

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

200/01

SCIENCE: PHYSICS

FOUNDATION TIER (Grades G-C)

A.M. FRIDAY, 15 June 2007

(2 hours)

For Examiner's use only	
Total Marks	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are reminded to show all working. Credit is given for correct working even when the final answer given is incorrect.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

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

1. An electric fire is marked with the following information:

230 V a.c.
50 Hz
3 kW

(a) (i) What do the letters **a.c.** stand for? [1]

(ii) Name the unit **kW**. [1]

(iii) Write down the power of the fire in **W**. [1]

(b) (i) The electric fire is used for 2 hours.
Use the equation:

$$\text{number of units used (kWh)} = \text{power (kW)} \times \text{time (h)}$$

to find the number of units used. [1]

number of units used = kWh

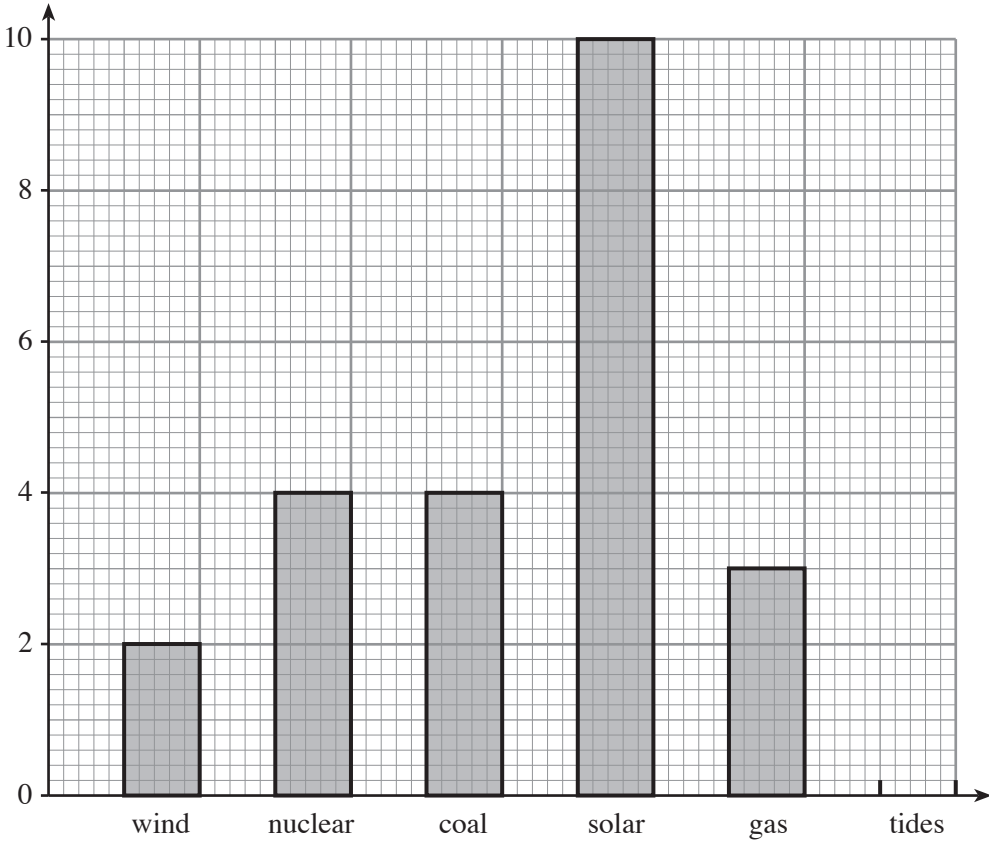
(ii) If the fire is used for longer than 2 hours, state what happens to the amount of electrical energy used. [1]

.....

5

2. The bar chart shows the estimated future costs of generating electricity using different energy sources.

Cost of generating 1 unit of electricity (p)



(a) (i) Name the cheapest method of generating electricity. [1]

(ii) Name the cheapest method of generating electricity **using fossil fuels**.
..... [1]

(iii) One unit of electricity generated by tides would cost 3p.
Add this information to the bar chart. [1]

(b) (i) Give a reason why we should cut down the use of coal and gas in generating electricity. [1]

.....
.....

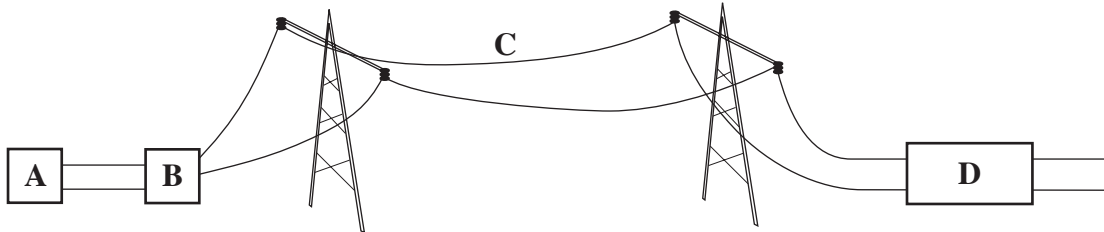
(ii) Give a reason why using wind to generate electricity is unreliable. [1]

.....
.....

(c) Use the information in the bar chart to give a reason why people would object to using electricity generated by solar power. [1]

.....
.....

3. The diagram shows part of the National Grid.

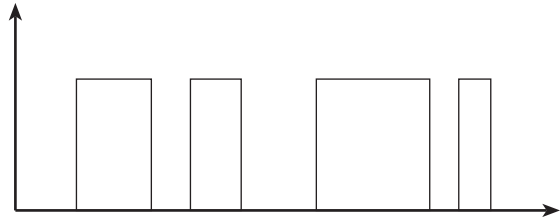


(a) Use a word from the box to complete the sentences that follow.
Each word may be used once, more than once or not at all.

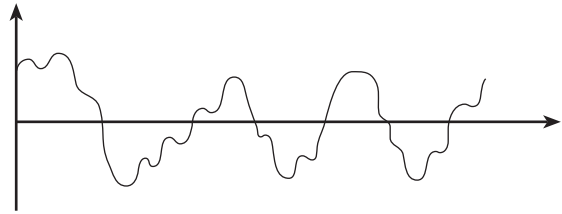
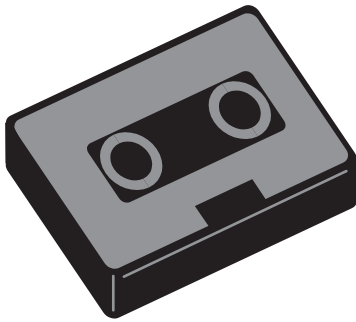
transformer pylon generator power current

- (i) Electricity is produced at **A** using a [1]
 - (ii) At **B**, a increases the voltage. [1]
 - (iii) Electricity is sent at a high voltage along **C**, so the is smaller. [1]
 - (iv) At **D**, the voltage is decreased using a [1]
- (b) Electricity can be sent throughout the country along either overhead wires or underground cables.
- (i) Give **one advantage** of using overhead wires. [1]
.....
 - (ii) Give **one disadvantage** of using overhead wires. [1]
.....

4. DVDs store information as a digital signal as shown below:



Video tapes store information as an analogue signal as shown below.



(i) **Apart from shape**, give **two** differences between the analogue and digital signals. [2]

1.

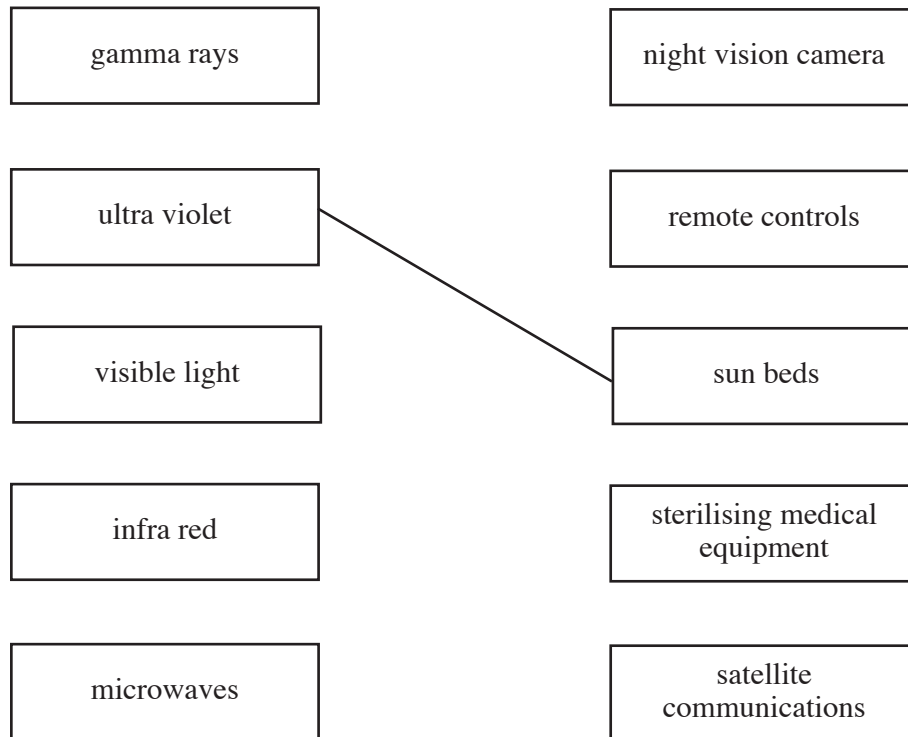
2.

(ii) Give **two** advantages of using digital signals. [2]

1.

2.

5. The diagram shows some of the regions of the electromagnetic spectrum and their uses.



- (a) (i) Name **two** parts of the electromagnetic spectrum not shown in the diagram. [2]

..... and

- (ii) **Join** each use with the correct part of the electromagnetic spectrum. Use a straight line. One has been done as an example. [4]

Each part of the spectrum may be used once, more than once or not at all.

- (b) Name the region of the electromagnetic spectrum with the highest frequency. [1]

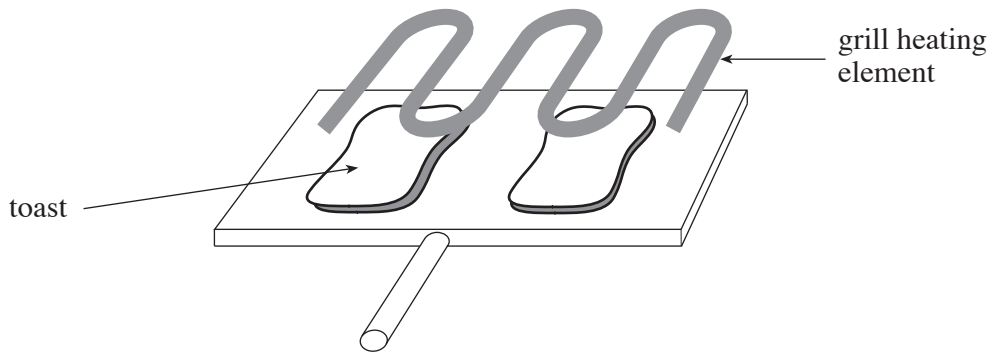
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6. Energy is transferred from one place to another by **conduction**, **convection** and **radiation**.

(a) (i) Name the method of energy transfer in liquids and gases. [1]

(ii) Name the method of energy transfer through space. [1]

(b) The diagram shows a grill being used to make toast.



(i) Give a reason why heat cannot be passing from the grill to the toast by conduction. [1]

.....

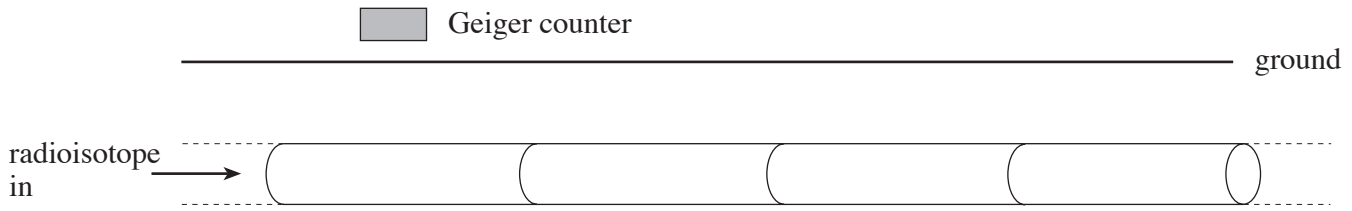
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(ii) Give a reason why heat cannot be passing from the grill to the toast by convection. [1]

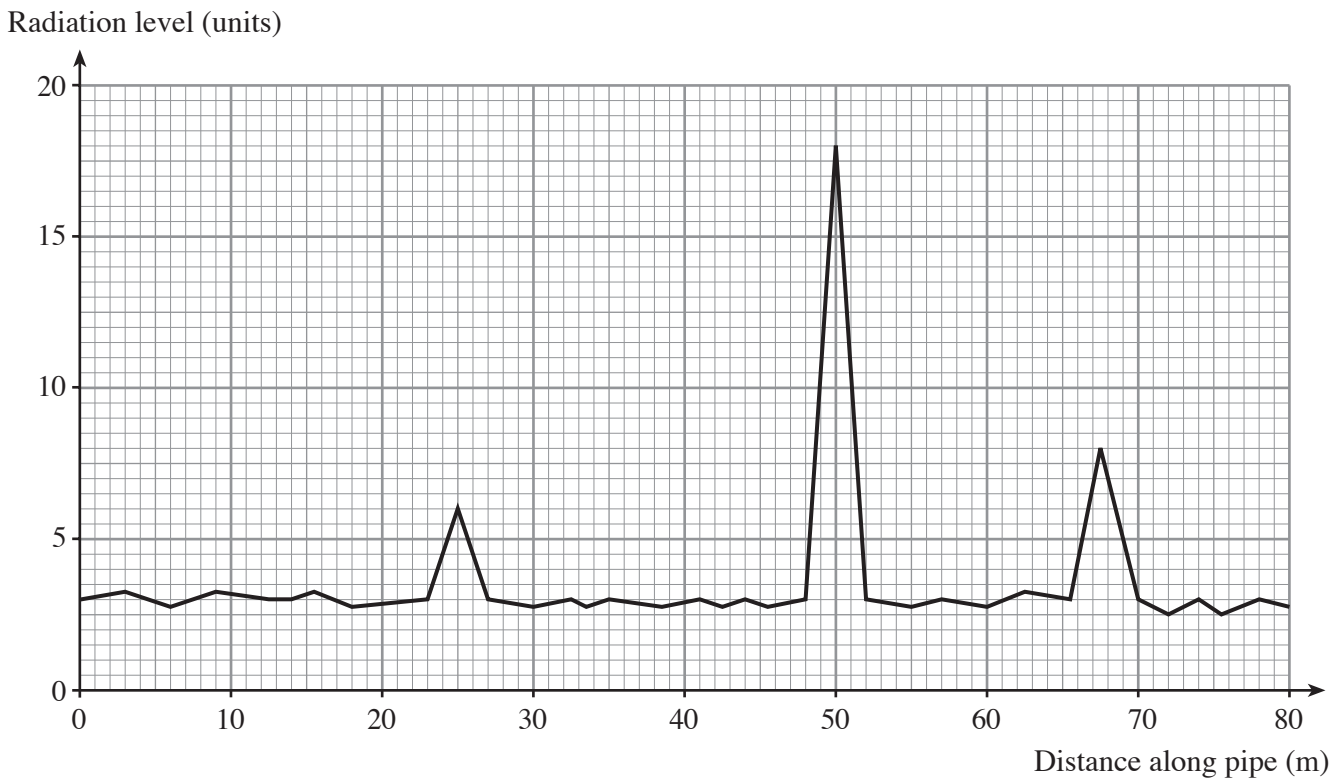
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7. A radioisotope is passed through a pipe so any cracks can be found.
The radiation level above the ground is measured with a Geiger counter.

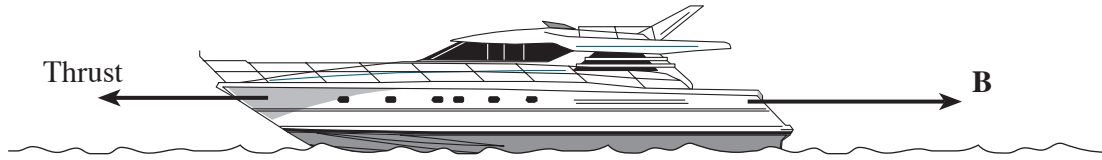


The radiation level detected along the length of the pipe is shown in the graph below.



- (a) Even before the radioisotope was passed along the pipe, there was a low radiation level present.
This was caused by background radiation.
Name **one** source of background radiation. [1]
- (b) Use the information in the graph to answer the following questions.
- (i) How many cracks were detected? [1]
- (ii) How can you tell that the biggest crack was 50 m along the pipe? [1]
.....
.....
- (c) The radioisotope has a short half-life of a few hours.
Give **one** reason why this is important. [1]
.....
.....

8. The diagram shows two of the forces acting on a boat moving through the water.

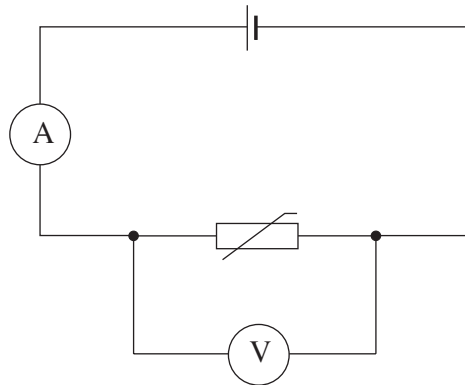


- (a) Name force **B**. [1]
- (b) The thrust is increased to speed up the boat.
State what happens to force **B** as the boat speeds up. [1]
- (c) Give a reason why the boat will reach a steady speed. [1]

.....

3

9. The circuit below is used to find the resistance of a thermistor at different temperatures.



The results are shown in the table.

Temperature (°C)	Voltage (V)	Current (A)	Resistance (Ω)
20	12	0.04	300
40	12	0.07	175
60	12	0.10	125
80	12	0.12	100
100	12	0.15	80

Use the information in the table to answer the following questions.

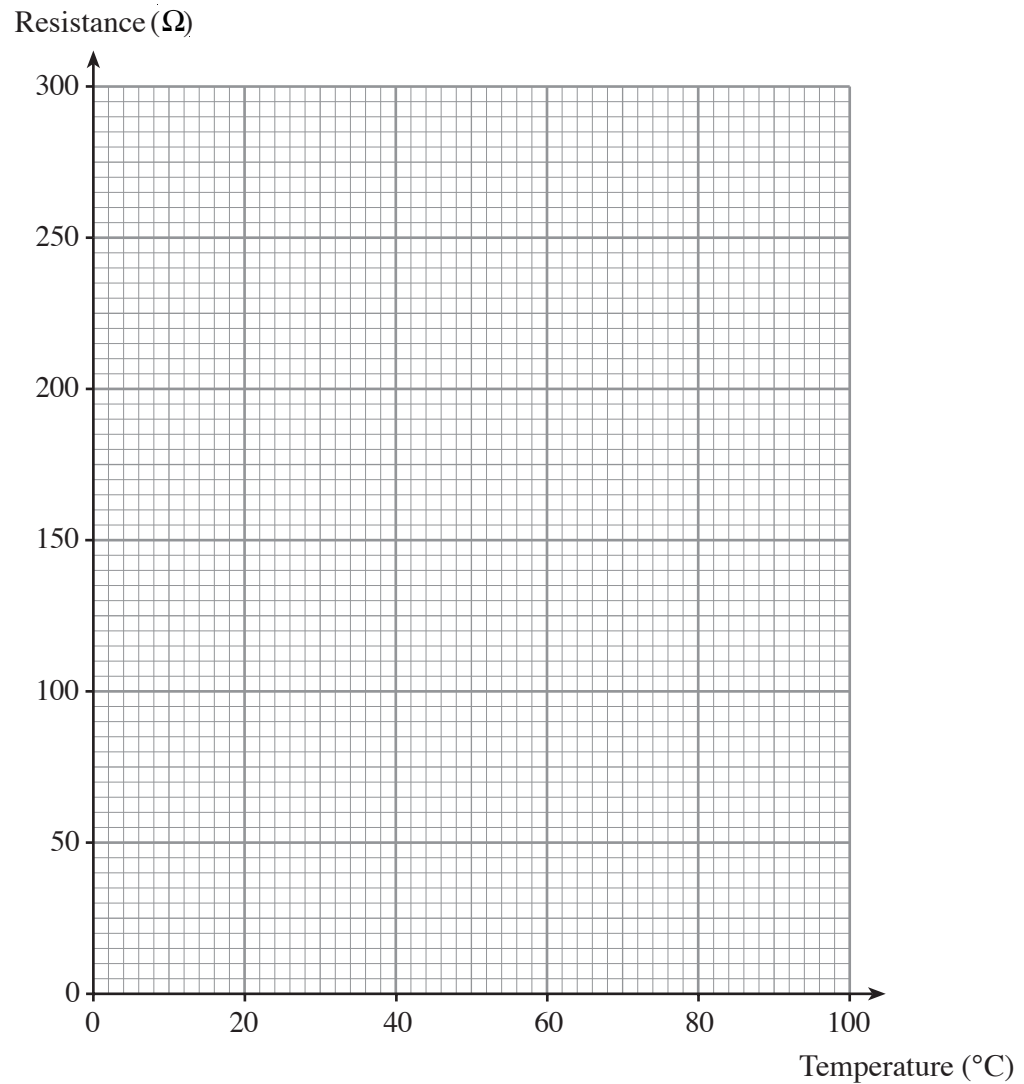
- (i) State what happens to the **current** as the temperature increases.

[1]

.....

- (ii) Plot a graph of **resistance** against **temperature** on the grid below.

[3]



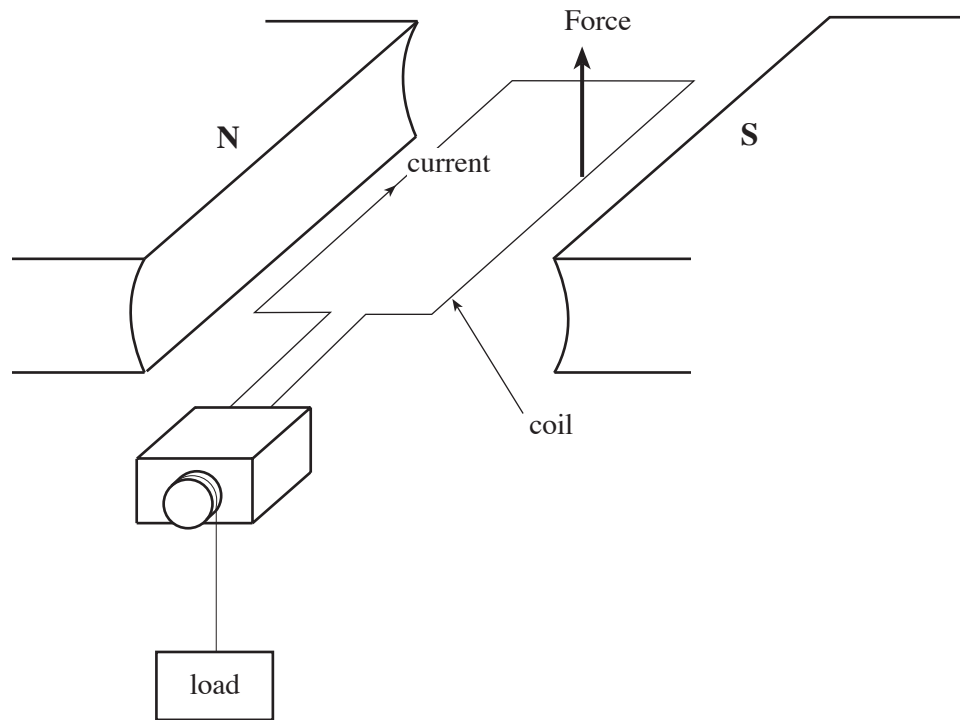
- (iii) State what happens to the **resistance** of the thermistor as the temperature increases.

[1]

.....

5

10. The diagram shows an electric motor used to lift a load.

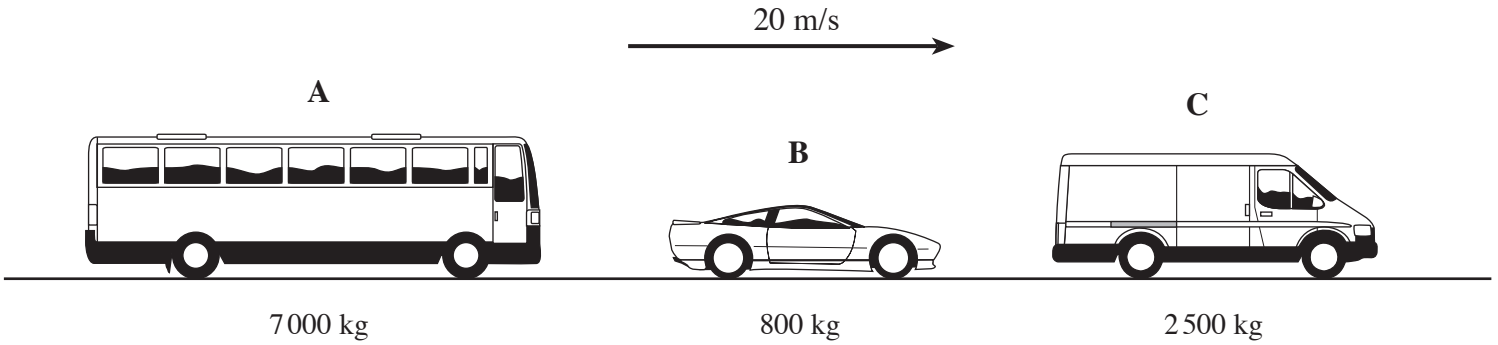


- (a) State **three** ways you can increase the force on the coil so that it spins faster. [3]
1.
 2.
 3.
- (b) The coil is made to spin faster so that it lifts the load more quickly through the same height. **Complete the sentences** below by underlining the correct word or phrase in the brackets. [2]
- (i) When the load is lifted more quickly, the work done by the motor (**increases, decreases, stays the same**).
 - (ii) When the load is lifted more quickly, the power of the motor (**increases, decreases, stays the same**).

11. Momentum is given by

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

The diagram shows three vehicles all moving at 20 m/s along a road.



(a) (i) Which vehicle, **A**, **B** or **C**, has the most momentum? [1]

(ii) Give a reason for your answer. [1]

.....
.....

(b) Calculate the momentum of vehicle **C**. [1]

momentum = kg m/s

(c) All the vehicles stop at traffic lights.

(i) What is their momentum now? [1]

(ii) Give a reason for your answer. [1]

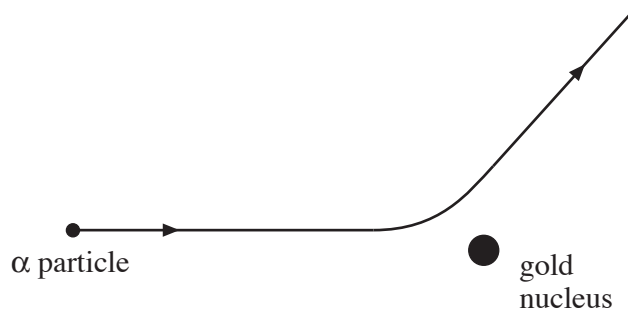
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12. The table shows the names of some types of particle and their charges.

Particle	Charge
proton
nucleus	positive
electron	negative
neutron
alpha	positive

(a) Complete the table. [2]

(b) Rutherford fired alpha (α) particles at very thin gold foil.
The diagram shows the path of one α particle as it passes near the nucleus of an atom of gold.



Explain why the α particle changes direction. [2]

.....
.....

(c) The symbol for gold is ${}_{79}^{197}\text{Au}$.
State **two** things the numbers tell us about the particles of an atom of gold. [2]

1.
2.

13. (a) Three core mains electric cable contains a **live**, a **neutral** and an **earth** wire, each covered in coloured plastic.

(i) Give a reason why the wires are covered in plastic. [1]

.....

(ii) State which wire should be connected to the fuse. [1]

(iii) State which wire is covered in brown plastic. [1]

(iv) Explain how the earth wire provides protection for the user from electric shocks. [2]

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

(b) Some electric appliances use a cable which does not have an earth wire.

(i) State which one of the following appliances can safely use this type of cable. [1]

.....



iron



hairdryer



electric fire

(ii) Give a reason for your answer. [1]

.....

14. On a bright summer day, a solar panel, mounted on the roof of a house, receives 3 000 J of energy every second from the Sun.

1 200 J of this energy is transferred every second to heat water in a storage tank.

- (i) Use the information above to find how much of the Sun’s energy, which falls on the solar panel, is wasted every second. [1]

wasted energy every second = J

- (ii) Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{input energy}} \times 100\%$$

to calculate the efficiency of the solar panel. [2]

efficiency = %

- (iii) Give **two** reasons why the solar panel only makes a small contribution to the energy supply of this house. [2]

1.

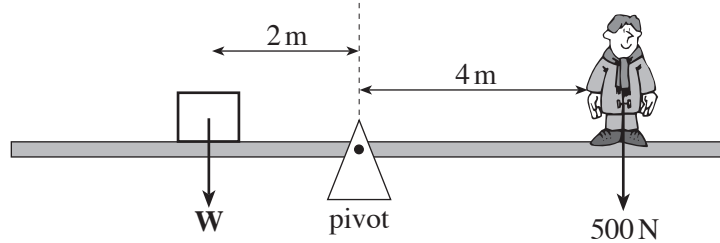
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2.

.....

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15. The diagram shows a child balanced by a weight (**W**) on a see-saw.



(a) (i) Write down, in words, an equation connecting **force**, **perpendicular distance** and **moment**. [1]

.....

(ii) Calculate the clockwise moment of the child about the pivot. [2]

moment = Nm

(b) When the see-saw is balanced, what can you say about the anticlockwise moment of **W** about the pivot? [1]

.....

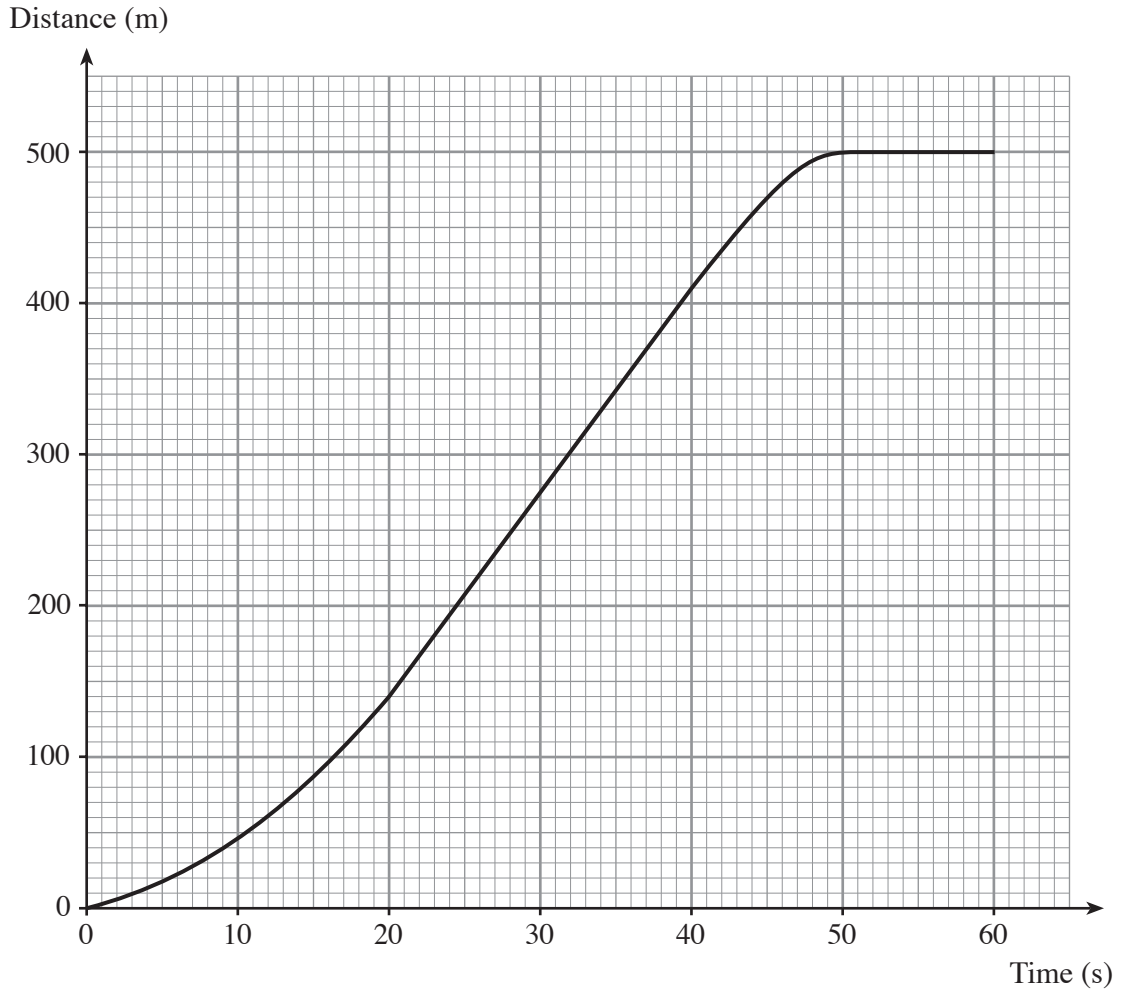
(c) When the child moves towards the pivot

(i) state which way the see-saw moves, [1]

(ii) explain why the see-saw moves. [1]

.....

16. A cyclist travelled along a straight level road. The graph shows how the distance travelled by the cyclist changes with time.



- (a) Write, **in words**, the equation connecting **distance**, **time** and **speed**. [1]

.....

.....

- (b) Use **your equation**, together with **information from the graph**, to calculate the cyclist's average (mean) speed:

- (i) during the first 20 seconds

average speed = m/s

(ii) between 40 s and 60 s.

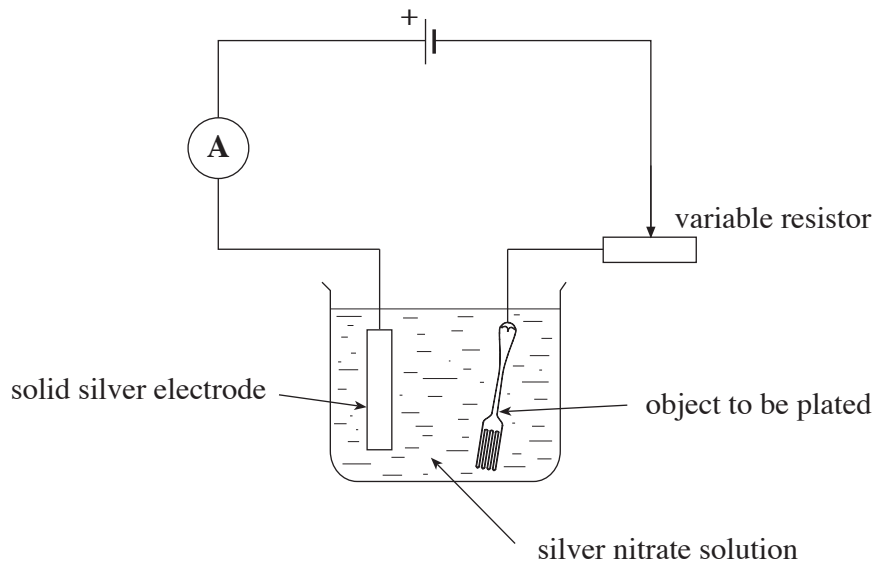
average speed = m/s
[3]

(c) **Use the graph** to explain why the average speed between 40 s and 60 s is less than the average speed during the first 20 s. [2]

.....
.....

6

17. The circuit below is one used for the silver plating of cutlery.



(a) (i) **Mark on the diagram** the direction of the current in the circuit. [1]

(ii) Explain carefully how the current is carried through the wire of the circuit. [2]

.....

.....

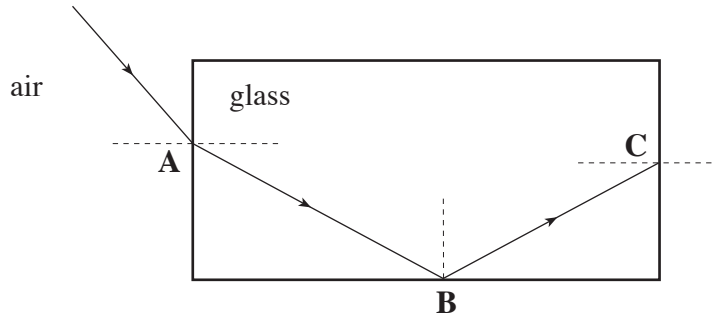
(b) The silver nitrate solution contains positive silver ions and negative nitrate ions.
Explain carefully how the current is carried, by the ions, through the silver nitrate solution. [2]

.....

.....

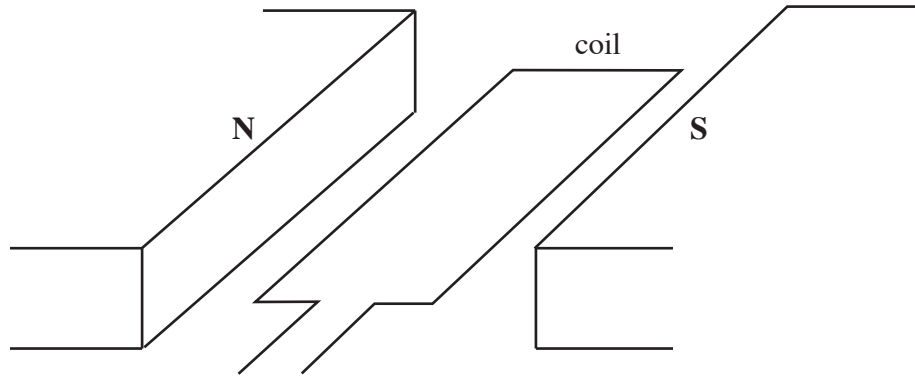
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18. The diagram shows a ray of light entering and travelling through a glass block.



- (a) (i) **Mark on the diagram** with i , the angle of incidence at **A**. [1]
- (ii) State what happens to the light at **A** as it passes from air into the glass. [1]
.....
- (iii) Give a reason why this change happens. [1]
.....
- (b) (i) State what happens to the light at **B**. [1]
- (ii) Give a reason why the light does not pass out of the block at **B**. [1]
.....
.....
- (c) **Add a line** to the diagram to show the path of the light as it passes out of the block at **C**. [1]

19. The diagram shows a simple generator of electricity.



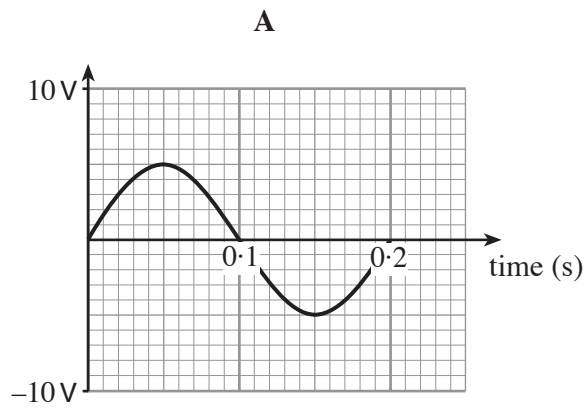
(a) Explain why a voltage is produced when the coil spins. [2]

.....

.....

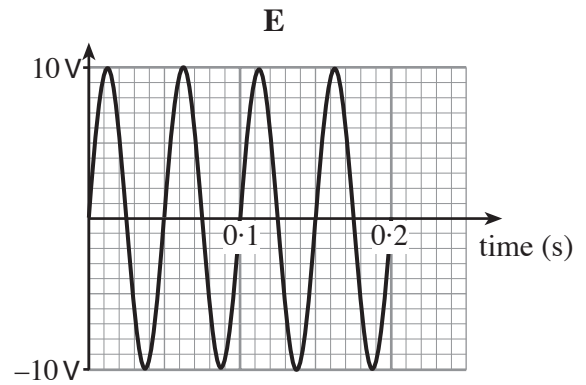
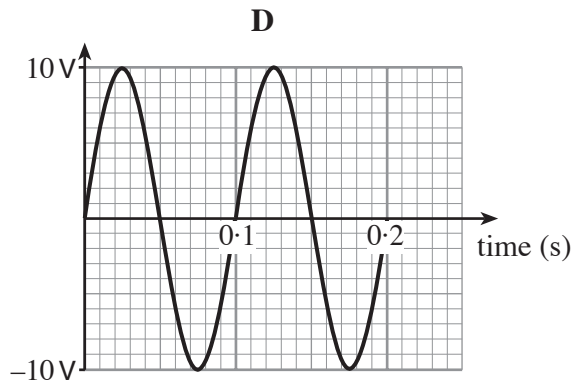
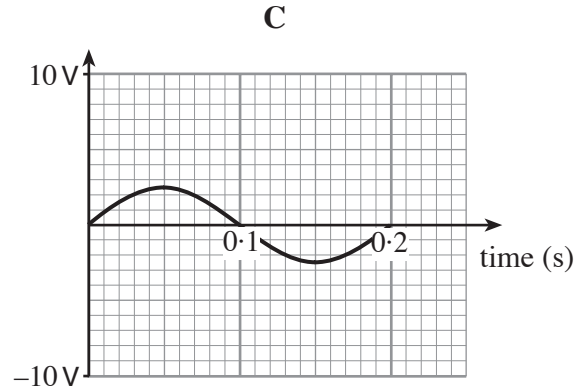
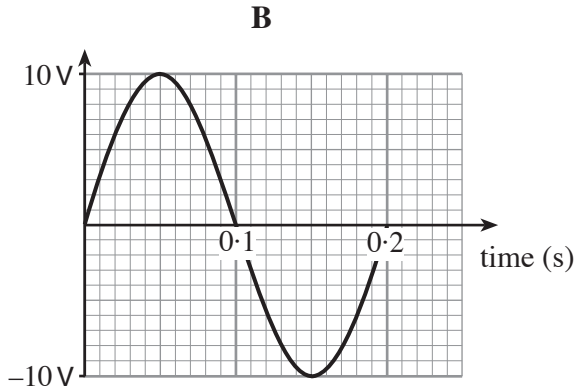
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(b) When this coil spins at a steady speed, the voltage produced is shown in the diagram A.



Write down the number of spins of the coil in 1 s. [1]

(c) The following diagrams show voltages produced after making changes to the coil.



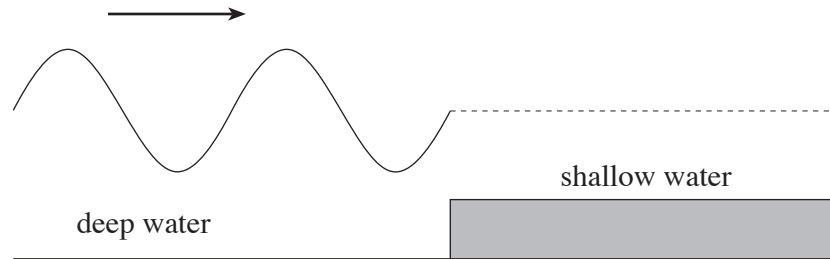
- (i) State which diagram, **B**, **C**, **D** or **E**, would be produced if the number of turns of wire on the coil were doubled. [1]

.....

- (ii) State which diagram, **B**, **C**, **D** or **E**, would be produced by the original coil if it were spun twice as fast. [1]

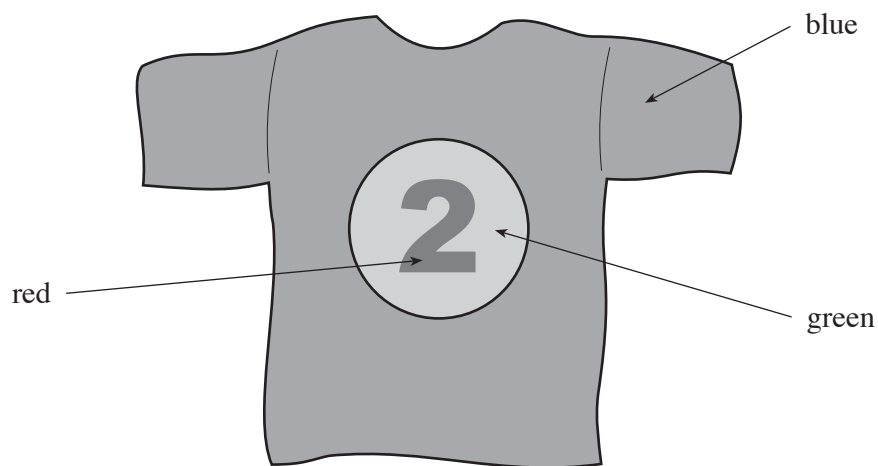
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20. The diagram shows waves travelling from deep water into shallow water.



- (a) (i) **Add an arrow** labelled **A** to the diagram, to show the amplitude of the wave. [1]
- (ii) **Add an arrow** labelled **W** to the diagram, to show the wavelength of the wave. [1]
- (b) As the wave travels into the shallow water, its wavelength gets shorter and its amplitude decreases.
Use this information to **complete the diagram** to show the waves in shallow water. [2]

21. The colours of a tee-shirt, in daylight, are shown in the diagram.



Describe the appearance of the tee-shirt when

(i) it is looked at through a red filter;

[2]

.....

.....

(ii) blue light shines on it;

[2]

.....

.....

(iii) yellow stage lighting shines on it.

[2]

.....

.....

6

22. (a) People once thought that the Earth was at the centre of the Solar System. They thought that all the planets and the Sun orbited the Earth.
State **two** ways in which this is different from the present-day model of the Solar System. [2]

1.
.....

2.
.....

(b) The Universe consists of billions of galaxies.

Most scientists accept the “Big Bang” as the model of the formation of the Universe.

(i) State what the “Big Bang” model says is happening to the Universe. [1]

.....

(ii) State what the “Big Bang” model says is happening to the billions of galaxies in the Universe. [1]

.....

(iii) The “Big Bang” model of the Universe is supported by observations of the **red shift of light** from distant galaxies.

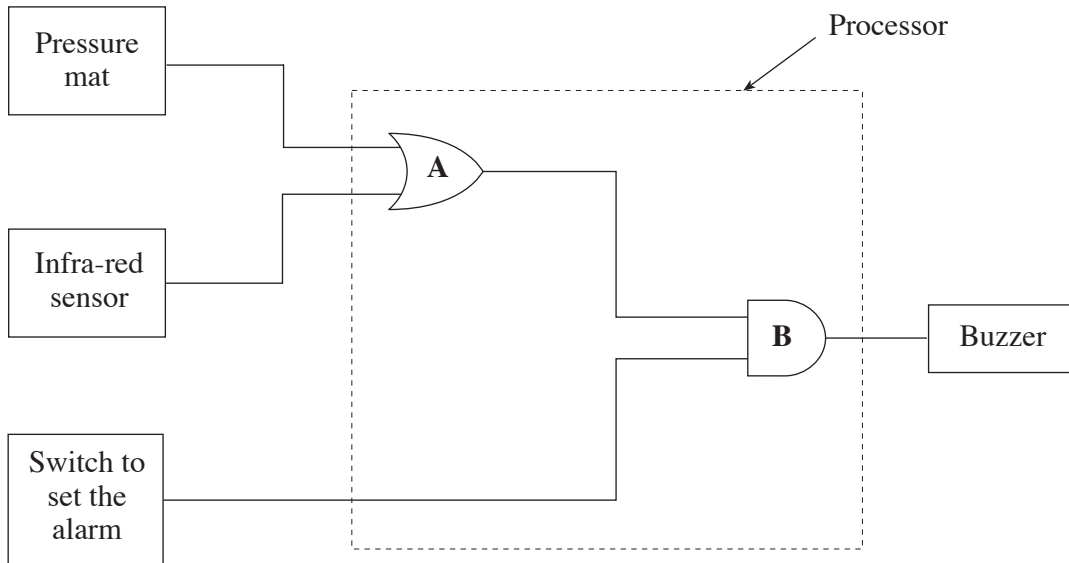
State what is meant by the **red shift of light**. [1]

.....

.....

5

23. A block diagram of an alarm circuit is shown below.



(a) The processor consists of two logic gates, **A** and **B**.

(i) State the purpose of the processor. [1]

.....

(ii) Name the logic gates, **A** and **B**. [2]

A **B**

(b) When the alarm is set (logic **1**), the buzzer sounds if someone steps on the pressure mat (logic **1**) or if the infra-red sensor detects movement (logic **1**). Complete the truth table below for the system. [2]

Switch to set alarm	Infra-red sensor	Pressure mat	Output of A	Output of B	Buzzer
0	1	0	1	0	0
1	0	0	0	0	0
0	0	1
1	0	1
1	1	1	1	1	1