



## FORMULAE

You may find the following formulae useful.

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

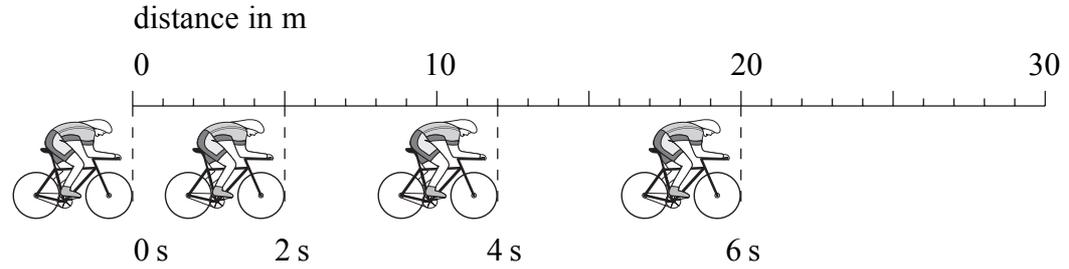
$$P = \frac{W}{t}$$

$$\text{frequency} = \frac{1}{\text{time period}}$$

$$f = \frac{1}{T}$$

Leave blank

1. A cyclist sets off from a standing start. Photographs are taken of the cyclist at 2 s intervals. The diagram shows the results.



(a) How far does the cyclist travel in the first 4 s?

distance = .....m  
(1)

(b) What happens to the cyclist's speed during the 6 s shown? Explain how you can tell.

.....  
.....  
(2)

(c) After 6 s the cyclist slows down. Mark the diagram with an X to show a possible position of the cyclist's front wheel when the next photograph is taken.  
(1)

(Total 4 marks)

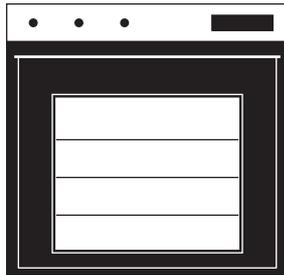
Q1

2. (a) The diagrams shows some appliances used in a home.

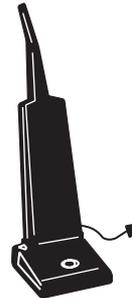
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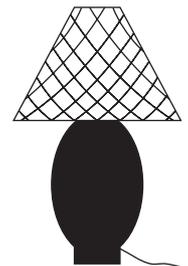
torch



gas oven



vacuum  
cleaner



lamp

(i) Which two use electricity to produce mainly light?

..... and ..... **(1)**

(ii) Which one uses electricity to produce movement?

..... **(1)**

(iii) Which two depend on the mains electricity supply?

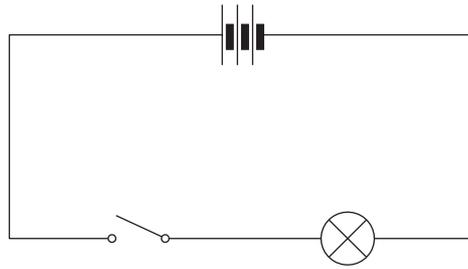
..... and ..... **(1)**

(iv) Which one normally works from a direct current supply?

..... **(1)**

(b) This is the circuit used by the torch.

*Leave  
blank*



(i) How many cells are fitted to the torch?

..... (1)

(ii) A voltmeter is used to check the voltage across the battery.  
Draw the symbol for a voltmeter in the correct position on the circuit.

(2)

(iii) One cell is removed from the battery. What happens to the brightness of the torch bulb when the torch is switched on?

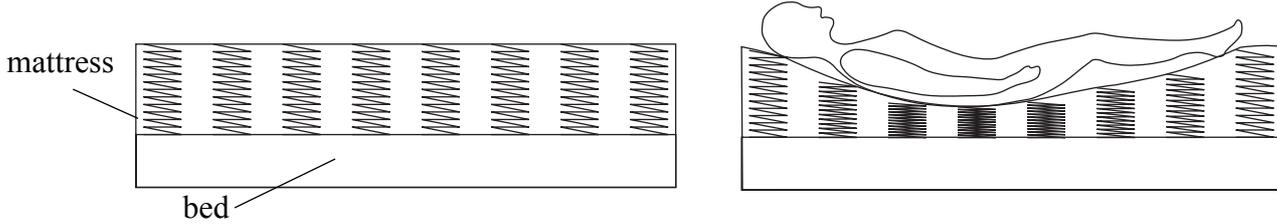
..... (1)

**Q2**

**(Total 8 marks)**

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3. The mattress of a bed contains springs. Each spring is the same. The diagrams show what happens when a person lies on the bed.



(a) (i) How do the springs change when a person lies on the bed?

..... (1)

(ii) Circle the spring that has the greatest force on it.

(1)

(iii) How can you tell that this spring has the greatest force acting on it?

..... (1)

(b) A manufacturer makes a mattress that sags less in the middle when a person lies on it.

Suggest two ways of doing this.

1 .....

2 .....

(2)

(c) One force acting on the person is the upward push of the springs.

(i) A second force acts on the person.

Draw an arrow on the diagram to show the direction of this force.

(1)

(ii) Use words from the box to complete the sentence.

<b>downward</b>	<b>Earth</b>	<b>mattress</b>	<b>upward</b>
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The second force on the person is the ..... pull of the

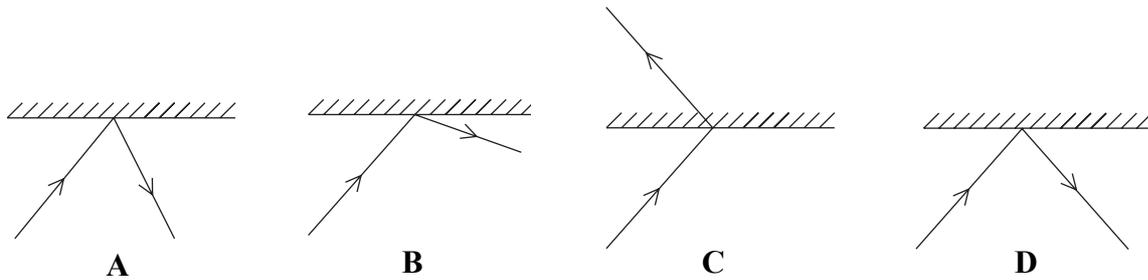
..... (2)

Q3

(Total 8 marks)

4. (a) Which diagram correctly shows the reflection of a ray of light at a mirror?

*Leave blank*



Write the correct answer (A, B, C or D) in the box.



(1)

(b) A person looking into a mirror sees an image.



(i) Write an **I** on the diagram to show the position of the image of the person's nose. (2)

(ii) Circle **three** words or phrases from the list that describe the image.

- magnified**
- same size as the object**
- smaller than the object**
- upside down**
- upright**
- real**
- virtual**

(3)

**Q4**

**(Total 6 marks)**



**Turn over**

5. (a) The table shows the power rating and operating current for a number of household electrical appliances.

*Leave blank*

Appliance	Power in watts	Current in amperes
Cooker	6000	25.0
Iron	960	4.0
Food mixer	480	2.0
Television	180	0.75
Table lamp	60	0.25

- (i) Each appliance is used for the same time. Which appliance costs most to run?

Give a reason for your answer.

Appliance .....

Reason .....

.....  
(2)

- (ii) You are provided with the following fuses

1A      3A      5A

Which fuse can be used with the iron? Explain your answer.

Choice of fuse .....

Explanation .....

.....  
(2)

(b) Electrical lighting in a house uses parallel circuits instead of series circuits.

*Leave  
blank*

State two reasons why parallel circuits are used for domestic lighting circuits.

1 .....

.....

2 .....

.....

(2)

Q5

(Total 6 marks)

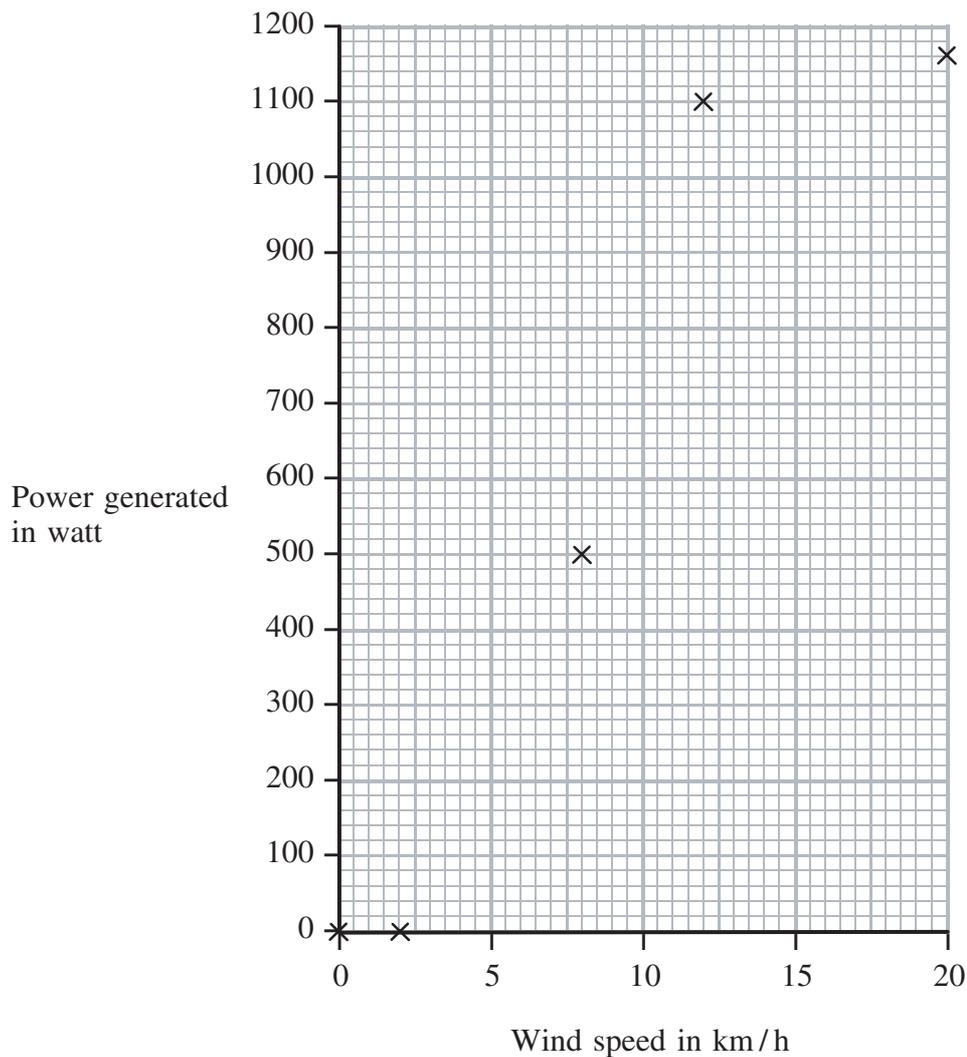
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6. (a) A wind powered generator is used to produce electrical power. The table shows the electrical power generated for different wind speeds.

*Leave blank*

Power generated in watts	0	0	140	500	900	1100	1160	1160
Wind speed in km/h	0	2	5	8	10	12	15	20

- (i) On to the axes below, plot the points at wind speeds of 5, 10 and 15 km/h.



Draw a smooth curve through the points.

**(4)**

(ii) What is the lowest wind speed needed to generate power?

Speed = ..... km/h  
(1)

(iii) What is the maximum power generated by the wind?

Power = ..... W  
(1)

(iv) State one disadvantage of using only a wind-powered generator as the source of electrical power.

.....  
.....  
(1)

(b) Complete the sentence to show the energy transfer taking place in the wind-powered generator.

..... energy is transferred to ..... energy.  
(2)

*Leave blank*

**Q6**

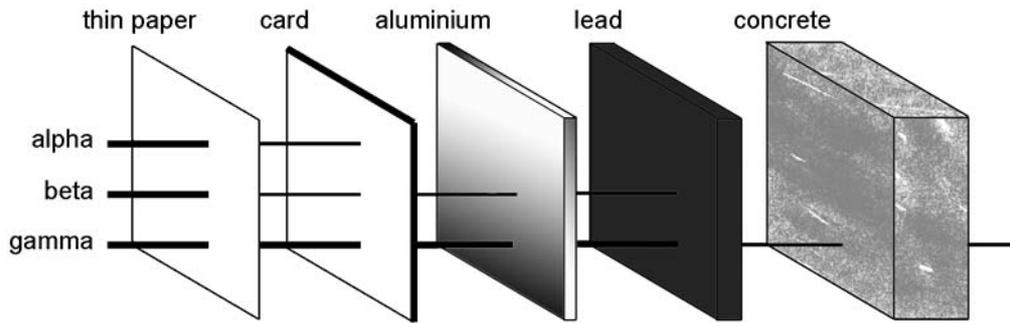
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**(Total 9 marks)**

**Turn over**

7. The three main types of radioactive emissions are called alpha, beta and gamma. The diagram shows the penetrations of alpha, beta and gamma radiation.

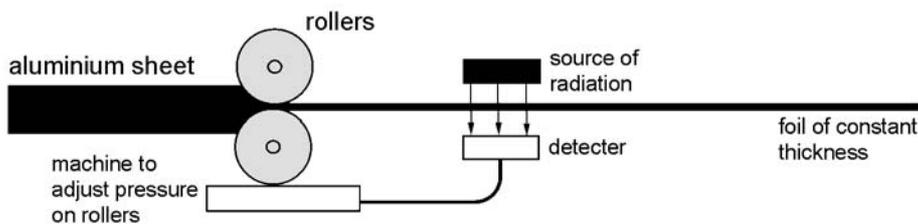
*Leave blank*



- (a) Which type of radiation has the greatest penetration?

.....  
(1)

- (b) The diagram shows how aluminium sheet is rolled to form foil of constant thickness.



- (i) Which type of radiation should be used to check the thickness of the foil?

.....  
(1)

- (ii) Explain why the other two types of radiation are not suitable.

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

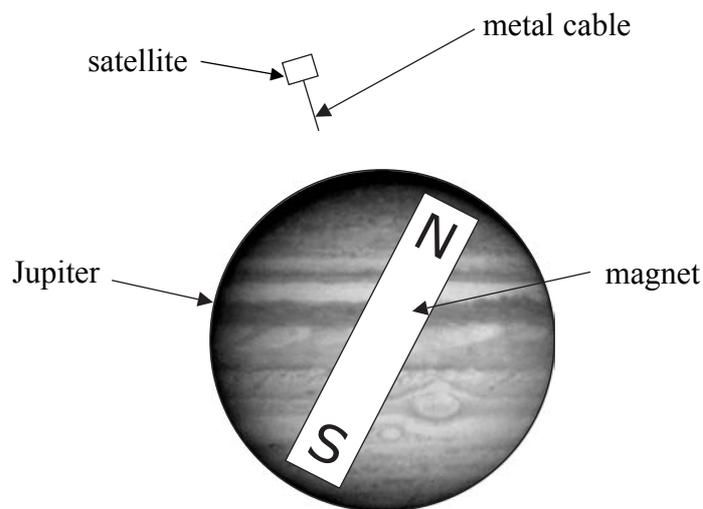
(2)

Q7

(Total 4 marks)

8. The magnetic field of the planet Jupiter is similar to that of a large permanent magnet placed inside the planet as shown below.

*Leave blank*



A satellite with a long metal cable hanging from it could generate electricity as it moves through the magnetic field of Jupiter.

- (a) State the effect that produces the electricity.

..... (1)

- (b) State and explain what happens to the size of the voltage induced in the metal cable if the satellite moves faster.

.....  
.....  
..... (3)

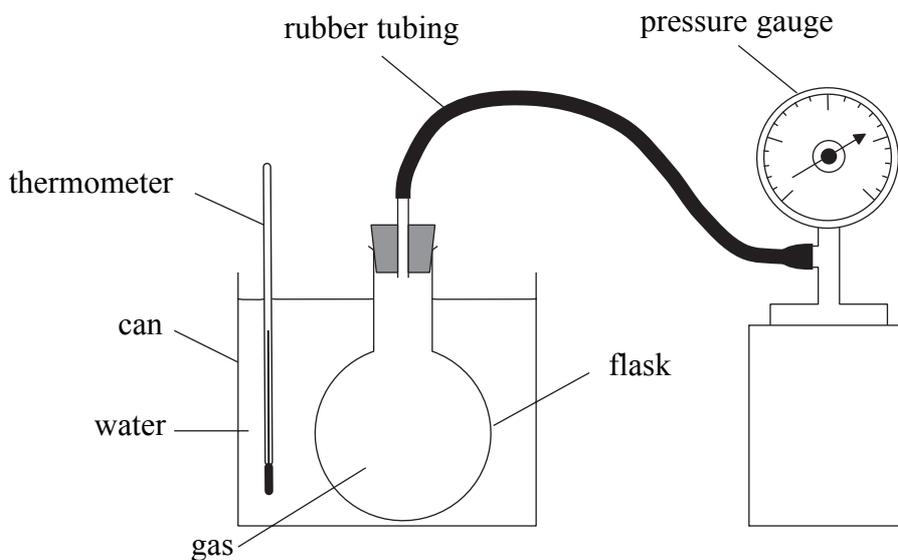
**Q8**

**(Total 4 marks)**

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9. The diagram shows the apparatus used to investigate how the pressure of a gas changes with temperature. As the water is heated the pressure of the gas is measured using the pressure gauge.

*Leave blank*



- (a) Explain how the gas exerts pressure.

.....

.....

(2)

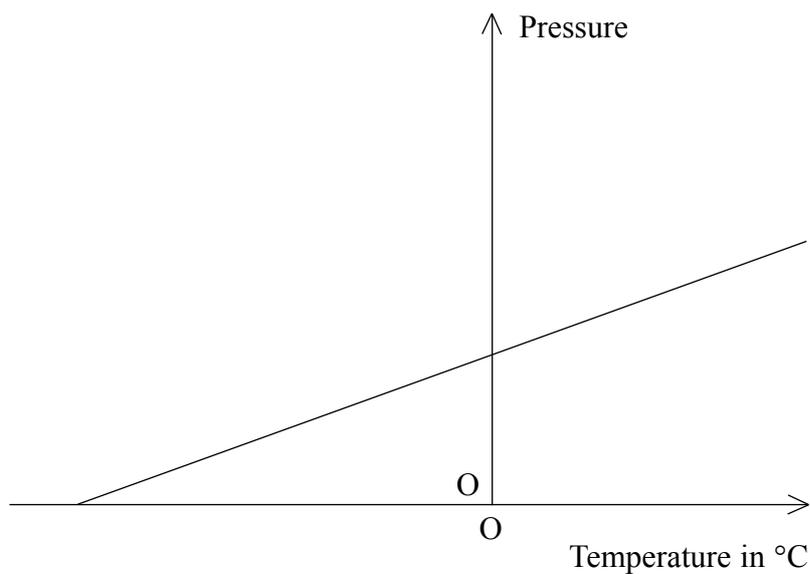
- (b) Complete the table to show what happens to the gas in the flask as the temperature is increased. Use the words **increases**, **decreases**, or **stays the same**.

	Increases, decreases, or stays the same
Speed of gas particles	
Pressure in the flask	
Mass of particles	
Volume of gas	

(4)

Leave  
blank

(c) A sketch graph of the results of the experiment is shown.



(i) What does the graph show about the way in which the pressure of the gas changes with increasing temperature?

.....  
(1)

(ii) Write an **X** on the temperature axis to show where the temperature is absolute zero.  
(1)

(iii) What is the speed of the gas particles at this temperature?

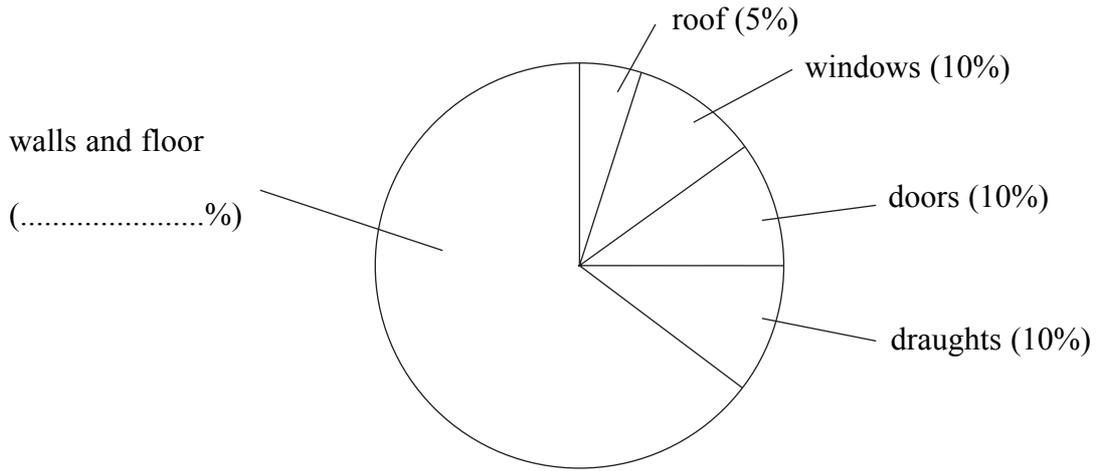
.....  
(1)

Q9

(Total 9 marks)

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10. (a) The heat energy losses from a house in a cold climate are shown in the diagram.



(i) Complete the diagram to show the percentage heat energy loss through the walls and floor. (1)

(ii) Complete the table below to show how the heat energy loss from parts of the house can be reduced. The first one has been done for you.

Part of the house	Method used for reducing heat energy loss
Roof	Glass-fibre insulation in the loft
Doors	..... .....
Floor	..... .....

(2)

Leave blank

- (b) Double glazing is used to reduce the heat energy loss from houses through the windows. The table compares the heat energy loss for ordinary windows and for double-glazed windows.

Type of window	Heat energy loss in joules per second
Ordinary window	224
Double-glazed window	116

The size of the windows and the temperature inside and outside the house are the same in each case.

- (i) How many joules per second does using double glazing save?

Saving = ..... J/s  
**(1)**

- (ii) What is the heat energy loss through an ordinary window in one hour?

.....  
.....

Heat energy loss = ..... J  
**(3)**

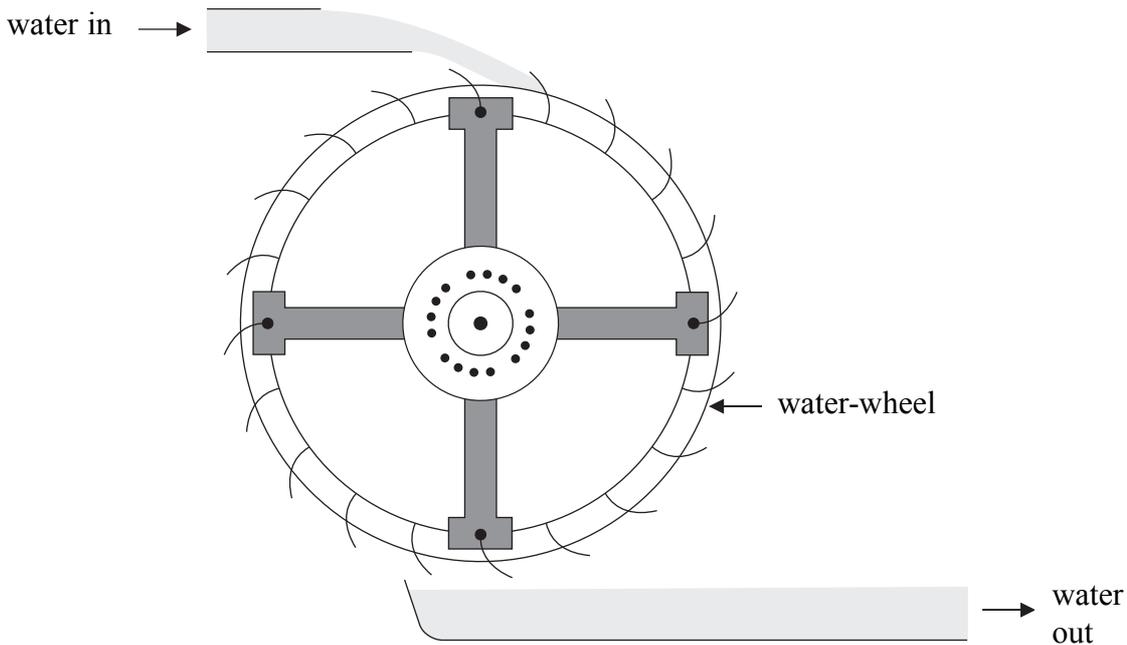
**Q10**

**(Total 7 marks)**

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11. Water flows onto a water-wheel as shown in the diagram. The wheel is turned when the water strikes the blades. This is used to run a generator, which produces an electric current.

*Leave blank*



- (a) State two main energy changes that take place during this process to produce electricity.

1 .....

2 .....

(2)

- (b) The power delivered by the water is 2000 W. The electrical power produced is 1400 W. Calculate the overall efficiency of the process.

.....  
 .....

Efficiency = .....

(2)

- (c) Suggest a reason why the process is not 100% efficient.

.....

(1)

(Total 5 marks)

Q11

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12. (a) The atoms  $^{14}_7\text{N}$  and  $^{15}_7\text{N}$  are isotopes of nitrogen.

Leave  
blank

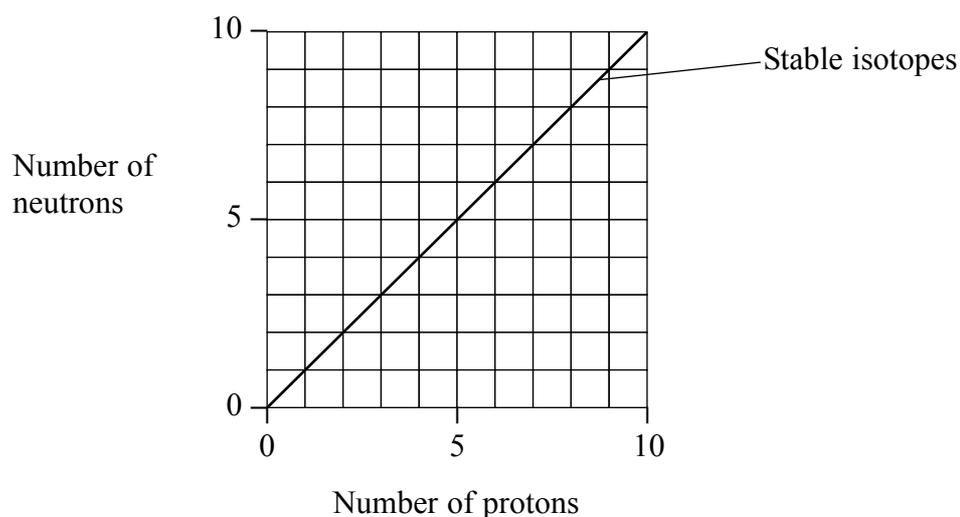
Write down one similarity and one difference between the nuclei of these isotopes.

similarity .....

difference .....

(2)

(b) The graph shows the relationship between the number of neutrons and the number of protons in some stable nuclei.



(i) What is the relationship between the number of protons and the number of neutrons for these stable nuclei?

.....  
(1)

(ii) Use an X to mark the position of  $^{15}_7\text{N}$  on the graph.

(1)

(iii) What does this tell you about  $^{15}_7\text{N}$ ?

.....  
(1)

Q12

(Total 5 marks)

TOTAL FOR PAPER: 75 MARKS

END

