OCR
Oxford Cambridge and RSA

F

Monday 15 June 2015 – Morning

GCSE GATEWAY SCIENCE
FURTHER ADDITIONAL SCIENCE B

B761/01 Further Additional Science modules B5, C5, P5 (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **28** pages. Any blank pages are indicated.

EQUATIONS

$$\text{energy} = \text{mass} \times \begin{matrix}\text{specific}\\ \text{heat}\\ \text{capacity}\end{matrix} \times \begin{matrix}\text{temperature}\\ \text{change}\end{matrix}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{efficiency} = \frac{\text{useful energy output } (\times 100\%)}{\text{total energy input}}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{distance} = \text{average speed} \times \text{time}$$

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{work done} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

$$\text{power} = \text{force} \times \text{speed}$$

$$KE = \frac{1}{2}mv^2$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

$$GPE = mgh$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

$$\text{refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{object size}}$$

$$I_e = I_b + I_c$$

$$\frac{\begin{matrix}\text{voltage across}\\ \text{primary coil}\end{matrix}}{\begin{matrix}\text{voltage across}\\ \text{secondary coil}\end{matrix}} = \frac{\begin{matrix}\text{number of}\\ \text{primary turns}\end{matrix}}{\begin{matrix}\text{number of}\\ \text{secondary turns}\end{matrix}}$$

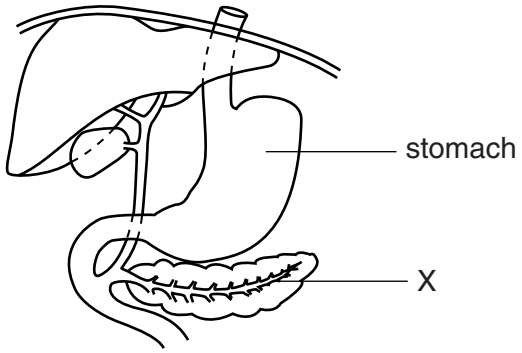
$$\text{power loss} = (\text{current})^2 \times \text{resistance}$$

$$V_pI_p = V_sI_s$$

Answer **all** the questions.

SECTION A – Module B5

1 Look at the diagram. It shows part of the digestive system.



(a) (i) What is the name of part **X**?

Put a (ring) around the correct answer.

gall bladder **liver** **pancreas** **salivary gland**

[1]

(ii) Describe the job of part **X** during digestion.

.....

..... **[1]**

(b) Both chemical and physical digestion take place in the stomach.

Describe **two** ways that chemical digestion is different from physical digestion.

.....

.....

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..... **[2]**

(c) At the end of the digestive system undigested food is removed from the body.

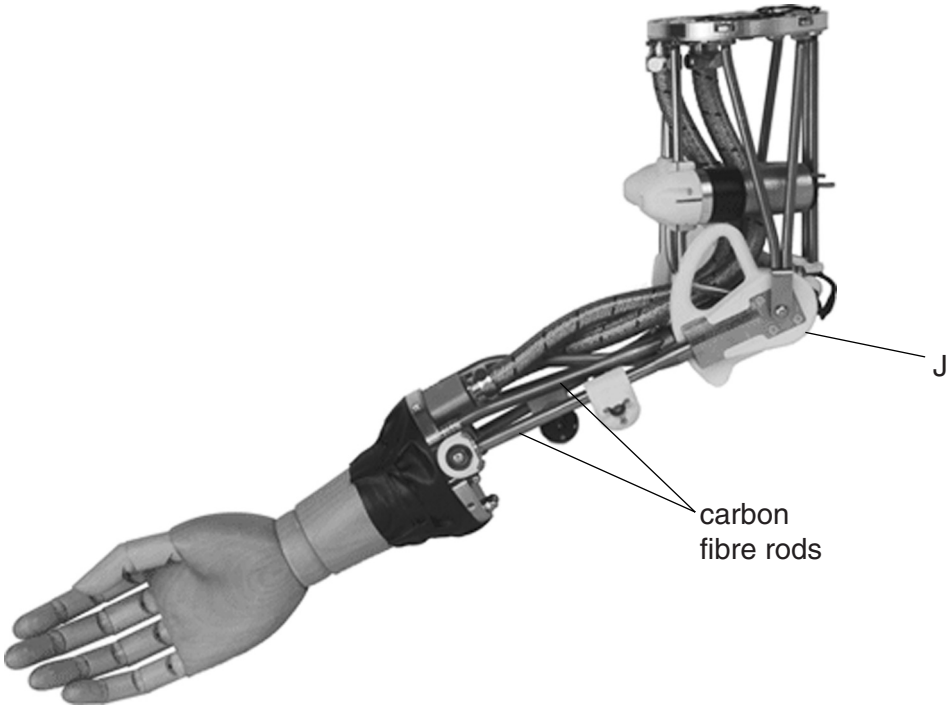
What word describes the removal of undigested food from the body?

Put a (ring) around the correct answer.

absorption **diffusion** **egestion** **excretion**

[1]

2 Look at the diagram of an artificial arm.



The artificial arm can be controlled by using a computer inside the arm.

(a) The joints in the arm move in the same directions as human joints.

Which type of joint is labelled **J** in the artificial arm?

..... **[1]**

(b) The carbon fibre rods are the skeleton of the arm.

Write down **two** ways the **lower artificial** arm is different from a **lower human** arm.

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..... **[2]**

3 Patrick and John are **non-identical** twins.

Read the information about Patrick and John.

	Age in years	Height in cm	Mass in kg
Patrick	14	180	70
John	14	168	76

Suggest and explain reasons for the differences in **height** and **mass** between Patrick and John.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

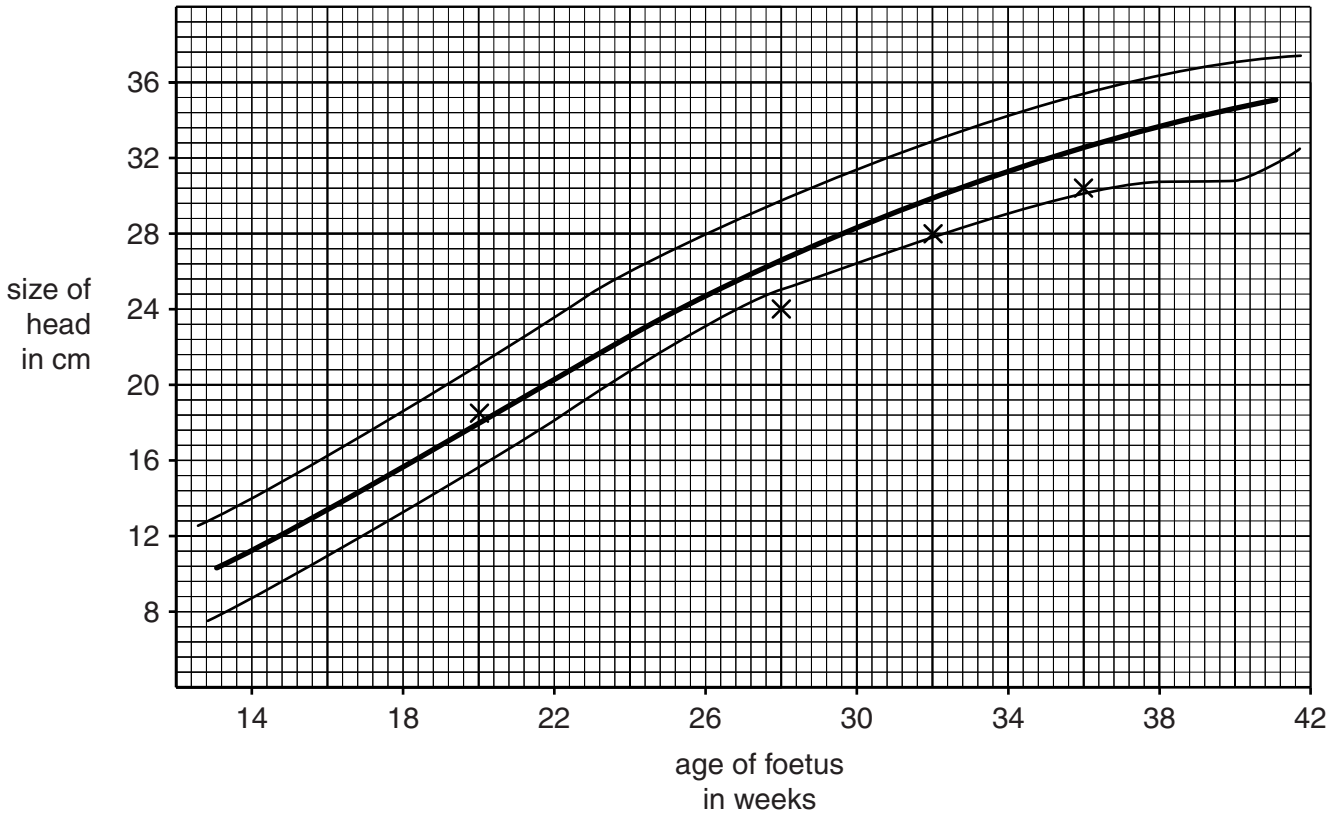
4 During pregnancy the development of the foetus is monitored.

One way to monitor development is to measure the size of the head.

Look at the graph.

The dark line in the middle shows the average head size for a foetus of that age.

The other two lines show the healthy range for the head size of a foetus.



(a) Claire is pregnant.

The head size of her foetus is measured four times.

The results are plotted on the graph.

(i) What was the size of the head of the foetus at 28 weeks?

..... cm **[1]**

(ii) Should there be any concerns for the health of the foetus? Explain your answer.

.....

..... **[1]**

(b) (i) A foetus can be tested for conditions such as Down's syndrome.

Describe how a foetus can be tested for Down's syndrome.

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..... **[2]**

(ii) People have different opinions about foetal testing.

Describe the ethical arguments **for** and **against** foetal testing.

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..... **[3]**

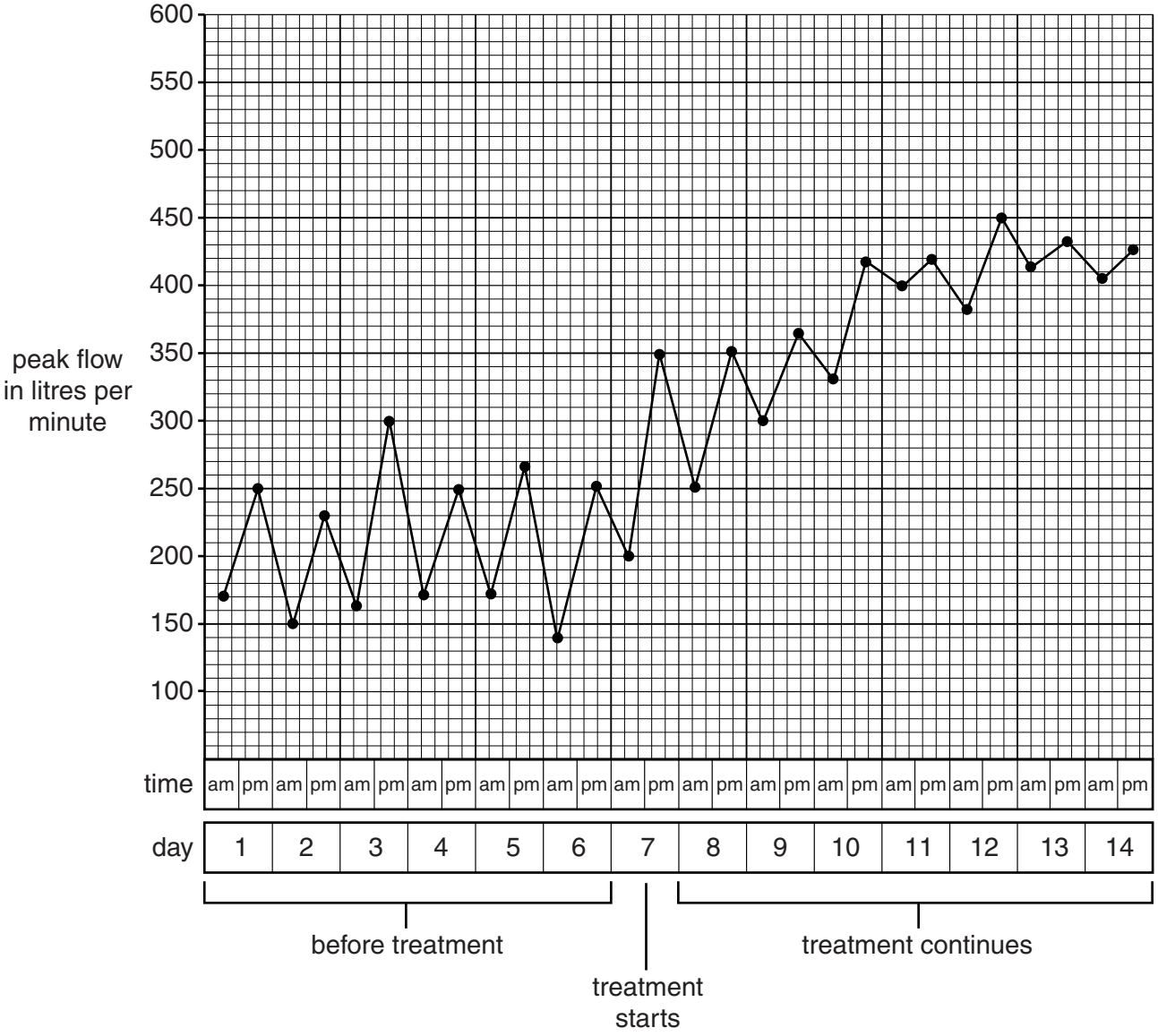
5 Peak flow meters can be used to measure how fast you breathe out.

Sally's doctor suspects she has asthma.

The doctor gets Sally to measure her peak flow each morning and afternoon.

After seven days Sally is given treatment for asthma.

The chart shows Sally's peak flow values.



(a) What is Sally's highest peak flow value?

..... litres per minute **[1]**

(b) Does the treatment have an effect?

Use the graph to explain your answer.

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..... **[2]**

(c) When Sally breathes in and out she uses muscles attached to her ribs.

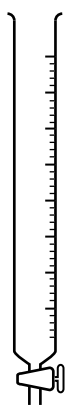
Write down the name of the muscles attached to the ribs.

..... **[1]**

SECTION B – Module C5

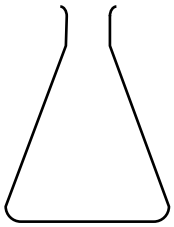
6 Rachel and Mark do a titration.

Look at the diagrams. They show some of the apparatus they use.

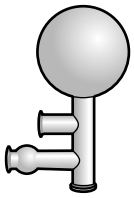


burette

pipette



flask



pipette filler

bottle of indicator

Rachel and Mark titrate dilute nitric acid with dilute sodium hydroxide solution.

(a) Write about how Rachel and Mark do the titration.

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..... **[3]**

(b) It is important to use a pipette filler when using a pipette in an acid-base titration.

Explain why.

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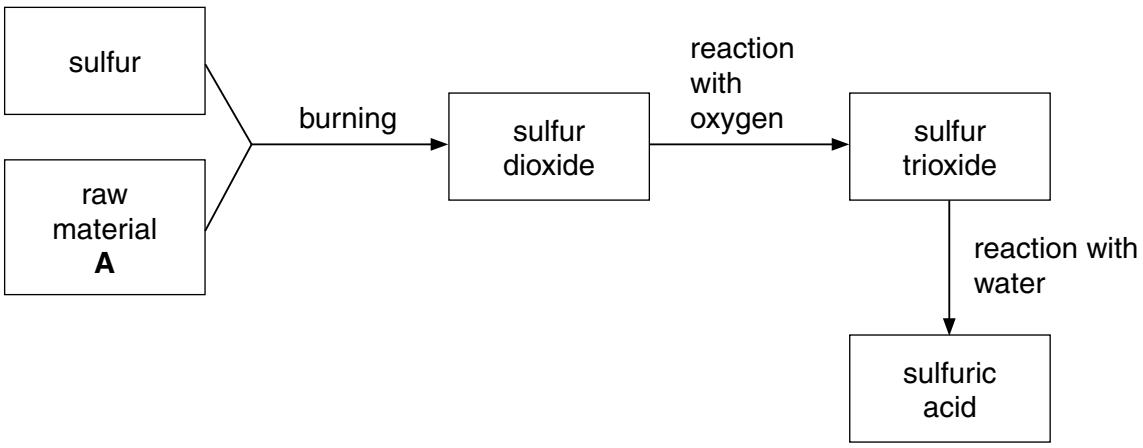
..... **[1]**

7 This question is about the Contact Process used for the manufacture of sulfuric acid.

Look at the flow chart for the Contact Process.



(a) (i) What is the name of raw material **A**?

..... **[1]**

(ii) In the second stage of the process, sulfur dioxide reacts with oxygen.

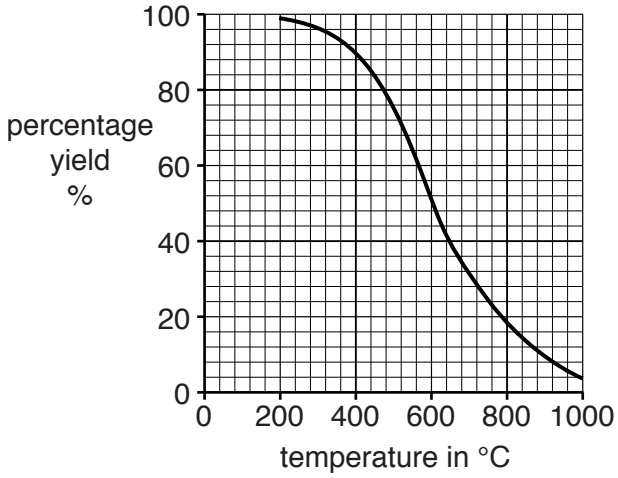
Sulfur trioxide is made.

Write a **word equation** for this reaction.

..... **[1]**

(b) Look at the graph.

It shows the percentage yield of sulfur trioxide as the temperature changes.



How does **increasing** the temperature change the percentage yield?

..... **[1]**

8 Phil has a tin of soup for his lunch.

He looks at the label on the tin.

The label shows information about the food contents of the soup.

It also shows the Guideline Daily Amounts (GDA).

Food content	Amount in one tin of this soup	GDA value	Percentage of GDA in one tin of this soup
energy	976 kJ	8300 kJ	11.7%
protein	3.6 g	45 g	8.0%
carbohydrate	27.0 g	230 g	11.7%
fat	12.0 g	70 g	
fibre	1.6 g	24 g	6.7%
sodium	1.0 g	2.4 g	41.7%

(a) Look at the information about fat content.

Calculate the percentage of the GDA for fat in one tin of the soup.

Write your answer to **three significant figures**.

Percentage GDA for fat = ...% **[2]**

(b) A food scientist writes a summary about the contents of foods.

The contents of foods

- Too much energy content can cause obesity.
- Carbohydrates provide energy but eating too much can cause obesity.
- Fats can be stored as body fat and can cause heart disease.
- Too much sodium can cause heart disease.

Which **one** of the contents in this soup is **most likely** to worry the food scientist?

Explain your answer.

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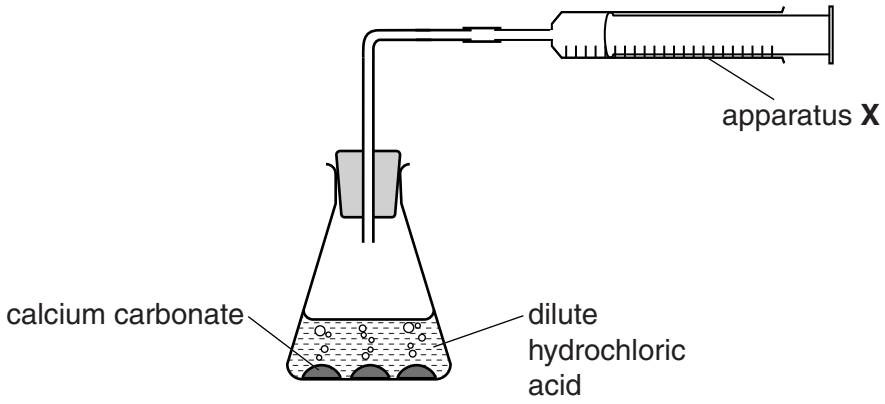
..... **[2]**

9 Greg and Steph investigate the reaction between calcium carbonate and hydrochloric acid.

$$\text{calcium carbonate} + \text{hydrochloric acid} \rightarrow \text{calcium chloride} + \text{carbon dioxide} + \text{water}$$

Look at the diagram. It shows the apparatus they use.



(a) What is the name of apparatus **X**?

..... **[1]**

(b) Greg and Steph do the experiment several times.

Each time they use a different mass of calcium carbonate.

They measure the volume of carbon dioxide made at the end of the reaction.

In each experiment the hydrochloric acid is in **excess**.

(i) Explain why each reaction stops.

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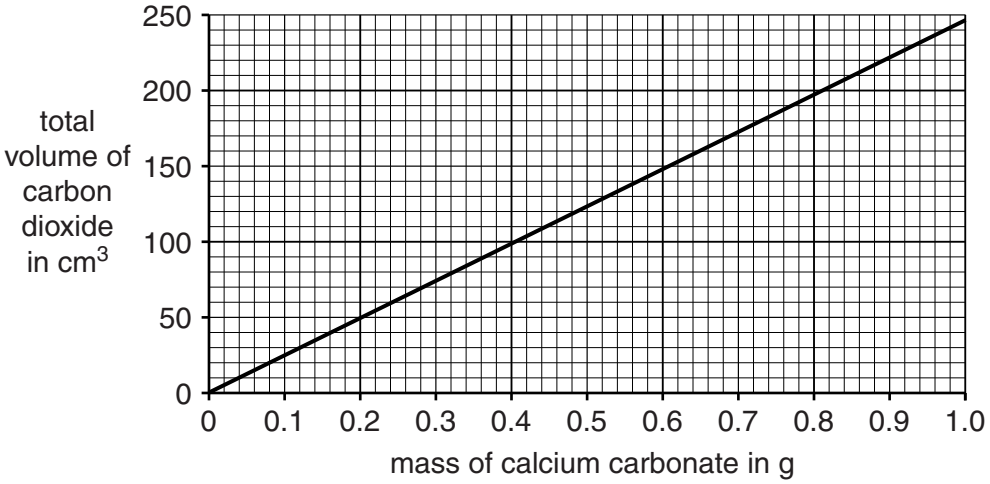
..... **[2]**

(ii) Look at the graph. It shows their results.



Greg and Steph want to make exactly 50 cm^3 of carbon dioxide at the end of the reaction.

What mass of calcium carbonate should they use?

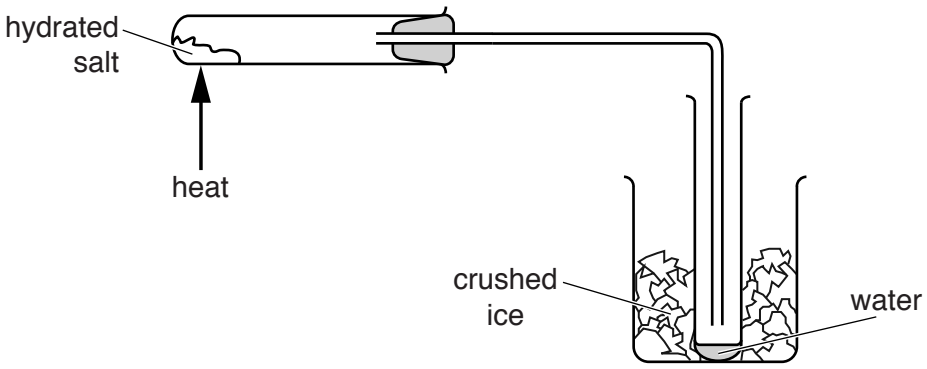
answer ..... g **[1]**

10 Peter is heating two hydrated salts.

These are

- hydrated copper(II) sulfate, $CuSO_4.5H_2O$
- hydrated sodium carbonate, $Na_2CO_3.10H_2O$.

Look at the apparatus he uses.



When each hydrated salt is heated, the water in the hydrated salt is given off as steam.

The steam is condensed and collected in the test tube placed in crushed ice.

The equations for the reactions are:

hydrated copper(II) sulfate → anhydrous copper(II) sulfate + water

hydrated sodium carbonate → anhydrous sodium carbonate + water

Look at Peter's results for hydrated copper(II) sulfate.

(a) Complete the table.

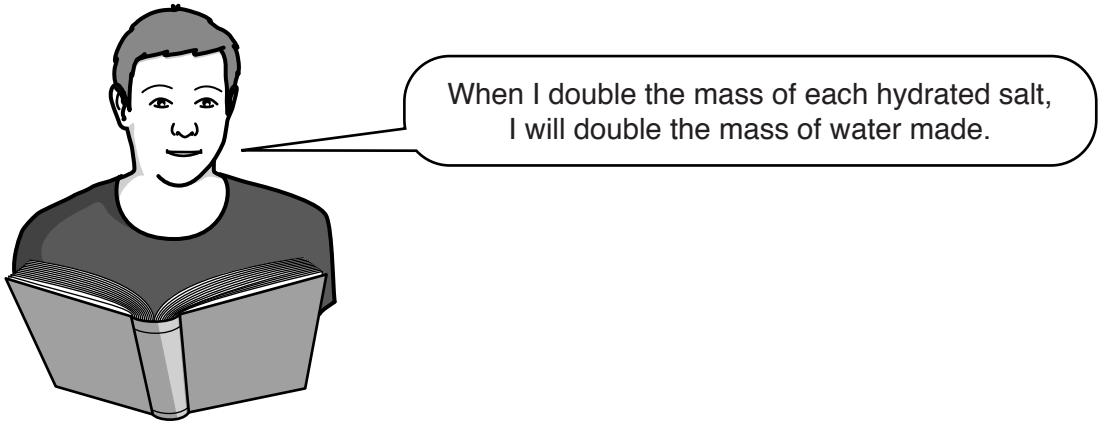
Mass of hydrated copper(II) sulfate in g	**Mass of anhydrous copper(II) sulfate in g**	**Mass of water in g**
0.50	0.32	0.18
1.00	0.64	0.36
1.50	0.96	.....
2.00	1.28	0.72
2.50	.....	0.90

[2]

(b) Look at Peter's results for hydrated sodium carbonate.

Mass of hydrated sodium carbonate in g	Mass of anhydrous sodium carbonate in g	Mass of water in g
1.00	0.37	0.63
1.50	0.70	0.80
2.00	1.00	1.00

Before he starts the experiment, Peter makes a prediction for **both** hydrated salts.



Do Peter's results support his prediction about **both** hydrated salts?

Explain your answer quoting information from **both** tables.

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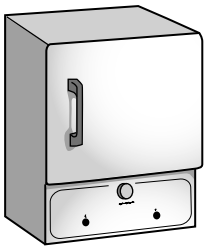
..... **[2]**

11 Barium sulfate is an insoluble salt.

Steve wants to make a pure, dry sample of barium sulfate.

Steve uses solutions of barium chloride and sodium sulfate in a **precipitation** reaction.

He also has these pieces of apparatus.



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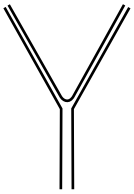

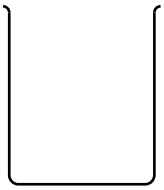

Describe the stages that Steve uses to prepare a **pure**, **dry** sample of barium sulfate.

Include a **word** equation for the precipitation reaction.

You may wish to draw a **labelled** diagram.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

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Section C starts on page 20

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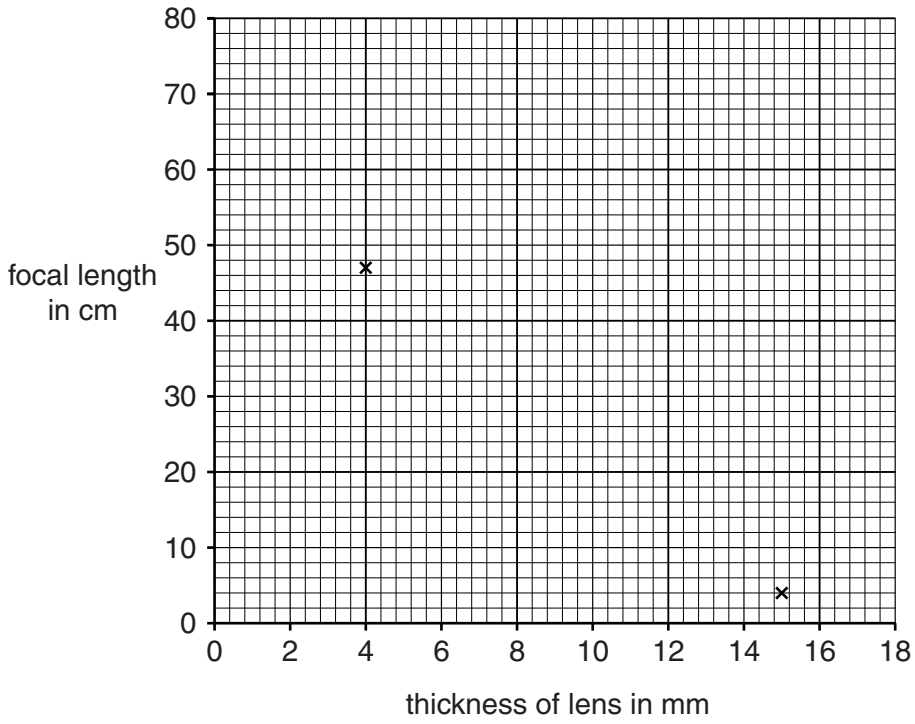
SECTION C – Module P5

12 Sarah experiments with convex lenses of different thicknesses.

She measures the thickness and focal length of five lenses.

Look at her results.

Lens	Thickness in mm	Focal length in cm
A	4.0	47
B	5.0	26
C	7.0	17
D	8.0	10
E	15.0	4



(a) Plot Sarah's results onto the graph. Two points have been done for you. **[1]**

(b) What can you conclude from the graph? Complete the sentence.

As the thickness of the lens increases, the focal length ..... . **[1]**

(c) Sarah needs a lens with a focal length of 20 cm.

Use the graph to estimate the thickness of a lens with a focal length of 20 cm.

Thickness = ... mm **[1]**

(d) Sarah wants to check the focal length of this lens in the laboratory.

Describe how she could take this measurement.

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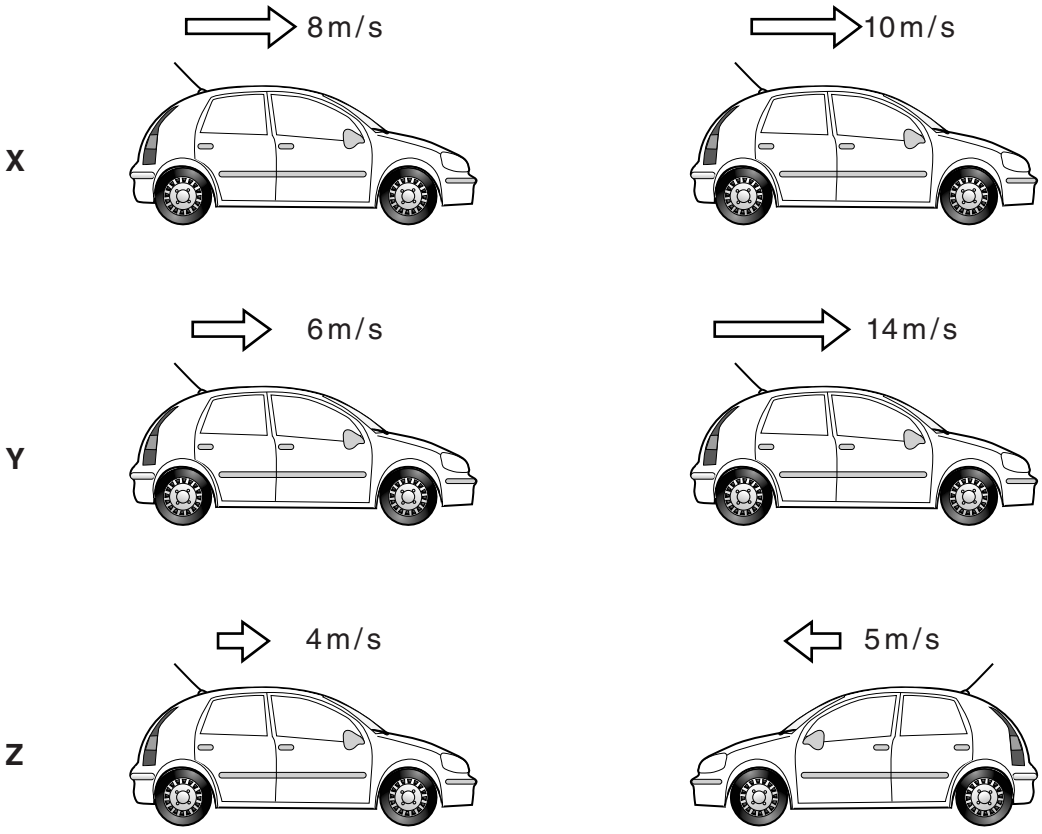
..... **[2]**

13 Look at the diagrams of the three pairs of cars **X**, **Y** and **Z**.

The arrows show the direction and speed of each car.



(a) The two cars shown in **Z** have the highest **relative** speed.

Use the data in the diagrams to show this.

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..... **[2]**

(b) Describe how the **velocity** of a car is different from the **speed** of a car.

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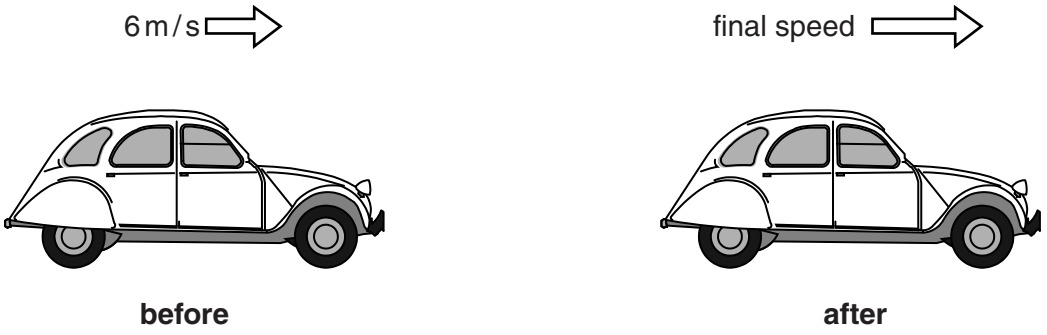
..... **[1]**

(c) Look at the diagram of a car accelerating.



The car accelerates at $0.5\,m/s^2$ for 16 s.

Calculate the final speed of the car.

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.....

answer ..... m/s **[2]**

14 Artificial satellites are put into orbit around Earth.

Some satellites are used for weather forecasting.

Look at the information about two types of weather satellite.

Satellite	Average orbital height	Orbital period	Shape of orbit	Uses
Meteosat	38 500 km	24 hours	circular	low definition weather imaging
POES	807 km	101 minutes	elliptical	high definition weather imaging

(a) Meteosat is in orbit above the equator **and** it moves around the Earth once every 24 hours.

POES has a different orbit and it passes over the North and South Poles.

Describe the **advantages** of each orbit for weather forecasting.

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Describe the **disadvantages** of each orbit for weather forecasting.

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..... **[3]**

(b) Satellites are kept in orbit by a centripetal force.

What causes this force?

..... **[1]**

(c) Meteosat and POES are artificial satellites.

What is the name of Earth's **natural** satellite?

..... **[1]**

(d) TV satellites use short wavelength radio waves (microwaves) to receive and send signals. Longer wavelength radio waves are not used.

Explain why only **short** wavelength radio waves can be used.

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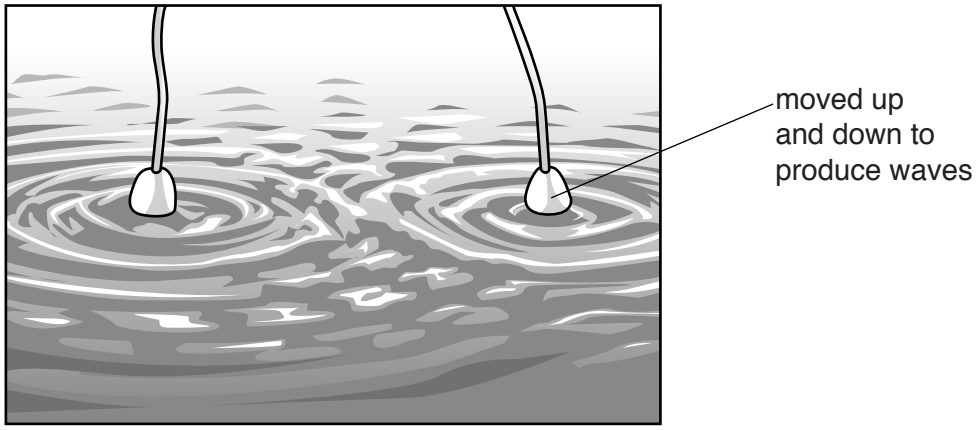
..... **[2]**

15 In his science class Bilhar investigates the behaviour of water waves.

He uses a ripple tank to produce and study the water waves.

Look at the diagram.



The waves cause interference.

Describe and explain what happens to the waves as they come together.

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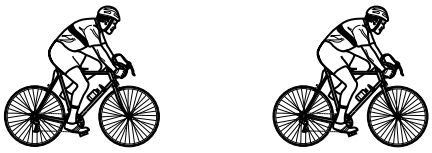
..... **[2]**

16 Sam and Jared race their bikes. They measure their speeds as they race.

Look at the information about a 10-second section of the race.

Sam increases speed steadily

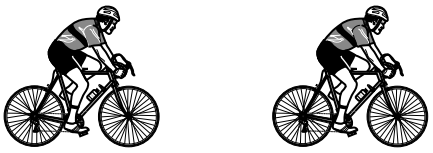
starting speed	finishing speed
6 m/s	12 m/s



10 seconds

Jared has a constant speed

starting speed	finishing speed
9 m/s	9 m/s



10 seconds

Sam says, 'I have the higher average speed and travel further than Jared.'

Jared says, 'Sam travelled further than me, so it's not a fair test.'

Sam and Jared are both **incorrect**. Use the data and calculations to explain why.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.