

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE (9–1)

Thursday 22 May 2025

Morning (Time: 1 hour 10 minutes) **Paper reference 4WSD5/1PR**

Science (Double Award)(Modular)

Physics

UNIT 5: 4WSD5

PAPER: 1PR

You must have:
Ruler, calculator, protractor, Equation Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in the calculations and state the units where required.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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FORMULAE

You may find the following formulae useful.

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$a = \frac{(v - u)}{t}$$

$$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$

$$v^2 = u^2 + (2 \times a \times s)$$

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

$$F = m \times a$$

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

$$W = m \times g$$

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

$$P = I \times V$$

$$\text{energy transferred} = \text{current} \times \text{voltage} \times \text{time}$$

$$E = I \times V \times t$$

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

$$V = I \times R$$

$$\text{charge} = \text{current} \times \text{time}$$

$$Q = I \times t$$

$$\text{energy transferred} = \text{charge} \times \text{voltage}$$

$$E = Q \times V$$

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

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

$$W = F \times d$$

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$GPE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2$$

$$KE = \frac{1}{2} \times m \times v^2$$

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

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

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{m}{V}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$p = \frac{F}{A}$$

$$\text{pressure difference} = \text{height} \times \text{density} \times \text{gravitational field strength}$$

$$p = h \times \rho \times g$$

Where necessary, assume the acceleration of free fall, $g = 10 \text{ m/s}^2$.

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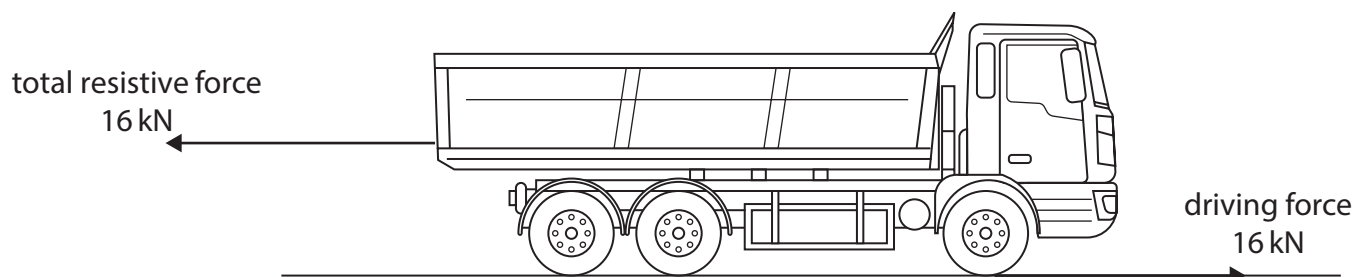
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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1 The diagram shows a truck travelling along a horizontal road.



- (a) The diagram shows the horizontal forces acting on the truck.

Give the resultant horizontal force acting on the truck.

(1)

resultant horizontal force = kN

- (b) The driver of the truck has to stop because a tree has fallen on the road.

- (i) The thinking distance of the driver is 7 m.

The braking distance of the truck is 20 m.

Calculate the stopping distance of the truck.

(1)

stopping distance = m

- (ii) Give two factors that would affect the braking distance of the truck.

(2)

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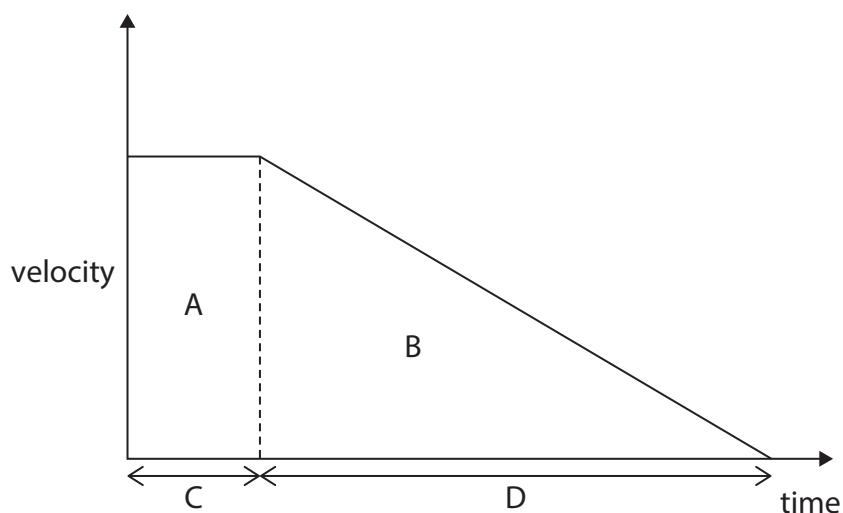


(iii) Which of these factors would **decrease** the driver's thinking distance?

(1)

- ☐ **A** the road is dry, rather than wet
- ☐ **B** the truck has old, worn tyres, rather than new tyres
- ☐ **C** the driver is tired
- ☐ **D** the truck is travelling at a lower speed

(c) The graph shows how the velocity of the truck varies as it stops.



Which of the letters on the graph represents the braking distance?

(1)

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

(Total for Question 1 = 6 marks)



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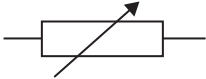
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2 This question is about electrical circuits.

(a) The table shows the circuit symbols for some electrical components.

Complete the table by placing ticks (✓) to show whether each component can visibly indicate the presence of a current in a circuit.

(3)

Electrical component	Can visibly indicate the presence of a current
	
	
	
	
	
	



(b) Diagram 1 shows an electrical circuit containing a cell and component X.

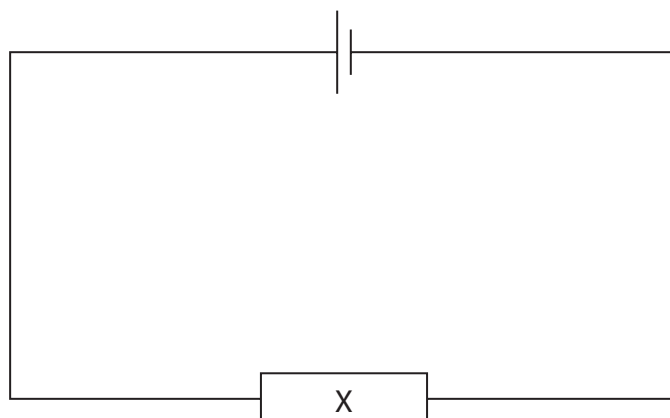


Diagram 1

The graph shows how the resistance of component X varies with temperature.

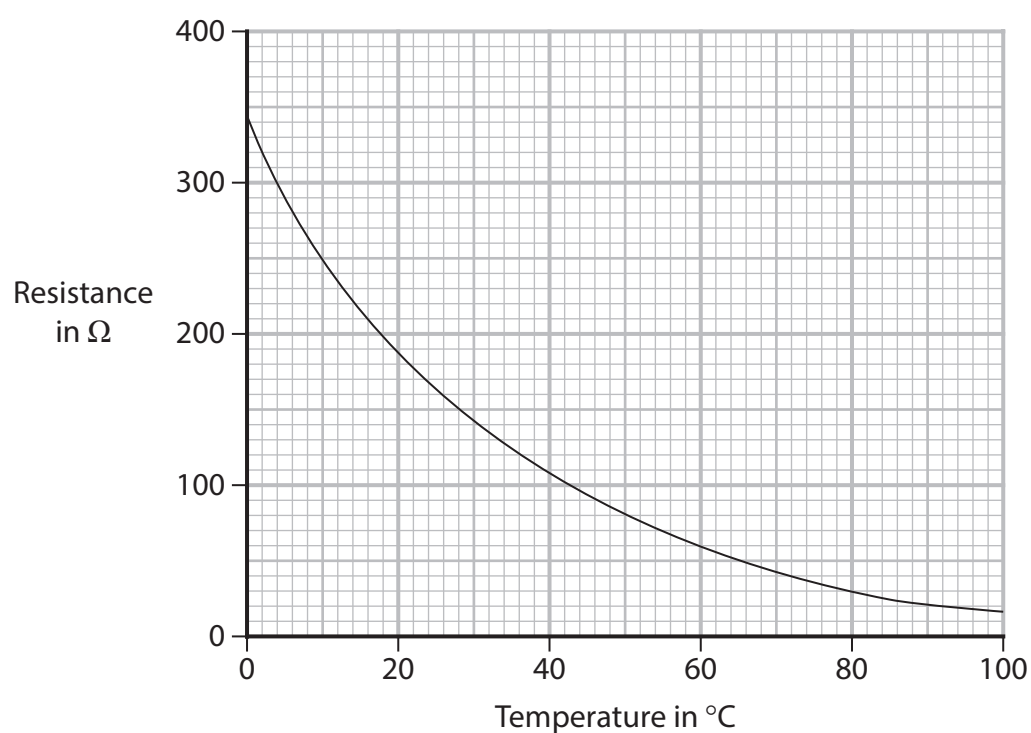


Diagram 2

(i) Give the name of component X.

(1)

- (ii) Using the graph, determine the resistance of component X when its temperature is 50 °C.

(1)

resistance = Ω

- (iii) The cell in diagram 1 has a voltage of 9.0V.

Calculate the current in component X when its temperature is 50 °C.

Use the formula

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

(3)

current = A

- (iv) The circuit in diagram 1 is modified by adding a second identical component X in series with the other components.

The temperatures of the first component X and second component X are reduced to 26 °C.

Explain how the resistance of the circuit is affected by these changes.

(4)

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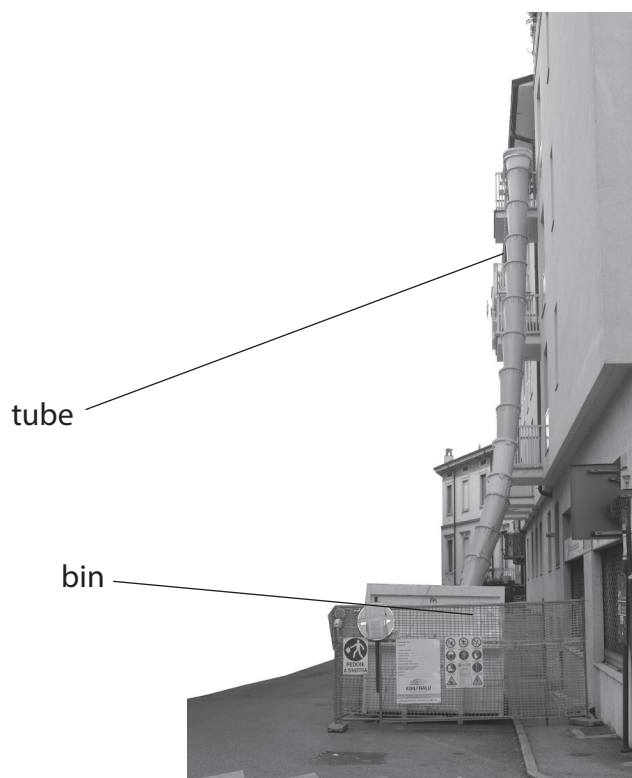
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(Total for Question 2 = 12 marks)



- 3 A builder drops a bag of waste through a tube to a bin on the road.

The photograph shows the tube and the bin.



(Source: © columbo.photog/Shutterstock)

- (a) The gravitational potential energy store of the bag decreases by 4750 J as it falls from the top of the tube to the end of the tube in the bin.

The bag has a mass of 55 kg.

- (i) State the formula linking gravitational potential energy, mass, gravitational field strength and height.

(1)

- (ii) Calculate the vertical height of the tube.

(3)

vertical height = m



(iii) State the maximum kinetic energy of the bag as it leaves the end of the tube.

(1)

(iv) Calculate the maximum speed of the bag as it leaves the end of the tube.

(3)

speed = m/s

(b) Explain why the speed of the bag as it leaves the end of the tube will be less than the value calculated.

(3)

(Total for Question 3 = 11 marks)

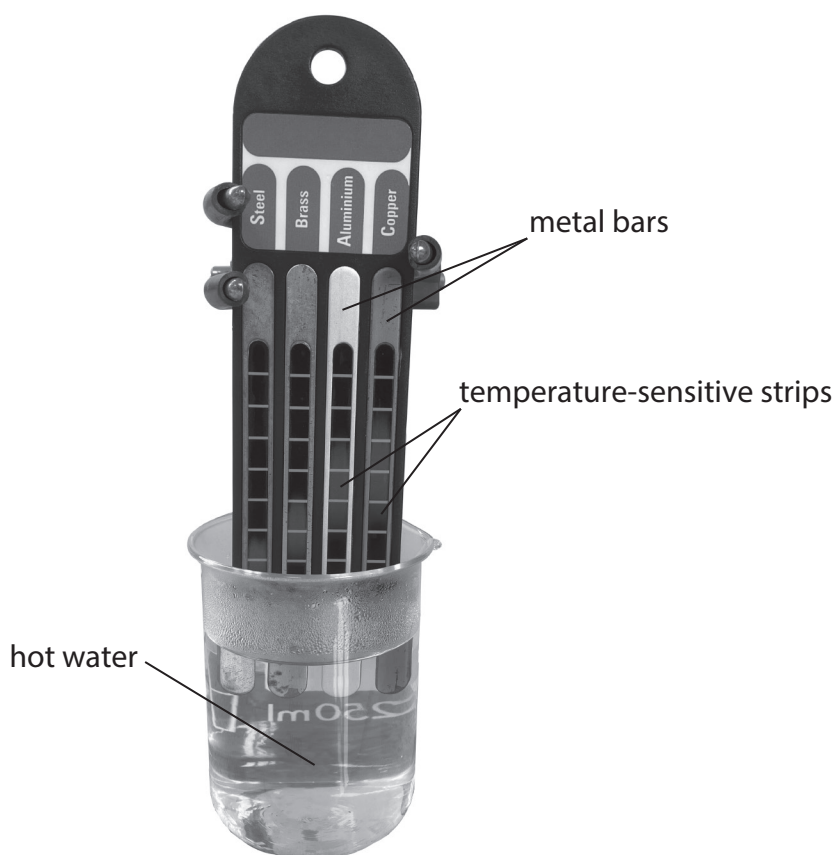
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- 4 A student does an experiment to investigate energy transfer by conduction.
- (a) The student plans to use the piece of apparatus shown in the photograph.



The apparatus has four bars made from different metals.

When the apparatus is placed in hot water, energy is transferred from the bottom of the bar to the top of the bar. The temperature-sensitive strip on each bar changes colour as the temperature of the bar changes.

The time taken for the colour change to reach the top of the bar can be used to compare how effective each metal is at transferring energy by conduction.

- (i) Give three control variables in the student's investigation.

(3)

1

2

3

You may draw a diagram to help your answer.

(5)

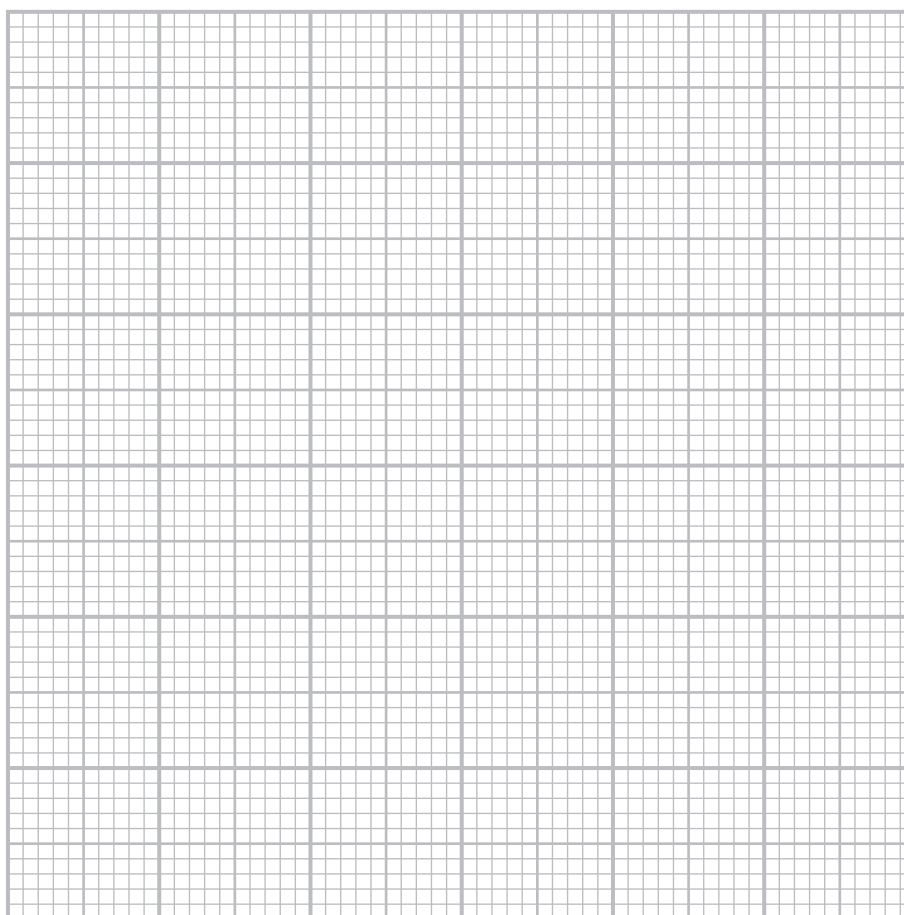
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(b) The table shows the results of the student's investigation.

Metal	Time taken for colour change in seconds
aluminium	29
brass	64
copper	22
steel	115

(i) Plot a bar chart of the student's results.

(3)



- (ii) Deduce which metal is the most effective at transferring energy by conduction.

(2)

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(Total for Question 4 = 13 marks)

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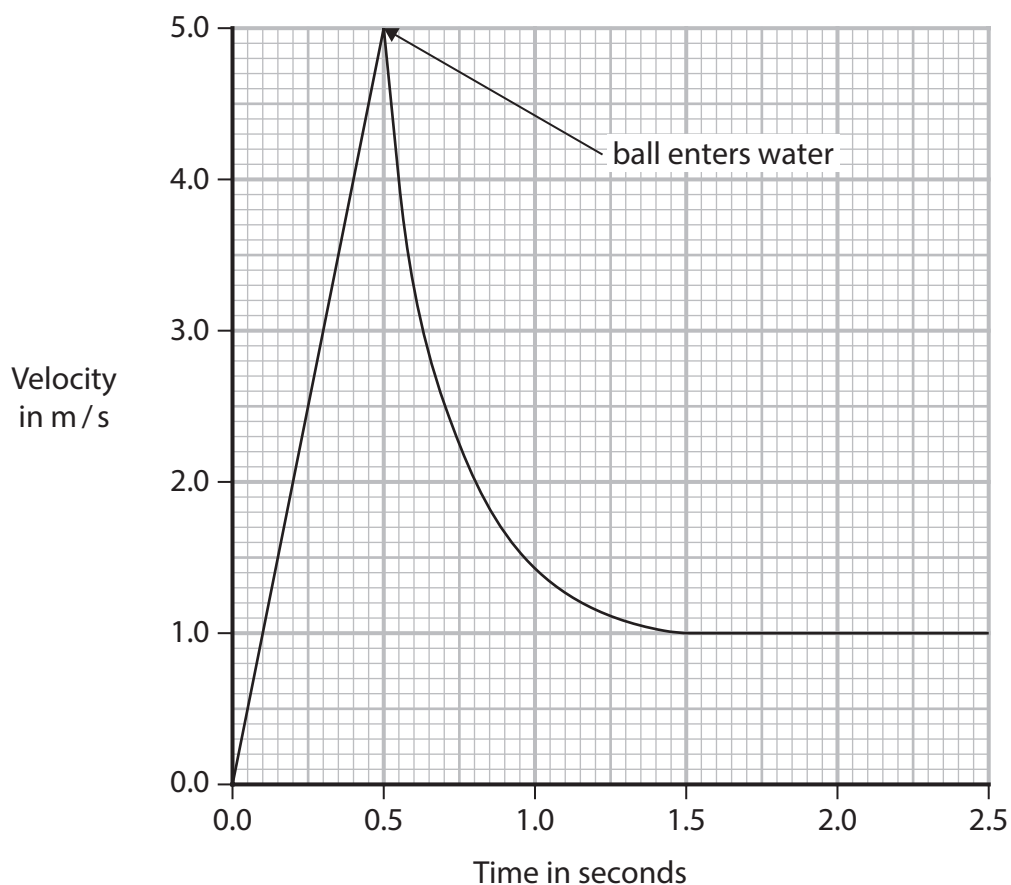
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- 5 A metal ball is dropped from a height into a pool of water.

The graph shows how the velocity of the ball varies with time.



- (a) (i) Describe the motion of the ball **before** it enters the water.

(2)

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- (ii) Using information from the graph, determine the initial height of the ball above the water.

(3)

height = m



- (b) Explain why the velocity of the ball decreases to a constant value as the ball travels through the water.

(4)

- (c) The pool of water has a depth of 2.85 m.

Calculate the pressure difference between the surface of the water and the bottom of the pool.

[for water, density = 1000 kg/m^3]

Give your answer to two significant figures.

(3)

pressure difference = Pa

(Total for Question 5 = 12 marks)



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- 6 An incubator can be used to keep things warm.

The incubator has two electric heaters.

Diagram 1 shows a model of the heating circuit made by a student.

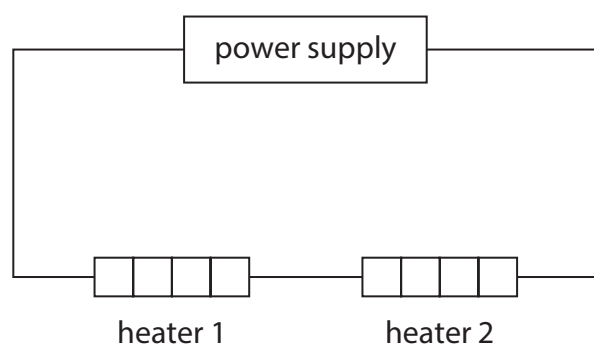


Diagram 1

- (a) (i) State what will happen if there is a break in the wire connecting heater 1 to the power supply.

(1)

- (ii) Diagram 2 shows a wire connected in parallel with heater 1 in the student's circuit.

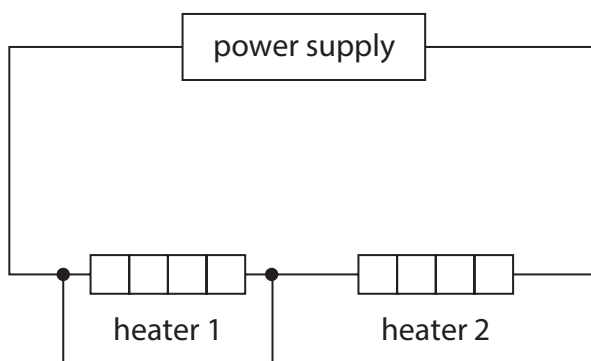


Diagram 2

Explain what happens to each heater when the wire is connected in parallel with heater 1.

Assume the wire has a low resistance.

(3)

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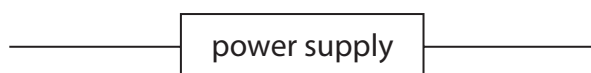


(b) The student decides to build a different circuit using the two heaters.

In this circuit, each heater can be turned on and off separately using switches.

Complete the circuit diagram to show how the two heaters and switches could be connected.

(2)



(Total for Question 6 = 6 marks)

TOTAL FOR PAPER = 60 MARKS

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Pearson Edexcel International GCSE (9–1)

Thursday 22 May 2025

Morning (Time: 1 hour 10 minutes)

Paper

reference

4WSD5/1PR

Science (Double Award) (Modular)

Physics

UNIT 5: 4WSD5

PAPER: 1PR

Equation Booklet

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These equations may be required for both International GCSE Physics (4WPH1) and International GCSE double award (4WSD5) papers.

1. Forces and Motion

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

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$

$$v^2 = u^2 + (2 \times a \times s)$$

$$\text{force} = \text{mass} \times \text{acceleration} \quad F = m \times a$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength} \quad W = m \times g$$

2. Electricity

$$\text{power} = \text{current} \times \text{voltage} \quad P = I \times V$$

$$\text{energy transferred} = \text{current} \times \text{voltage} \times \text{time} \quad E = I \times V \times t$$

$$\text{voltage} = \text{current} \times \text{resistance} \quad V = I \times R$$

$$\text{charge} = \text{current} \times \text{time} \quad Q = I \times t$$

$$\text{energy transferred} = \text{charge} \times \text{voltage} \quad E = Q \times V$$

3. Waves

$$\text{wave speed} = \text{frequency} \times \text{wavelength} \quad v = f \times \lambda$$

$$\text{frequency} = \frac{1}{\text{time period}} \quad f = \frac{1}{T}$$

$$\text{refractive index} = \frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})} \quad n = \frac{\sin i}{\sin r}$$

$$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}} \quad \sin c = \frac{1}{n}$$



4. Energy resources and energy transfers

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy output}}$$

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

$$W = F \times d$$

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$GPE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2$$

$$KE = \frac{1}{2} \times m \times v^2$$

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

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

5. Solids, liquids and gases

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{m}{V}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$p = \frac{F}{A}$$

$$\text{pressure difference} = \text{height} \times \text{density} \times \text{gravitational field strength}$$

$$p = h \times \rho \times g$$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant}$$

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{pressure} \times \text{volume} = \text{constant}$$

$$p_1 \times V_1 = p_2 \times V_2$$

8. Astrophysics

$$\text{orbital speed} = \frac{2 \times \pi \times \text{orbital radius}}{\text{time period}}$$

$$v = \frac{2 \times \pi \times r}{T}$$

The equations on the following page will only be required for International GCSE Physics.

These additional equations may be required in International GCSE Physics papers 2P and 2PR.

1. Forces and Motion

momentum = mass $\times$ velocity

$$p = m \times v$$

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

$$F = \frac{(mv - mu)}{t}$$

moment = force $\times$ perpendicular distance from the pivot

5. Solids, liquids and gases

change in thermal energy = mass $\times$ specific heat capacity $\times$ change in temperature

$$\Delta Q = m \times c \times \Delta T$$

6. Magnetism and electromagnetism

relationship between input and output voltages for a transformer

$$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$$

input power = output power

$$V_p I_p = V_s I_s$$

for 100% efficiency

8. Astrophysics

$\frac{\text{change in wavelength}}{\text{reference wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}}$

$$\frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta \lambda}{\lambda_0} = \frac{v}{c}$$

END OF EQUATION LIST