar** **protein**

Do not write outside the box

11 (b) The scientists investigated the growth of lettuce plants.

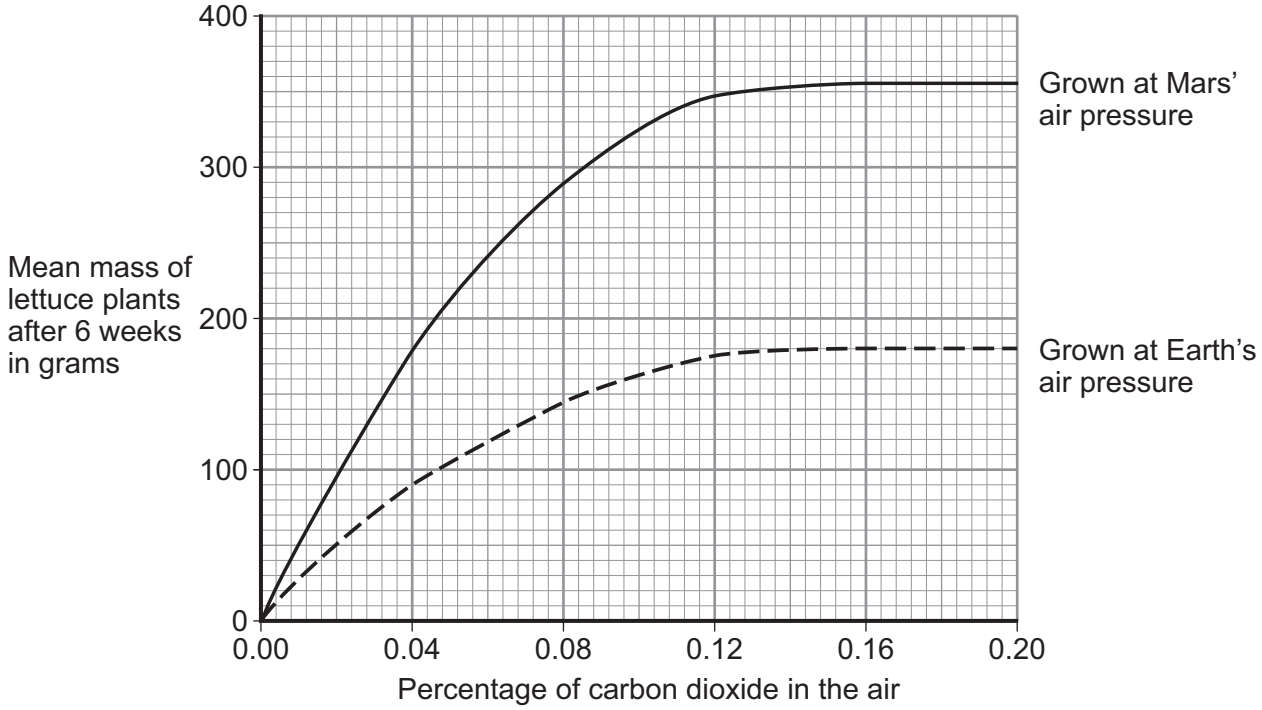
The scientists:

- grew lettuce plants at different concentrations of carbon dioxide at the air pressure found on Mars
- grew lettuce plants at different concentrations of carbon dioxide at the air pressure found on Earth.

The scientists grew 10 lettuce plants for 6 weeks in each part of the investigation.

The results are shown in **Figure 19**.

Figure 19



11 (b) (i) Suggest **one** environmental factor that the scientists should keep the same in the investigation so that the results are valid.

[1 mark]

_____

Do not write outside the box

11 (b) (ii) The concentration of carbon dioxide in the air on Earth is 0.04%.

Compare the effect on the mass of the lettuces grown for 6 weeks at the air pressure found on Mars, instead of at the air pressure found on Earth at 0.04% carbon dioxide.

[2 marks]

11 (b) (iii) Give **one** way that photosynthesis will change the composition of the air in the pressure chamber.

[1 mark]

11 (c) One scientist said,

'On Earth, carbon dioxide is **not** a limiting factor at a concentration of 0.16%.'

11 (c) (i) What evidence in **Figure 19** supports this statement?

[1 mark]

11 (c) (ii) Name **one** limiting factor other than carbon dioxide concentration.

[1 mark]

9

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Chemistry Questions

12 **Table 5** shows information about the structure and properties of three oxides.

Table 5

Oxide	Melting point in °C	Type of structure	Does it conduct electricity when solid?	Does it conduct electricity when liquid?
Magnesium oxide	2852	Giant ionic lattice		
Silicon dioxide	1600		No	No
Sulfur trioxide	17	Simple molecule		

12 (a) Complete **Table 5**.

[3 marks]

12 (b) Magnesium oxide and silicon dioxide are used as linings in hot furnaces.

Use information from **Table 5** to suggest **one** reason why.

[1 mark]

_____

_____

12 (c) (i) Calculate the relative formula mass (M_r) of sulfur trioxide (SO_3).

Relative atomic masses (A_r): O = 16, S = 32

[2 marks]

_____

_____

Relative formula mass (M_r) = _____

Do not write outside the box

12 (c) (ii) The relative formula mass (M_r) of silicon dioxide is 60.

Calculate the percentage by mass of oxygen in silicon dioxide (SiO_2).

Relative atomic masses (A_r): O = 16, Si = 28

[2 marks]

_____

_____

Percentage by mass of oxygen = _____ %

12 (c) (iii) The relative formula mass (M_r) of magnesium oxide is 40.

What is the mass of one mole of magnesium oxide?

[1 mark]

Mass of one mole of magnesium oxide = _____

9

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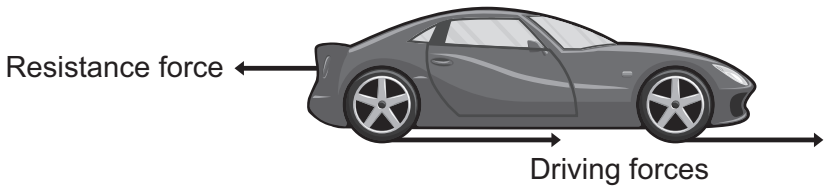
Physics Questions

13 **Figure 20** shows the horizontal forces acting on a moving car on a straight, level road.

Figure 20



13 (a) (i) The total resistance force is 500 N.

The driving force on **each** of the four wheels is 1000 N.

Calculate the resultant force acting on the car in **Figure 20**.

[1 mark]

Resultant force = _____ N

13 (a) (ii) Describe the motion of the car in **Figure 20**.

[2 marks]

Question 13 continues on the next page

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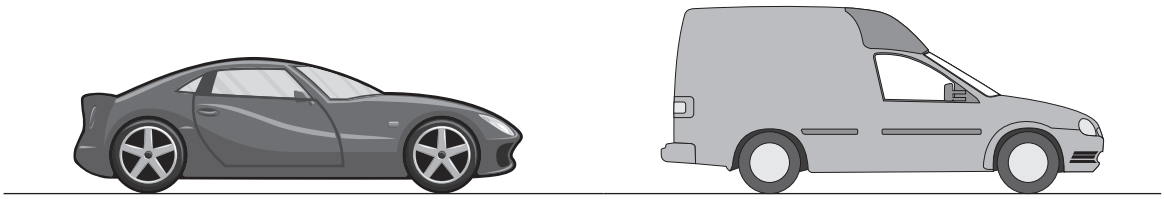
13 (b) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Figure 21 shows the car and a van made by the same manufacturer.

Figure 21



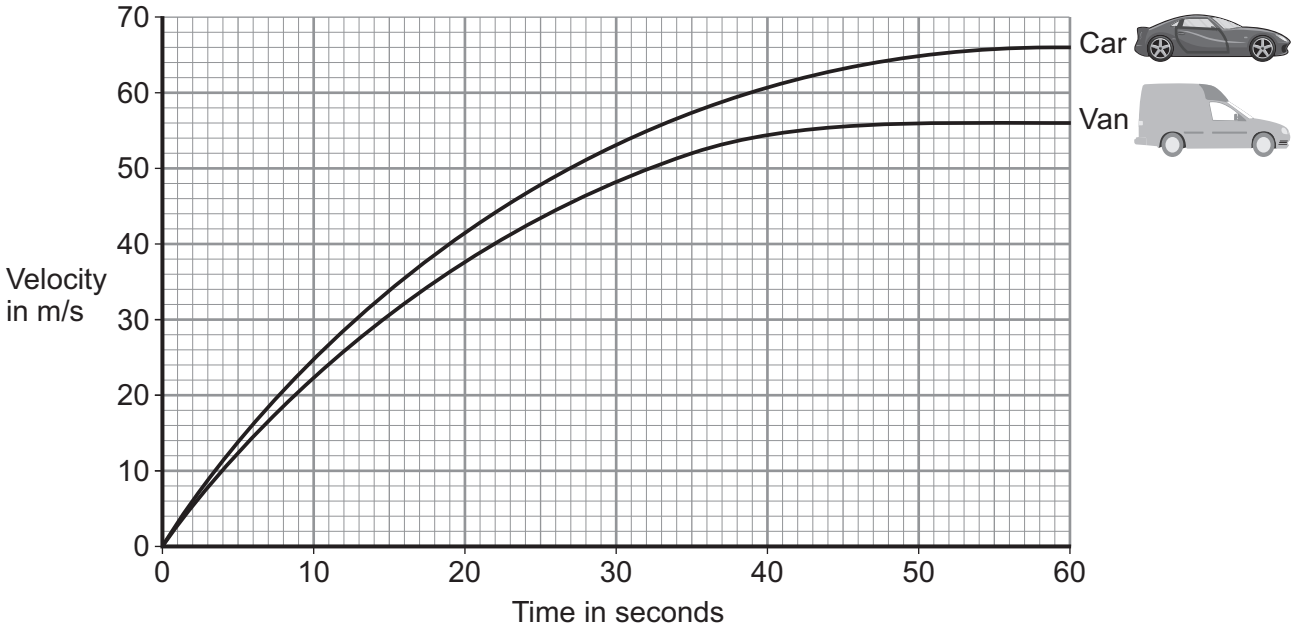
The car and the van have the same mass and identical engines.

The manufacturer carries out a test to compare the performance of the car and the van.

The test is a race between the two vehicles on a straight, level road.

Figure 22 shows the velocities of the car and the van during the test.

Figure 22



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Use **Figure 22** to describe the similarities and differences between the test results for the car and the van.

In your answer you should describe, in terms of horizontal forces, what is happening to each vehicle.

[6 marks]

Extra space

9

END OF QUESTIONS

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