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)

Monday 16 June 2025

Morning (Time: 1 hour 40 minutes)

Paper reference **4WPH2/1P**

Physics (Modular)

UNIT 2: 4WPH2

PAPER: 1P

You must have:
Ruler, calculator, 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 90.
- 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

wave speed = frequency × wavelength $v = f \times \lambda$

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

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

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

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

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

relationship between input and output voltages for a transformer

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

input power = output power $V_p I_p = V_s I_s$

for 100% efficiency

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

$\dfrac{\text{change in wavelength}}{\text{reference wavelength}} = \dfrac{\text{velocity of a galaxy}}{\text{speed of light}}$ $\dfrac{\lambda - \lambda_0}{\lambda_0} = \dfrac{\Delta\lambda}{\lambda_0} = \dfrac{v}{c}$

Where necessary, assume the acceleration of free fall, g = 10 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 ☒.

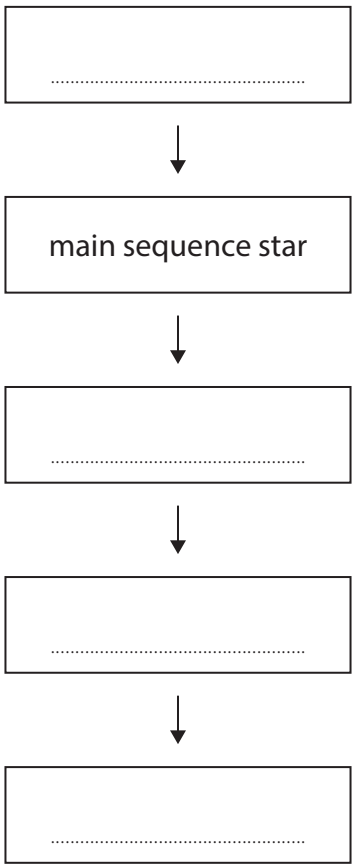
1 (a) The words in the box give some stages of the evolution of a star.

neutron star	nebula	red supergiant	supernova

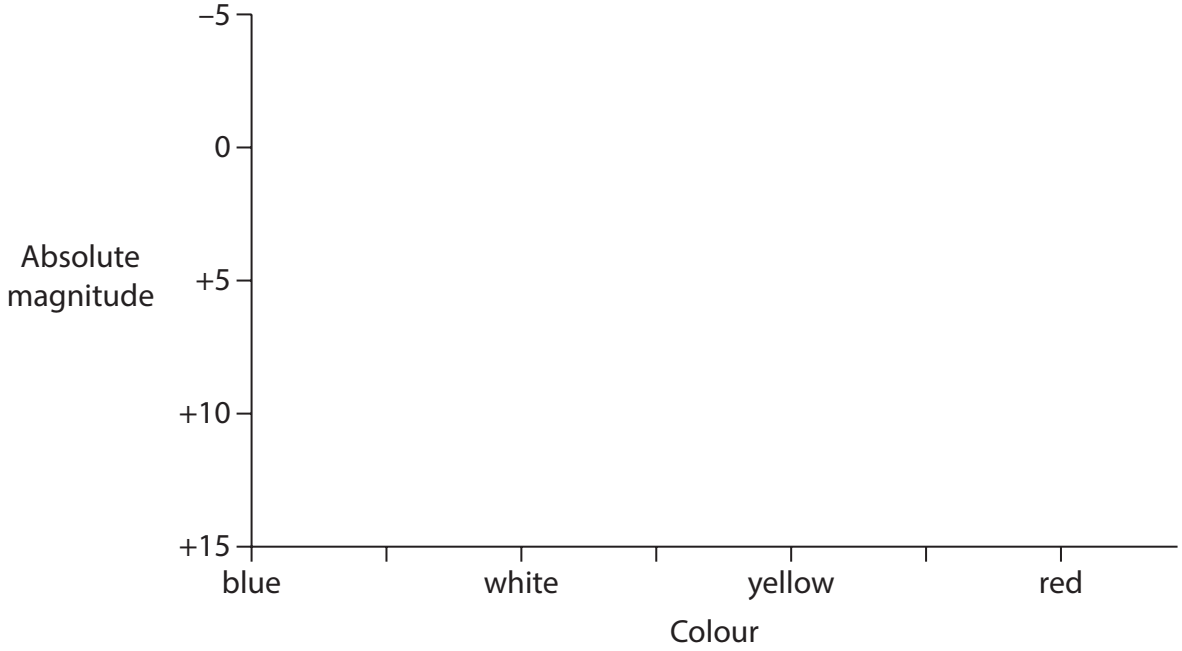
Complete the diagram to show the stages in the evolution of a star that is larger than the Sun.

Use the words from the box.

(2)



(b) The Hertzsprung-Russell diagram shows the relationship between the absolute magnitude and colour of stars.



(i) Identify the position of a white dwarf on the diagram.

Mark the position with the letter W.

(1)

(ii) Identify the position of a main sequence star on the diagram.

Mark the position with the letter M.

(1)

(iii) Identify the position of a red giant star on the diagram.

Mark the position with the letter R.

(1)

(c) State a property of a star that is directly related to its surface temperature.

(1)

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(Total for Question 1 = 6 marks)

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2 This question is about sound waves.

(a) The table gives some statements about sound waves.

Complete the table by placing a tick (✓) next to each correct statement.

(2)

Statement	Correct (✓)
sound waves are longitudinal	
sound waves can travel through a vacuum	
sound waves are part of the electromagnetic spectrum	
sound waves can be reflected and refracted	

(b) An oscilloscope can be used to determine the time period of a sound wave.

(i) Name a piece of apparatus that can be connected to the oscilloscope to detect sound waves.

(1)

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(ii) Describe how an oscilloscope can be used to determine the time period of a sound wave.

(3)

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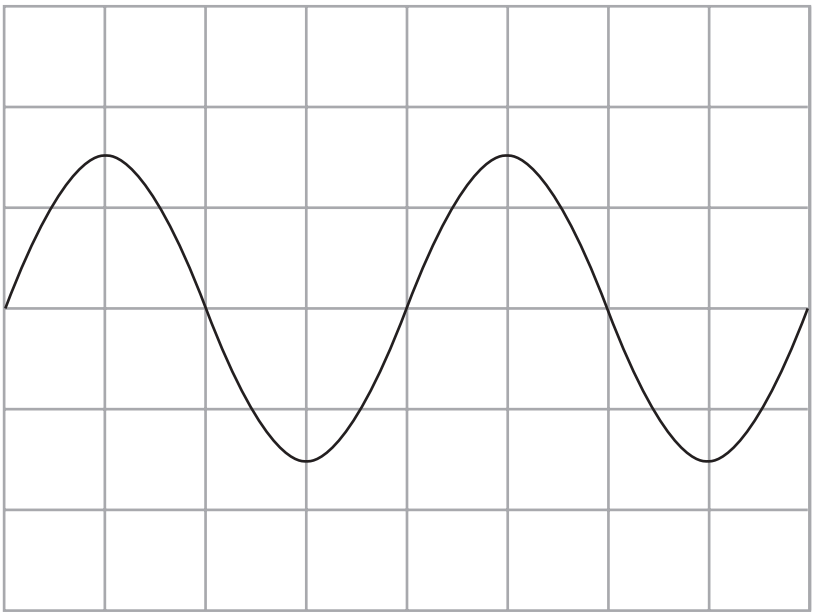
(iii) The diagram shows the trace on an oscilloscope screen when a sound wave is detected.



On the screen, draw the trace for a quieter sound wave with a lower frequency.

(2)

(c) A sound wave has a frequency of 496 Hz and a speed of 324 m/s.

Calculate the wavelength of the sound wave.

Give your answer to three decimal places.

(4)

wavelength of sound wave = ... m

(Total for Question 2 = 12 marks)

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3 This question is about light as it travels through air and a glass block.

The refractive index of the glass block is 1.52

(a) A ray of light is shone from air into a glass block at an angle of incidence of 18° to the normal.

(i) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(ii) Calculate the angle of refraction of the light in the glass.

(4)

angle of refraction = ... °

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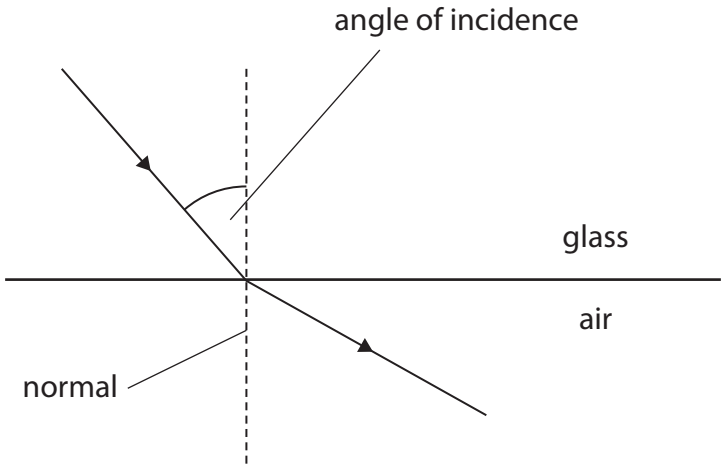
(b) The diagram shows the ray of light as it leaves the glass block and travels into the air.



The angle of incidence is increased.

Above a certain angle of incidence, the light ray is not refracted.

(i) Give the name of this effect.

(2)

.....

.....

(ii) Calculate the critical angle for the glass block.

Use the equation

$$c = \sin^{-1}\left(\frac{1}{n}\right)$$

(2)

critical angle = ... °

(iii) Give a use for the effect when the angle of incidence is increased so that the light is not refracted.

(1)

.....

.....

(Total for Question 3 = 10 marks)

4 This question is about waves.

(a) Which of these properties is the same for all electromagnetic waves?

(1)

- ☒ **A** energy
- ☒ **B** frequency
- ☒ **C** speed in a vacuum
- ☒ **D** wavelength

(b) Which of these electromagnetic waves is detected by night vision equipment?

(1)

- ☒ **A** gamma rays
- ☒ **B** infrared
- ☒ **C** microwaves
- ☒ **D** X-rays

(c) An electromagnetic wave has a frequency of 9.85×10^4 Hz.

Calculate the time period of this wave.

(2)

time period = ... s

(d) Electromagnetic waves are transverse waves.

Describe the difference between transverse waves and longitudinal waves.

(2)

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(Total for Question 4 = 6 marks)

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5 (a) State the name of the force which causes a planet to orbit a star.

(1)

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(b) Describe one difference between the orbit of a comet and the orbit of a moon.

(2)

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(c) A planet orbits a star at a mean speed of 47 400 m/s.

Orbit radius is 5.79×10^{10} m.

Calculate the time period of the orbit of the planet.

Give your answer in standard form.

(4)

time period = ... seconds

(Total for Question 5 = 7 marks)

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6 A teacher demonstrates the penetrating power of different types of radiation emitted from a radioactive source.

The teacher has this equipment.

- radioactive sources
- metre ruler
- Geiger-Müller detector and counter
- a selection of materials, including paper, aluminium and lead
- a timer

(a) Describe a method that the teacher could use to compare the penetrating power of different radiations from radioactive sources.

You may draw a diagram to help your answer.

(5)

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(b) The table shows the teacher's results when using one of the radioactive sources.

Material	Counts in one minute
air	780
piece of paper	520
4 cm thickness of aluminium	520
4 cm thickness of lead	12

(i) Give a reason why these results show that the source emits alpha radiation.

(1)

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(ii) Give a reason why these results show that the source does **not** emit beta radiation.

(1)

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(iii) Give a reason why these results show that the source emits gamma radiation.

(1)

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(Total for Question 6 = 8 marks)

7 In a nuclear power station, a chain reaction occurs.

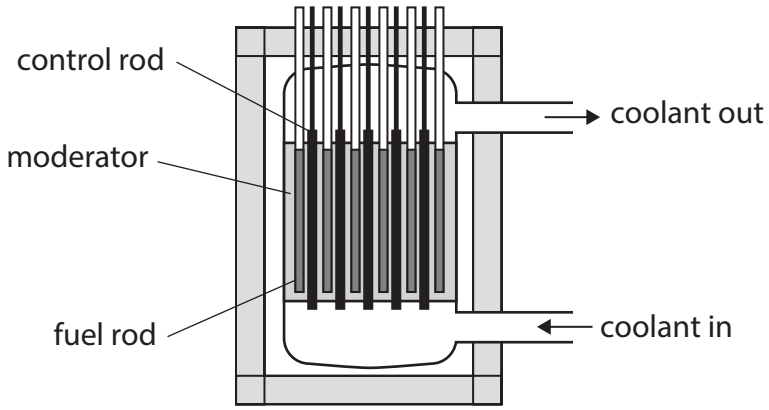
(a) Explain the meaning of the term **chain reaction**.

(2)

(b) Explain why the rate of fission will increase in an uncontrolled chain reaction.

(2)

(c) The diagram shows a nuclear fission reactor with some parts labelled.



Explain how the different parts of the reactor work together to keep the rate of fission constant.

(6)

(d) Suggest why there are no fusion power plants on Earth.

(2)

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(Total for Question 7 = 12 marks)

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8 This question is about magnetic fields.

(a) Describe what is shown by magnetic field lines.

(2)

(b) Diagram 1 shows two magnets held close together with their north poles facing.

Diagram 1

The magnets are released.

(i) Explain what happens when the magnets are released.

(2)

(ii) An iron nail is placed near one of the magnets.

Explain what happens to the iron nail.

(2)

(c) A straight copper wire produces a magnetic field.

(i) State why the copper wire produces a magnetic field.

(1)

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(ii) Diagram 2 shows the copper wire.

Sketch the shape of the magnetic field pattern around the wire.

You should draw four field lines.

(2)

Diagram 2

(d) Diagram 3 shows two charged particles, A and B, moving in a magnetic field.

The arrow drawn on each particle shows the direction of movement.

One particle experiences a force due to the magnetic field.

The other particle does not experience a force.

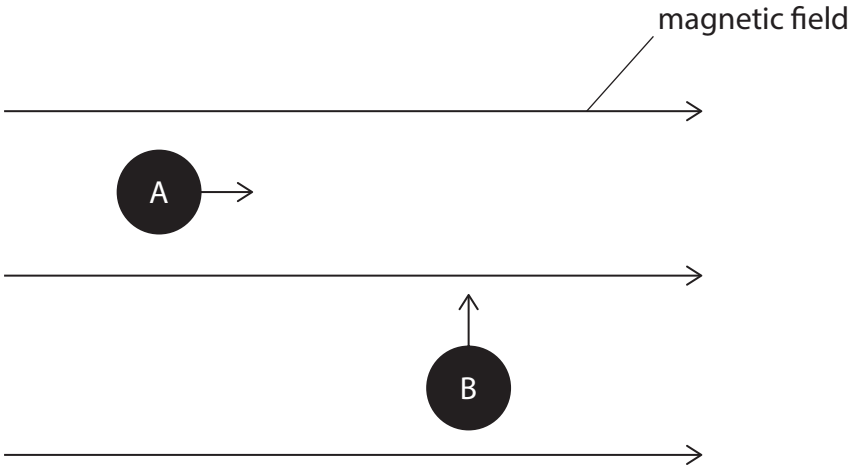

Diagram 3

Explain which particle does **not** experience a force.

(2)

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(Total for Question 8 = 11 marks)

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9 This question is about gases.

(a) Which of these is a correct unit for the volume of a gas?

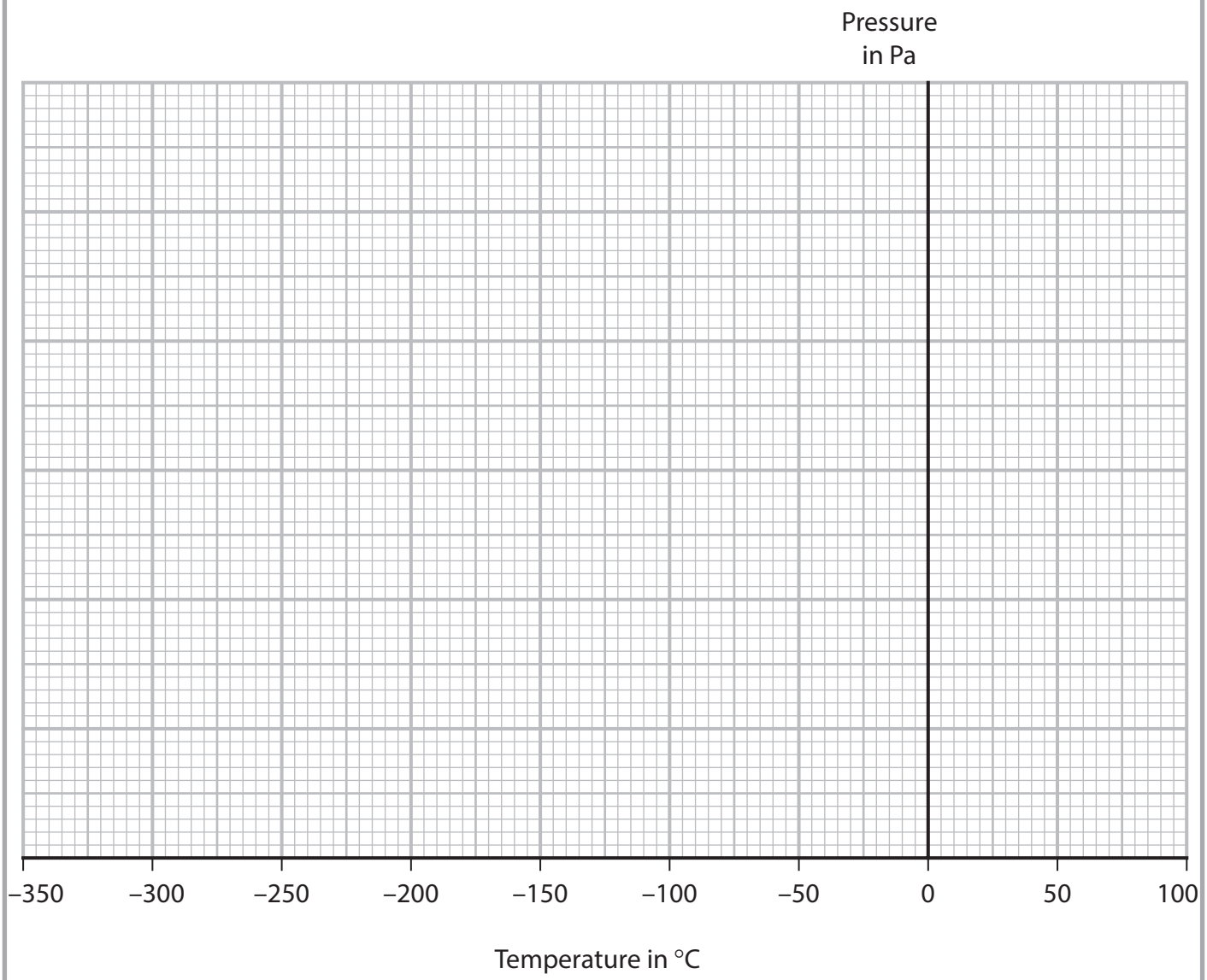
(1)

- ☒ **A** J
- ☒ **B** K
- ☒ **C** m^2
- ☒ **D** m^3

(b) A student measures the pressure of a fixed volume of gas at different temperatures.

The table shows the student's results.

Temperature in °C	Pressure in Pa
0	720
25	771
50	832
75	894
100	945



(i) Plot the student's results on the grid.

You should add a scale to the *y*-axis starting at 0 Pa.

(2)

(ii) Draw a line of best fit.

(1)

(iii) Use the graph to determine a value for absolute zero.

(2)

absolute zero = ... °C

(iv) Explain why the value of absolute zero found from the student's results can only be an estimate.

(2)

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(c) Explain the motion of particles at absolute zero.

(2)

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(Total for Question 9 = 10 marks)

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10 This question is about cosmology.

(a) Give two pieces of evidence that support the Big Bang theory.

(2)

1 .....

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2 .....

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(b) The galaxy NGC 300 is moving away from Earth at a speed of 1.44×10^5 m/s.

Light is emitted from hydrogen atoms in NGC 300 with a reference wavelength of 4.3405×10^{-7} m.

Calculate the wavelength of this light when it is detected at Earth.

Give your answer to five significant figures.

[speed of light in a vacuum, $c = 3.00 \times 10^8$ m/s]

(4)

wavelength = ... m

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(c) Two galaxies at different distances from the Earth have different redshifts.

Explain why these redshifts are different.

(2)

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(Total for Question 10 = 8 marks)

TOTAL FOR PAPER = 90 MARKS

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Pearson Edexcel International GCSE (9–1)

Monday 16 June 2025

Morning (Time: 1 hour 40 minutes)

Paper reference **4WPH2/1P**

Physics (Modular)

UNIT 2: 4WPH2

PAPER: 1P

Equation Booklet

Do not return this Booklet with the question paper.

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These equations may be required for International GCSE Physics modular (4WPH2) papers.

Unit 1

1. Forces and motion	
average speed = $\frac{\text{distance moved}}{\text{time taken}}$	
acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{(v-u)}{t}$
(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)	$v^2 = u^2 + (2 \times a \times s)$
force = mass × acceleration	$F = m \times a$
weight = mass × gravitational field strength	$W = m \times g$
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	
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. 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 = ½ × mass × speed^2	$KE = \frac{1}{2} \times m \times v^2$
power = $\frac{\text{work done}}{\text{time taken}}$	$P = \frac{W}{t}$
4. Solids, liquids and gases: Part 1	
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	$p = h \times \rho \times g$
change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta T$

Unit 2

5. Waves	
wave speed = frequency × wavelength	$v = f \times \lambda$
frequency = $\frac{1}{\text{time period}}$	$f = \frac{1}{T}$
refractive index = $\frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}$	$n = \frac{\sin i}{\sin r}$
$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$	$\sin c = \frac{1}{n}$
6. Solids, liquids and gases: Part 2	
$\frac{\text{pressure}}{\text{temperature}}$ = constant	$\frac{p_1}{T_1} = \frac{p_2}{T_2}$
pressure × volume = constant	$p_1 \times V_1 = p_2 \times V_2$

7. 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

9. Astrophysics	
orbital speed = $\frac{2 \times \pi \times \text{orbital radius}}{\text{time period}}$	$v = \frac{2 \times \pi \times r}{T}$
$\frac{\text{change in wavelength}}{\text{reference wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}}$	$\frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$

END OF EQUATION LIST