Please check the examination details below before entering your candidate information

| Candidate surname | Other names |
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Centre Number | Candidate Number

# Pearson Edexcel International GCSE (9–1)

## Thursday 13 November 2025

Morning (Time: 2 hours)

**Paper reference** **4PH1/1P 4SD0/1P**

# Physics

**UNIT: 4PH1**
**Science (Double Award) 4SD0**
**PAPER: 1P**

**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/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 any calculations and state the units.

## Information

- The total mark for this paper is 110.
- 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.



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## FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time $E = I \times V \times t$

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

power = $\dfrac{\text{work done}}{\text{time taken}}$ $P = \dfrac{W}{t}$

power = $\dfrac{\text{energy transferred}}{\text{time taken}}$ $P = \dfrac{E}{t}$

orbital speed = $\dfrac{2\pi \times \text{orbital radius}}{\text{time period}}$ $v = \dfrac{2 \times \pi \times r}{T}$

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

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

pressure × volume = constant $p_1 \times V_1 = p_2 \times V_2$

$\dfrac{\text{pressure}}{\text{temperature}}$ = constant $\dfrac{p_1}{T_1} = \dfrac{p_2}{T_2}$

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

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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** This question is about stars.

(a) The table gives information about four different stars.

| Star | Colour | Mass in multiples of the mass of the Sun | Evolutionary stage |
|---|---|---|---|
| Betelgeuse | red | 16.5 | red supergiant |
| Sirius A | blue-white | 2.4 | main sequence |
| Sirius B | white | 1.0 | white dwarf |
| The Sun | yellow | 1.0 | main sequence |

(i) Which of these stars has the lowest surface temperature?

**(1)**

☒ **A** Betelgeuse

☒ **B** Sirius A

☒ **C** Sirius B

☒ **D** The Sun

(ii) Which of these stars will become a supernova in the future?

**(1)**

☒ **A** Betelgeuse

☒ **B** Sirius A

☒ **C** Sirius B

☒ **D** The Sun

(iii) Sirius B and the Sun have approximately the same mass but are different colours and in different evolutionary stages.

Describe two other differences between Sirius B and the Sun.

**(2)**

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(b) Sirius B orbits with Sirius A as part of a binary star system.

The mean orbital radius of Sirius B is $29.7 \times 10^9$ km.

The time for Sirius B to complete one orbit is 50 years.

Calculate the mean orbital speed of Sirius B.

Give your answer in km / s.

**(3)**

mean orbital speed = .............................................. km / s

**(Total for Question 1 = 7 marks)**

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**2** A car travels at a constant speed of 14 m/s along a road.

(a) Calculate the distance travelled by the car in a time of 30 seconds.

Use the formula

distance travelled = average speed × time taken

**(2)**

distance travelled = .............................................................. m

(b) The driver of the car sees an obstacle in the road ahead and applies the brakes.

(i) Which of these is a description of the thinking distance of the car?

**(1)**

☒ **A** distance travelled between applying the brakes and the car coming to a stop

☒ **B** distance travelled between seeing the obstacle and applying the brakes

☒ **C** distance travelled between seeing the obstacle and the car coming to a stop

☒ **D** distance travelled as the car slows down

(ii) Which of these factors would increase the braking distance of the car?

**(1)**

☒ **A** car travelling at a lower initial speed

☒ **B** driver being tired

☒ **C** worn tyres on the car

☒ **D** a dry road instead of a wet road

(iii) State the only factor that affects both the thinking distance and the braking distance of the car.

**(1)**

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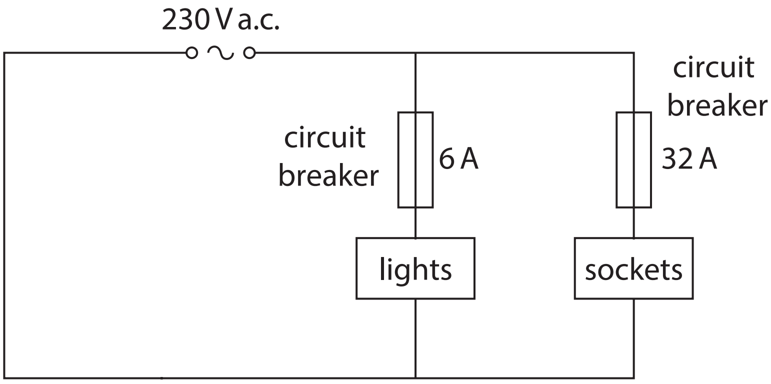
**(Total for Question 2 = 5 marks)**

**3** This is a simplified diagram of the electrical wiring in a house.




(a) A current larger than 32 A flows in the sockets.

Describe how having the circuit breaker in series with the sockets protects the house.

**(2)**

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(b) A student suggests that fuses could be used instead of the circuit breakers.

Give two **disadvantages** of using fuses instead of circuit breakers.

**(2)**

1 ..........................................................................................................................................

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(c) Explain why the wiring in the house includes an earth wire.

**(2)**

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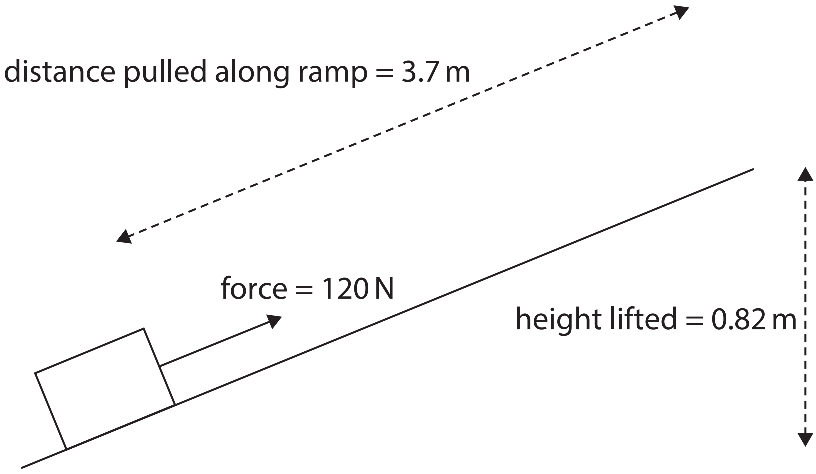
**(Total for Question 3 = 6 marks)**

**4** The diagram shows a force pulling a block up a ramp.




(a) Show that the work done by the force is about 440 J.

Use the formula

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

**(2)**

(b) The block gains 12 J of energy in its gravitational store when it is lifted through a height of 0.82 m.

Calculate the mass of the block.

**(2)**

mass = ........................................................................ kg

(c) A student states that most of the input energy is destroyed when the block is pulled up the ramp.

Comment on the student's statement.

**(2)**

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**(Total for Question 4 = 6 marks)**

**5** This question is about radioactivity.

(a) Uranium-238 decays by emitting an alpha particle to become an isotope of thorium.

Complete the equation for the alpha decay of uranium-238.

**(3)**

$$^{238}_{\square}\text{U} \rightarrow \, ^{\square}_{90}\text{Th} + \, ^{\square}_{\square}\alpha$$

(b) The isotope of thorium produced in the decay of uranium-238 is also radioactive.

Thorium decays by emitting a beta particle.

Describe how the structure of a thorium nucleus changes when a beta particle is emitted.

**(2)**

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(c) A teacher demonstrates radioactivity using a radioactive rock.

The rock contains uranium-238 and other radioactive isotopes.

The teacher takes precautions to reduce the risk of contamination and irradiation by the radioactive rock.

(i) Suggest a safety precaution that would reduce the risk of **contamination** by the radioactive rock.

**(1)**

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(ii) Suggest a safety precaution that would reduce the risk of **irradiation** by the radioactive rock.

**(1)**

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(iii) The teacher measures the amount of radiation emitted by the radioactive rock in a time of 1 minute using a Geiger-Müller (GM) tube and counter.

The teacher repeats this measurement to obtain a total of five measurements of the count rate.

The table shows the teacher's results.

| **Count rate in counts per minute** |
|---|
| 54 |
| 58 |
| 52 |
| 35 |
| 55 |

Calculate the mean count rate.

Give your answer to 2 significant figures.

**(3)**

mean count rate = .............................................. counts per minute

**(Total for Question 5 = 10 marks)**

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**6** This question is about magnetism.

(a) Diagram 1 shows the ends of two strong bar magnets and the space between the bar magnets.

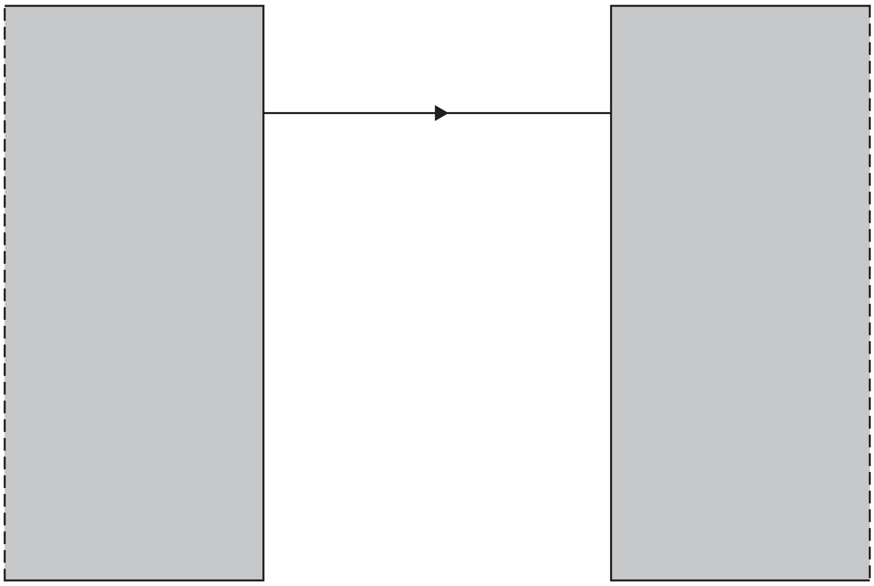

**Diagram 1**

There is a uniform magnetic field in the space between the bar magnets.

(i) One of the magnetic field lines has already been drawn.

Complete diagram 1 by drawing **three** more magnetic field lines and labelling the poles of the bar magnets.

**(3)**

(ii) Describe a method a student could use to show the shape and direction of the magnetic field between the bar magnets.

You may draw a diagram to help your answer.

**(3)**

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(iii) Name a magnetically soft material.

**(1)**

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(b) A student investigates how the length, L, of a current-carrying wire in a magnetic field affects the size of the force on the wire.

The student uses a power supply and keeps the current in the wire constant.

They use the same magnet throughout the experiment.

Diagram 2 shows part of the student's equipment.

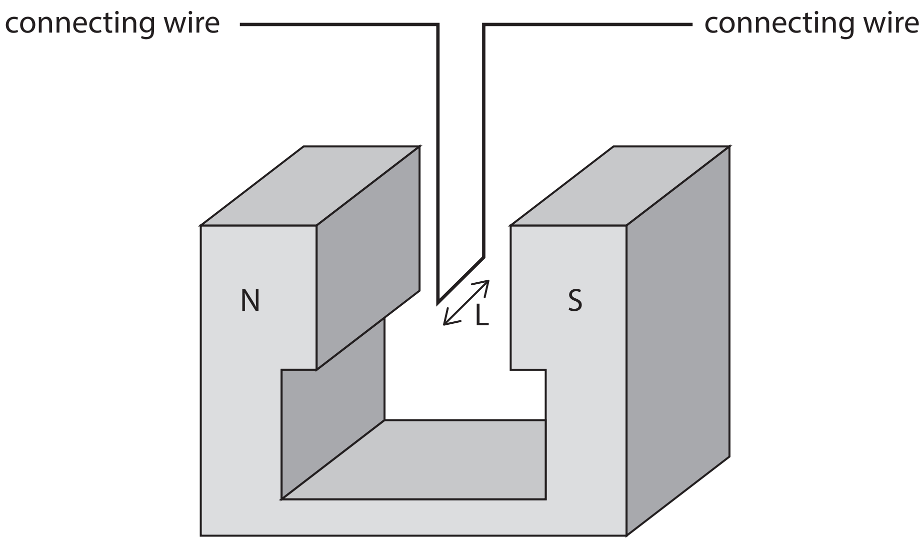



**Diagram 2**

(i) Table 1 lists the variables in the student's investigation.

Add one tick (✓) to each row to show whether each variable is an independent, dependent or control variable.

**(3)**

| Variable | Independent | Dependent | Control |
|---|---|---|---|
| current | | | |
| length of wire in field | | | |
| force on wire | | | |
| magnetic field strength | | | |

**Table 1**

(ii) Table 2 shows the student's results.

| Length of wire in field in mm | Force in N |
|---|---|
| 0 | 0.00 |
| 5 | 0.32 |
| 10 | 0.64 |
| 15 | 0.92 |
| 20 | 1.28 |
| 25 | 1.58 |
| 30 | 1.92 |

**Table 2**

Plot a graph of the results on the grid.

**(3)**

(iii) Draw a line of best fit.

**(1)**

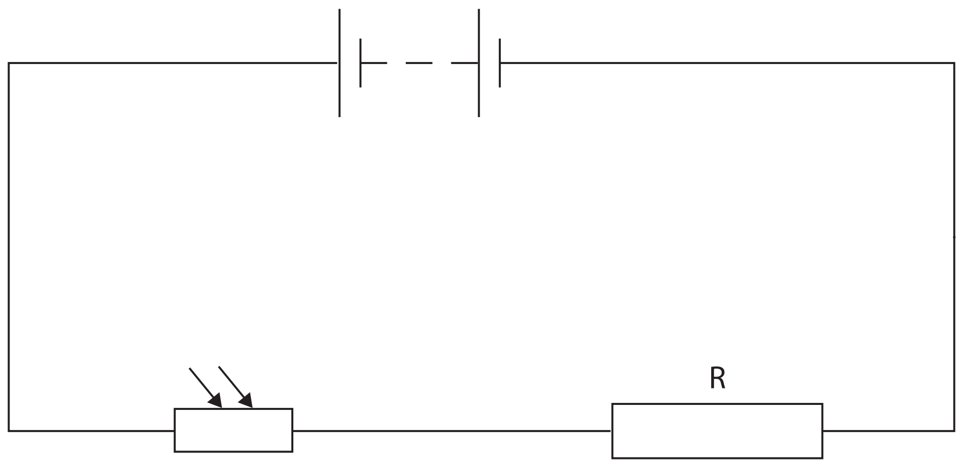
(iv) The student repeats the experiment but with a smaller current in the wire.

Draw another line on the grid to show the expected results when using a smaller current.

**(2)**

**(Total for Question 6 = 16 marks)**

**7** The diagram shows an electric circuit used to determine the brightness of the light in a room.




(a) Add a voltmeter to the diagram to measure the voltage of resistor R.

**(2)**

(b) (i) State the formula linking voltage, current and resistance.

**(1)**

(ii) The voltage across resistor R is 1.9 V.

The resistance of resistor R is 800 Ω.

Calculate the current in the circuit.

Give your answer in milliamps, mA.

**(3)**

current = .............................................................. mA

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(c) Explain why the voltage across the light dependent resistor (LDR) decreases if the brightness of the light in the room increases.

**(4)**

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(d) Another resistor is connected in parallel with resistor R. The new resistor has a higher resistance than resistor R.

Explain what happens to the current in the LDR in the circuit diagram.

Assume that the brightness of the light in the room remains constant.

**(2)**

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**(Total for Question 7 = 12 marks)**

**8** The diagram shows a pot made of clay.

(Source: © Victoria Sergeeva / Shutterstock)

(a) Describe a method that could be used to accurately determine the volume of clay used in the pot.

**(4)**

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(b) Give the name of a piece of apparatus that could be used to measure the mass of the clay pot.

**(1)**

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(c) The clay pot can be used to hold liquids.

A student needs to determine the volume of liquid that can be contained in the pot.

The student measures the mass of the empty pot and then measures the mass of the pot again when it is filled with a liquid.

The table shows the student's measurements.

| | |
|---|---|
| **Mass of empty pot in kg** | 1.2 |
| **Mass of pot filled with liquid in kg** | 6.8 |

The density of the liquid used is 920 kg / $m^3$.

Calculate the volume of liquid that can be contained in the pot.

Use the formula

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

**(4)**

volume = ........................................................ $m^3$

**(Total for Question 8 = 9 marks)**

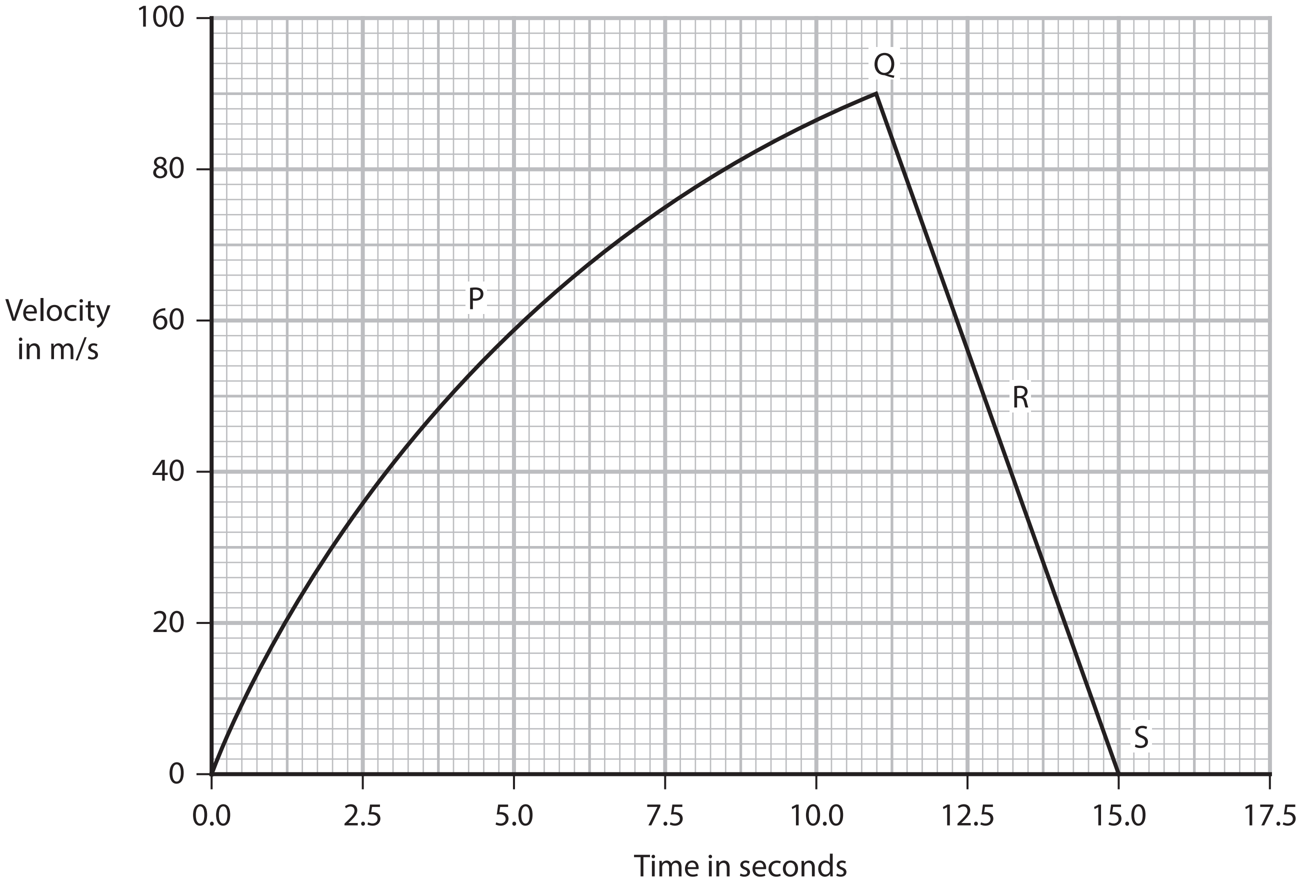
**9** The photograph shows a car being driven along a straight race track.

(Source: © Shayne T Wright/Shutterstock)

The car starts from rest and accelerates along the straight race track.

After crossing the finish line, the driver applies the brakes to bring the car to rest.

The graph shows how the velocity of the car changes with time after the car starts to accelerate.




(a) What feature of the graph gives the magnitude of the acceleration of the car?

**(1)**

- ☒ **A** area between line and time axis
- ☒ **B** axes labels
- ☒ **C** curved section of the line
- ☒ **D** gradient of the line

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(b) At which point on the graph does the driver of the car first apply the brakes?

**(1)**

- ☒ **A** P
- ☒ **B** Q
- ☒ **C** R
- ☒ **D** S

(c) Explain why the graph is a curve for the first 11.0 seconds.

**(2)**

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(d) Calculate the distance travelled by the car from 11.0 seconds to 15.0 seconds.

**(3)**

distance = ........................................................ m

**(Total for Question 9 = 7 marks)**

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**10** This question is about light.

(a) Light is an example of a wave.

State what is meant by the term **wave**.

**(2)**

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(b) Diagram 1 shows a ray of light incident on a mirror.

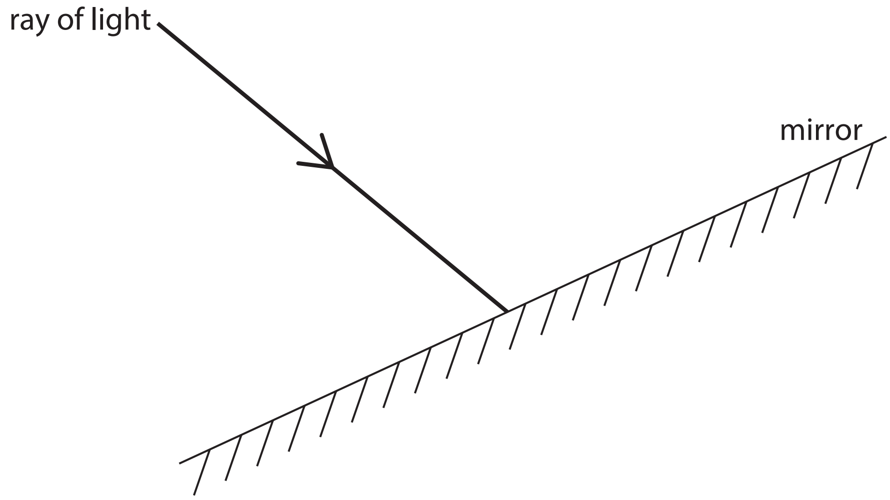


**Diagram 1**

Draw another ray of light on diagram 1 to show the path of the ray after it is incident on the mirror.

**(2)**

(c) Diagram 2 shows a ray of red light entering a semi-circular glass block from the air.

When the ray of red light is incident on the glass–air boundary, the light refracts with an angle of refraction of 90°

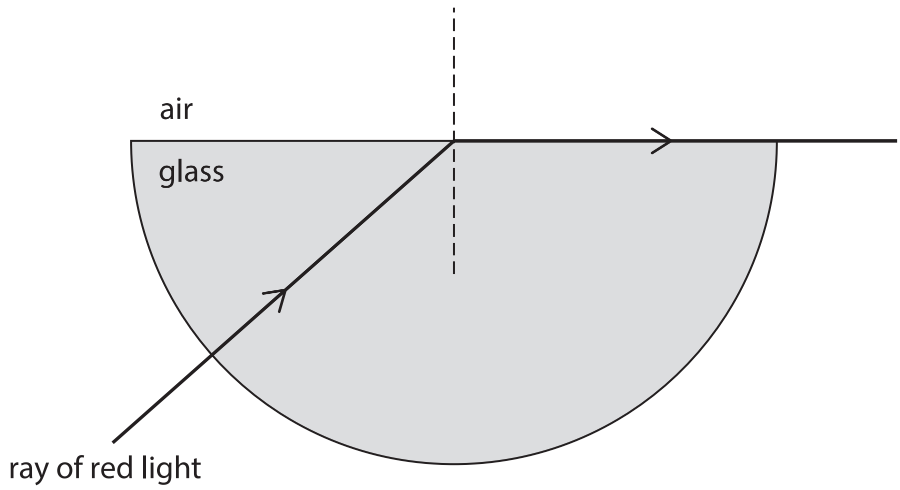


**Diagram 2**

(i) Using diagram 2, determine the critical angle for red light at the glass–air boundary.

**(1)**

critical angle = ........................................ degrees

(ii) Calculate the refractive index of the glass.

**(3)**

refractive index = ........................................

(iii) The refractive index of blue light in glass is higher than the refractive index of red light in glass.

A ray of blue light has an angle of incidence equal to the critical angle of the red light.

Explain what would happen to the ray of blue light at the glass–air boundary.

**(3)**

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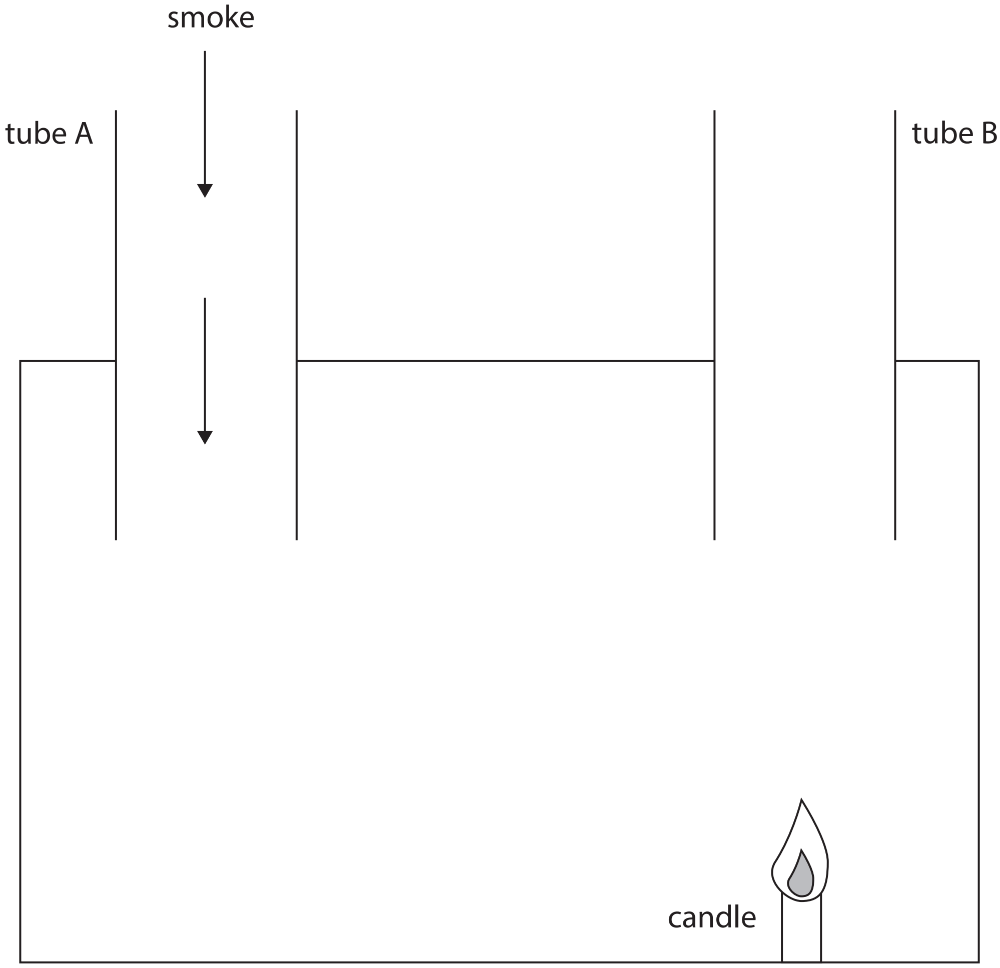
**(Total for Question 10 = 11 marks)**

**11** The diagram shows apparatus that can be used to demonstrate convection currents.




The apparatus consists of a box with two tubes, A and B, that allow air to enter and leave the box.

During the demonstration, a candle is placed inside the box directly underneath tube B.

A source of smoke is placed above tube A.

Using ideas about convection, explain why the smoke moves down into the box through tube A.

You may add to the diagram to help your answer.

**(Total for Question 11 = 5 marks)**

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**12** This question is about gas pressure.

(a) Diagram 1 shows some gas particles contained in a box.

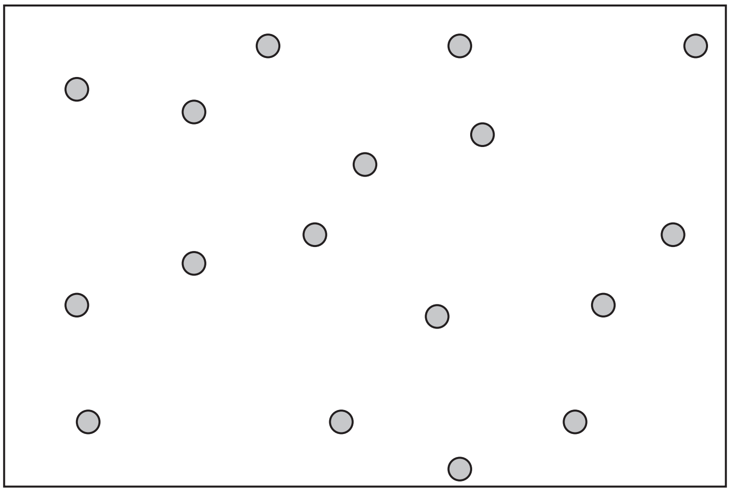

**Diagram 1**

(i) The gas particles move in random motion.

State what is meant by the term **random motion**.

**(2)**

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(ii) The gas exerts a pressure due to the gas particles colliding with the walls of the box.

Explain how these collisions produce a pressure.

**(2)**

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(iii) The volume of the box is increased but the temperature of the gas remains constant.

Explain how increasing the volume of the box affects the pressure of the gas in the box.

Assume the amount of gas remains constant.

**(3)**

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(b) Diagram 2 shows a device used to measure differences in gas pressure. This device is called a manometer.

The difference between the pressure of the atmosphere and the pressure of the gas supply causes a difference in the height of the liquid levels on each side of the manometer.

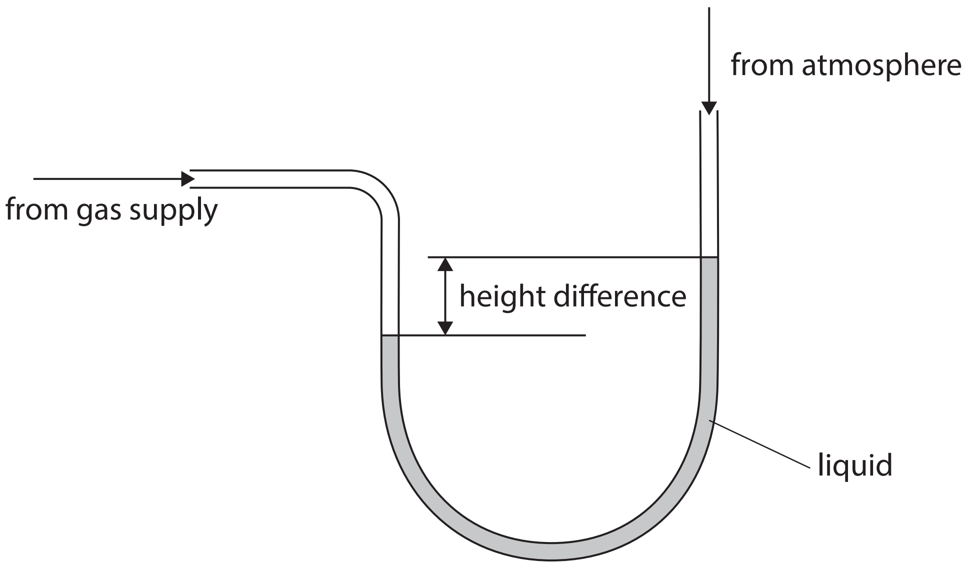


**Diagram 2**

(i) The liquid in the manometer is oil, which has a density of 820 kg/m$^3$.

The pressure difference between the atmosphere and the gas supply is 1850 Pa.

Calculate the height difference between the liquid levels in the manometer.

Use the formula

pressure difference = height × density × gravitational field strength

**(3)**

height difference = .................................................... m

(ii) Different liquids can be used in the manometer.

Liquid mercury has a density of 14 000 kg / m$^3$.

Suggest why liquid mercury would be more appropriate to use in the manometer when measuring very large pressure differences.

**(2)**

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**QUESTION 12 CONTINUES ON NEXT PAGE.**

(c) The pressure of a sample of gas is 232 kPa at a temperature of 16 °C.

Calculate the temperature when the pressure of the sample of gas increases to 249 kPa.

Give your answer in degrees Celsius (°C)

Assume that the volume and the mass of the gas sample remain constant.

**(4)**

temperature = ........................................................ °C

**(Total for Question 12 = 16 marks)**

**TOTAL FOR PAPER = 110 MARKS**

Pearson Edexcel International GCSE (9–1)

# Thursday 13 November 2025

Morning (Time: 2 hours)

| Paper reference | 4PH1/1P 4SD0/1P |
|---|---|

# Physics

**UNIT: 4PH1**

**Science (Double Award) 4SD0**

**PAPER: 1P**

**Equation Booklet**

**Do not return this Booklet with the question paper.**

*Turn over*

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These equations may be required for both International GCSE Physics (4PH1) and International GCSE Combined Science (4SD0) papers.

| | |
|---|---|
| **1. Forces and Motion** | |
| average speed = $\frac{\text{distance moved}}{\text{time taken}}$ | |
| acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$ | $a = \frac{(v-u)}{t}$ |
| $(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$ | $v^2 = u^2 + (2 \times a \times s)$ |
| force = mass × acceleration | $F = m \times a$ |
| weight = mass × gravitational field strength | $W = m \times g$ |
| **2. Electricity** | |
| power = current × voltage | $P = I \times V$ |
| energy transferred = current × voltage × time | $E = I \times V \times t$ |
| voltage = current × resistance | $V = I \times R$ |
| charge = current × time | $Q = I \times t$ |
| energy transferred = charge × voltage | $E = Q \times V$ |
| **3. Waves** | |
| wave speed = frequency × wavelength | $v = f \times \lambda$ |
| frequency = $\frac{1}{\text{time period}}$ | $f = \frac{1}{T}$ |
| refractive index = $\frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}$ | $n = \frac{\sin i}{\sin r}$ |
| $\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$ | $\sin c = \frac{1}{n}$ |

| **4. Energy resources and energy transfers** | |
|---|---|
| efficiency = $\frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$ | |
| work done = force × distance moved | $W = F \times d$ |
| gravitational potential energy = mass × gravitational field strength × height | $GPE = m \times g \times h$ |
| kinetic energy = $\frac{1}{2}$ × mass × speed$^2$ | $KE = \frac{1}{2} \times m \times v^2$ |
| power = $\frac{\text{work done}}{\text{time taken}}$ | $P = \frac{W}{t}$ |
| **5. Solids, liquids and gases** | |
| density = $\frac{\text{mass}}{\text{volume}}$ | $\rho = \frac{m}{V}$ |
| pressure = $\frac{\text{force}}{\text{area}}$ | $p = \frac{F}{A}$ |
| pressure difference = height × density × gravitational field strength | $p = h \times \rho \times g$ |
| $\frac{\text{pressure}}{\text{temperature}}$ = constant | $\frac{p_1}{T_1} = \frac{p_2}{T_2}$ |
| pressure × volume = constant | $p_1 \times V_1 = p_2 \times V_2$ |
| **8. Astrophysics** | |
| 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 × velocity | $p = m \times v$ |
| force = $\frac{\text{change in momentum}}{\text{time taken}}$ | $F = \frac{(mv - mu)}{t}$ |
| moment = force × perpendicular distance from the pivot | |
| **5. Solids, liquids and gases** | |
| change in thermal energy = mass × specific heat capacity × 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 | $V_p I_p = V_s I_s$<br>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**