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 10 minutes)

Paper reference **4WSD6/1PR**

Science (Double Award) (Modular)

Physics

UNIT 6: 4WSD6
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.

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FORMULAE

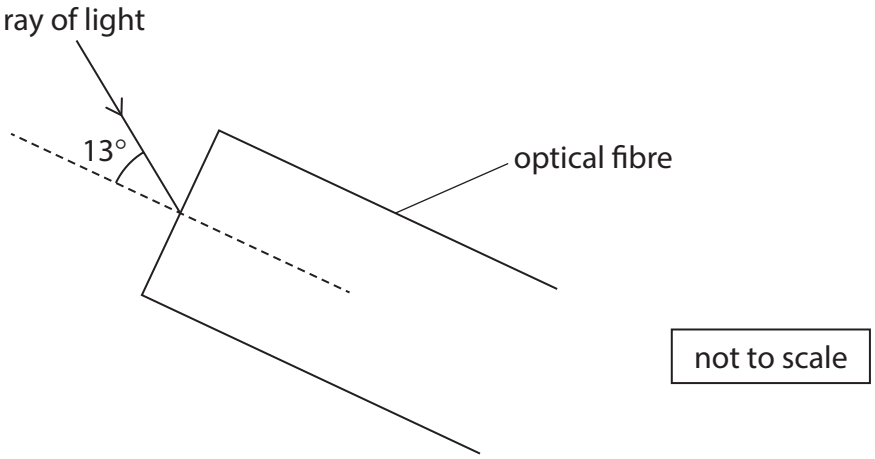
Unit 2

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

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 ray of light travelling from air into an optical fibre.



The ray of light is at an angle of 13° to the normal.

The glass of the fibre has a refractive index of 1.6

(a) (i) State the relationship between refractive index, angle of incidence and angle of refraction.

(1)

(ii) Calculate the angle of refraction of the ray.

(4)

angle of refraction = ... degrees

(b) Inside the fibre, total internal reflection occurs.

Describe the conditions needed for total internal reflection to occur.

(2)

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(c) Describe the role of total internal reflection in transmitting information along optical fibres.

(2)

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(Total for Question 1 = 9 marks)

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2 This question is about waves.

(a) Explain what is meant by the term **wave**.

(2)

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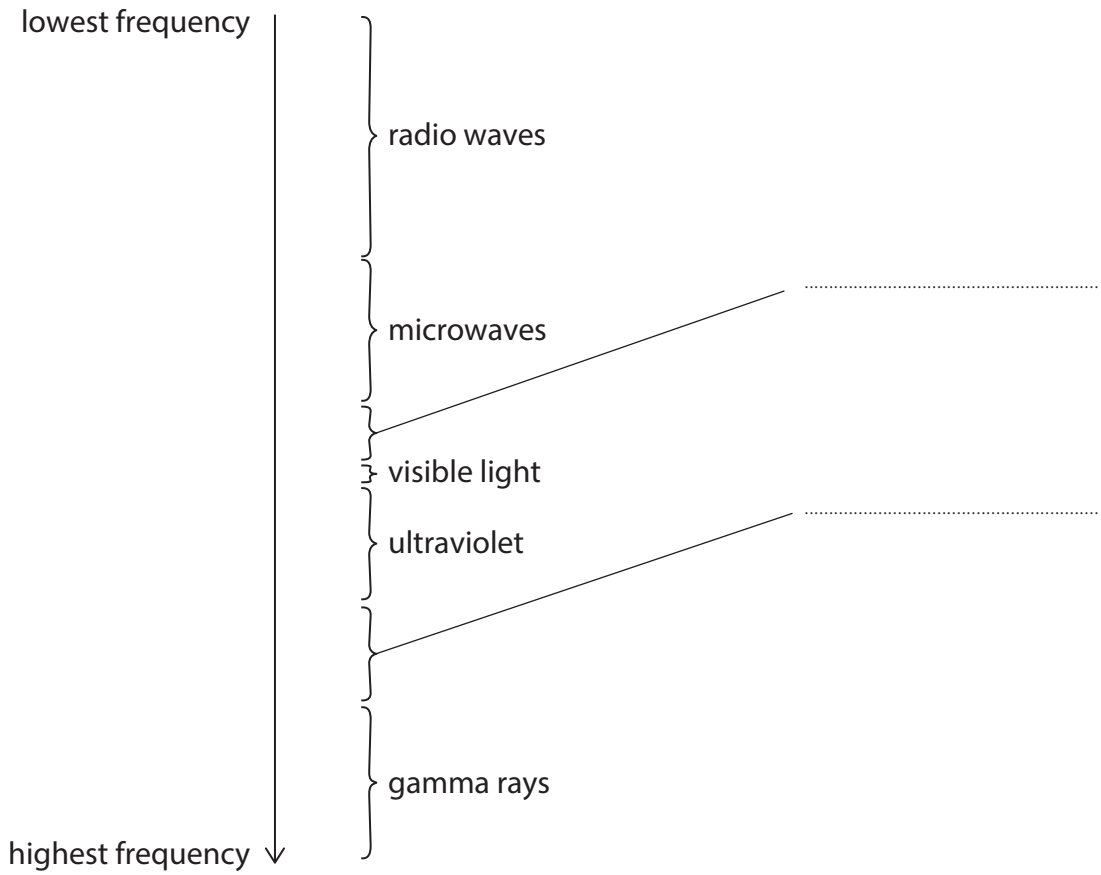
(b) The diagram shows the parts of the electromagnetic spectrum in order of increasing frequency.



Complete the diagram by naming the missing parts.

(2)

(c) Microwave radiation can be used for cooking.

The image shows a microwave oven.

(Source: © Rashevskyi Viacheslav/Shutterstock)

(i) Explain how microwave radiation cooks food.

(2)

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(ii) Microwave radiation can be dangerous.

Suggest one way that the design of the oven reduces the danger of the microwave radiation.

(1)

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(Total for Question 2 = 7 marks)

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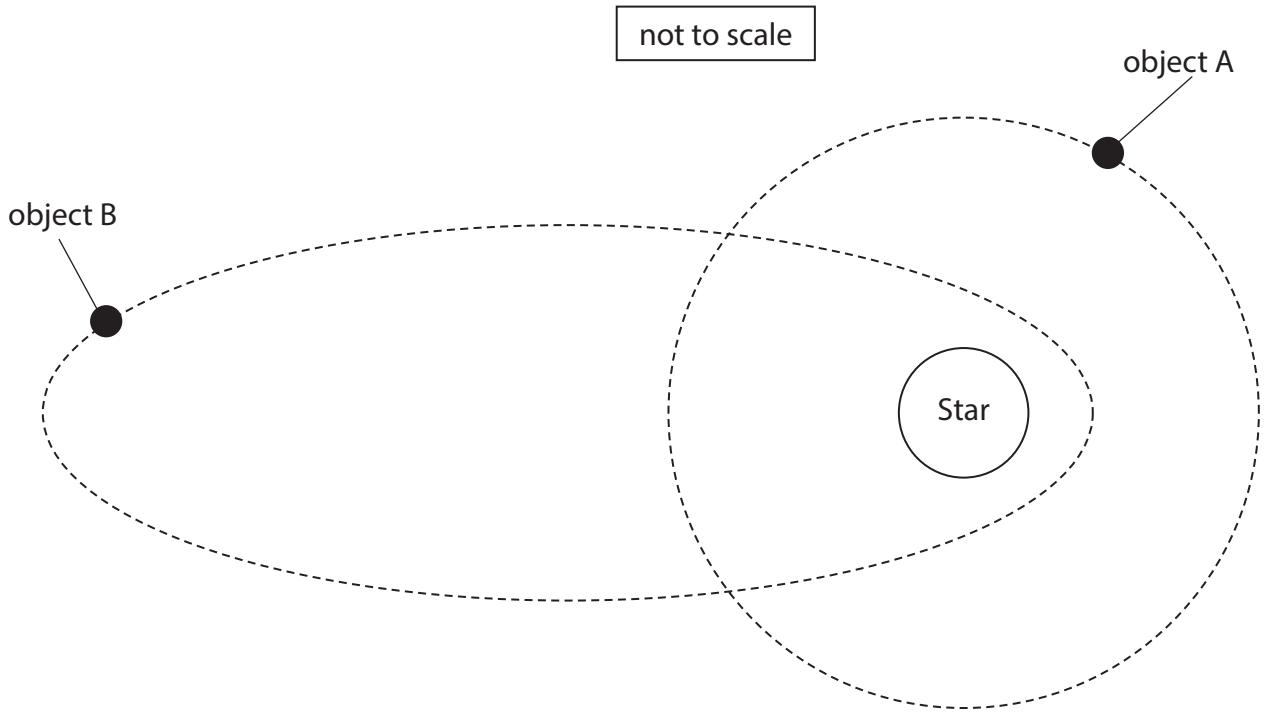
3 The diagram shows two objects, A and B, orbiting a star.



(a) (i) What is object A?

(1)

- ☒ **A** a comet
- ☒ **B** a galaxy
- ☒ **C** a moon
- ☒ **D** a planet

(ii) What is object B?

(1)

- ☒ **A** a comet
- ☒ **B** a galaxy
- ☒ **C** a moon
- ☒ **D** a planet

(iii) Which force causes object A and object B to orbit the star?

(1)

- ☒ **A** electric
- ☒ **B** gravitational
- ☒ **C** magnetic
- ☒ **D** nuclear

(b) Object A has an orbital speed of 6.87 km/s and an orbital radius of 414 000 000 km.

(i) Calculate the time period of the orbit of object A.

Give your answer in standard form.

(4)

time period = ... s

(ii) State the order of magnitude of this time period.

(1)

order of magnitude = ...

(Total for Question 3 = 8 marks)

4 A student investigates the magnetic field between two bar magnets.

(a) Bar magnets are made of magnetically hard materials.

State what is meant by the term **magnetically hard material**.

(1)

(b) Describe a method that the student could use to determine the shape and direction of the magnetic field between two bar magnets.

(3)

(c) The diagram shows two bar magnets.

Draw the magnetic field between the magnets.

You should draw four field lines.

(3)

(d) Describe what is meant by a uniform magnetic field.

(2)

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(Total for Question 4 = 9 marks)

5 A teacher demonstrates radioactive decay.

(a) State the meaning of the term **half-life**.

(2)

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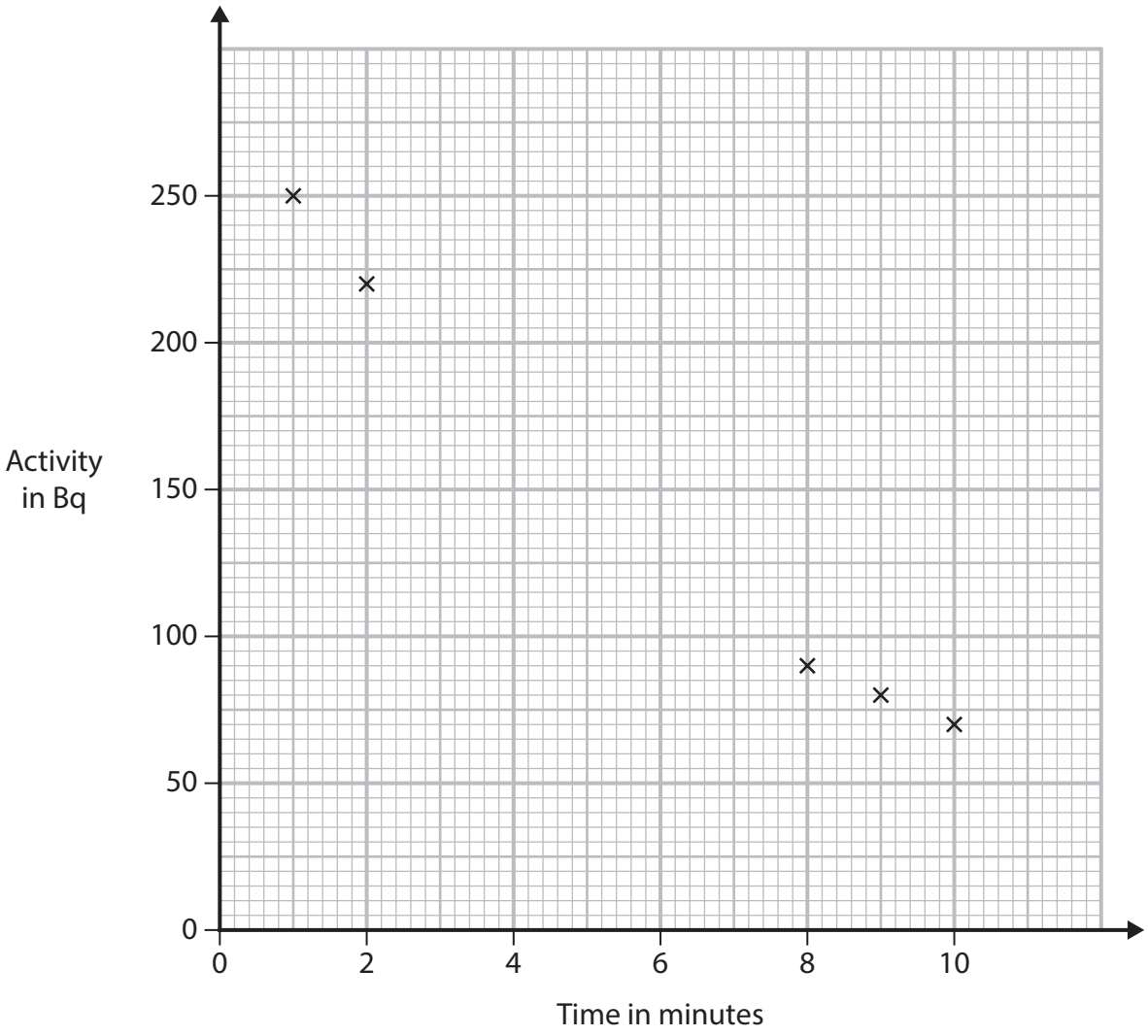
(b) The teacher demonstrates how the activity of a radioactive sample varies over a period of 10 minutes.

The table shows the teacher's results.

Time in minutes	Activity in Bq
1	250
2	220
3	180
4	165
5	140
6	120
7	110
8	90
9	80
10	70

A student has started to plot the results on the grid.



(i) Plot the missing results on the grid.

(1)

(ii) Draw a curve of best fit.

(1)

(iii) Estimate the half-life of the sample using these results.

(2)

half-life = ... minutes

(iv) The student writes these conclusions.

> As time increases, activity decreases
>
> so
>
> activity × time = constant

Evaluate the student's conclusions.

(4)

(Total for Question 5 = 10 marks)

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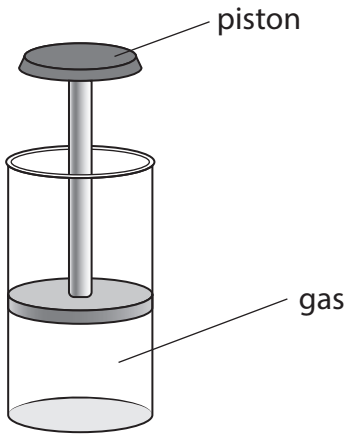
6 A student investigates the relationship between the pressure and the volume of a gas in a container.

The student uses the apparatus shown.



The student applies a force to the piston to decrease the volume of the gas in the container.

The student keeps the gas at the same temperature throughout the experiment.

(a) Explain why the pressure of the gas increases when the volume of the gas decreases.

Refer to gas molecules in your answer.

(3)

(b) The initial volume of the gas in the container is 35 cm^3.

The initial pressure of the gas in the container is 103 kPa.

When the student applies a force to the piston, the pressure of the gas increases by 25%.

Calculate the new volume of the gas in the container.

(3)

new volume = ... cm^3

(c) Explain what happens to the gas molecules in the container if the temperature of the gas increases.

(2)

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(Total for Question 6 = 8 marks)

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7 This question is about radioactivity.

(a) The radioactive isotope of the element yttrium, $^{90}_{39}Y$, is sometimes used to treat cancer.

$^{90}_{39}Y$ decays by beta (β^-) radiation to form an isotope of zirconium, Zr.

(i) Give the equation to show this decay of $^{90}_{39}Y$.

(3)

(ii) During cancer treatment, part of the patient is irradiated using yttrium.

Explain how irradiation differs from contamination.

(2)

(b) Explain one source of background radiation from Earth.

(2)

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(c) Nuclear power stations produce radioactive waste.

Explain how one risk from radioactive waste can be reduced.

(2)

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(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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Pearson Edexcel International GCSE (9–1)

Monday 16 June 2025

Morning (Time: 1 hour 10 minutes)

Paper reference **4WSD6/1PR**

Science (Double Award) (Modular)

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UNIT 6: 4WSD6

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Equation Booklet

Do not return this Booklet with the question paper.

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These equations may be required for International GCSE Combined Science modular (4WSD6) 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	$W = m \times g$
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	$p = h \times \rho \times g$

Unit 2

5. Waves	
wave speed = frequency × wavelength	$v = f \times \lambda$
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END OF EQUATION LIST

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