

Physics Applicant Event Diagnostic Test

Please complete all of Section 1 and then self mark and check your suitability for the course.

Then have a read through section 2, you can attempt this if you would like but it is optional. This section gives you a glimpse of two typical A level physics questions on the OCR H556 Spec.

SECTION 1- Assessment- Please ATTEMPT this section

This is the section you must complete to assess your own maths knowledge and to see if you are suitable for the course. Please have a go at the 6 questions and then self mark. You will be able to get an indication if this course is suitable for you by looking at the marks you obtained.

These are all GCSE higher graded maths questions.

What the results mean-

- A score of 2 marks or less indicates that you are not suitable for this course.
 - A score of 3-4 marks indicates you may be suitable for this course
- A score of 5-6 marks indicates that you are a strong candidate for this course.

The flight of a plane was in two stages.

The table shows information about the flight.

	Distance (miles)	Speed (mph)	Time (hours)
1st stage	731	x	$\frac{731}{x}$
2nd stage	287	$x - 24$	$\frac{287}{x - 24}$

In total, the flight lasted 2 hours.

Work out the value of x .

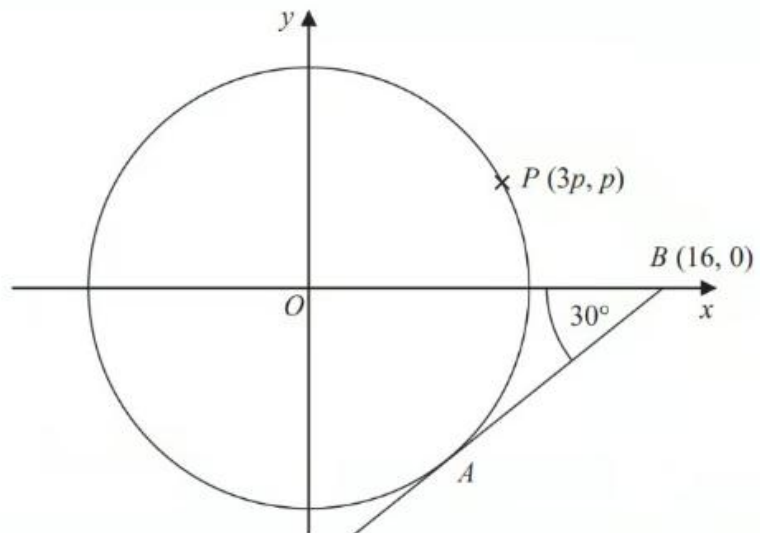
1.

$$6x^2 = 7xy + 20y^2 \text{ where } x > 0 \text{ and } y > 0$$

Find the ratio $x:y$

2.

The diagram shows a circle, centre O .



AB is the tangent to the circle at the point A .

Angle $OBA = 30^\circ$

Point B has coordinates $(16, 0)$

Point P has coordinates $(3p, p)$

Find the value of p .

Give your answer correct to 1 decimal place.

You must show all your working.

3.

- 1 ABC is a right-angled triangle. $AB = 18$ cm and $BC = 6$ cm.
The line BD bisects the angle ABC .

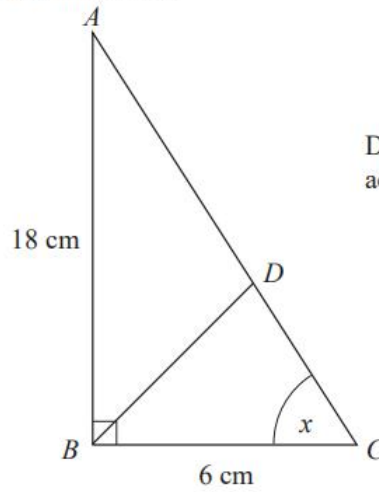


Diagram **NOT** accurately drawn

- (a) Write down the value of $\tan x$.

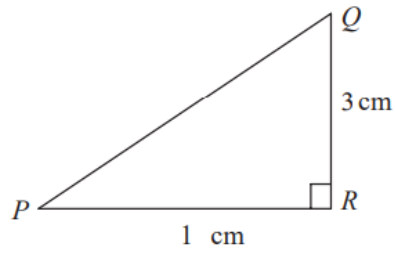
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- (b) Calculate the length BD .

(1)

4.

Diagram **NOT**
accurately drawn



PQR is a right-angled triangle.

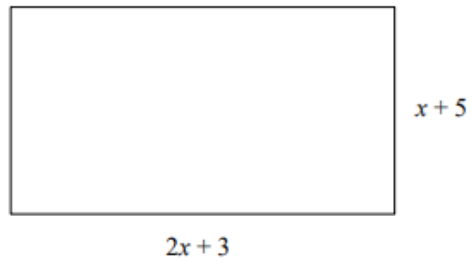
$$QR = 3 \text{ cm}$$
$$PR = 1 \text{ cm}$$

Work out the size of angle RPQ .
Give your answer correct to 3 significant figures.

5.

.....^o

A rectangle has a length of $(2x + 3)$ cm and a width of $(x + 5)$ cm.



(a) Find an expression for the perimeter of the rectangle.

(b) Given the rectangle has a perimeter of 43 cm find the value of x cm
(2)

6.

.....
(2)

Mark Scheme

Mark Scheme:

1.
 - **M1:** Sets up equation $\frac{731}{x} + \frac{287}{x-24} = 2$.
 - **M1:** Clear attempt to eliminate denominators.
 - **A1:** Reduces to $x^2 - 533x + 8772 = 0$ (or equivalent).
 - **A1:** $x = 516$ (rejecting 17).

Mark Scheme:

2.
 - **M1:** Rearranges to $6x^2 - 7xy - 20y^2 = 0$.
 - **M1:** Factorises into $(3x + 4y)(2x - 5y)$ or uses quadratic formula for x/y .
 - **A1:** $x : y = 5 : 2$.

Mark Scheme:

3.
 - **M1:** Uses trig to find radius: $r = 16 \sin 30^\circ = 8$.
 - **M1:** Substitutes $(3p, p)$ into $x^2 + y^2 = r^2$.
 - **A1:** $10p^2 = 64$.
 - **A1:** $p = 2.5$ (correct to 1 d.p.).

Mark Scheme:

4.
 - **(a) B1:** $\tan x = 3$.
 - **(b) M1:** Identifies $\angle CBD = 45^\circ$.
 - **M1:** Method to find BD (e.g., Sine rule or Coordinate geometry).
 - **A1:** 6.36 (or $4.5\sqrt{2}$).

Mark Scheme:

- **M1:** $\tan(\angle RPQ) = \frac{3}{1}$ or 3.
- **A1:** 71.6° (correct to 3 sig figures).

5.

Mark Scheme:

- **(a) M1:** Summing all 4 sides or $2(2x + 3 + x + 5)$.
- **A1:** $6x + 16$.
- **(b) M1:** Setting their expression equal to 43.
- **A1:** $x = 4.5$.

6.

Section 2- Typical A level Physics Questions-

You DO NOT (optional) need to attempt any questions in Section 2. This section just highlights 2 typical examination questions that we get in the OCR A level Physics Exam H556 Specification. They show the difficulty/complexity of the questions encountered within A level Physics. Please note that no formula triangles are used to solve any questions.

Please view these questions to get a feel for what the questions are on and how they are structured.

1. The International Space Station (ISS) circles the Earth at a height of 4.0×10^5 m. Its mass is 4.2×10^5 kg.

The radius of the Earth is 6.4×10^6 m.

- i. Show that the speed of the ISS in orbit is about 8 km s^{-1} .

[3]

- ii. Calculate the total energy of the ISS.

total energy = J [2]

2. Fig. 4.1 shows a circuit with a capacitor of capacitance 0.010 F.

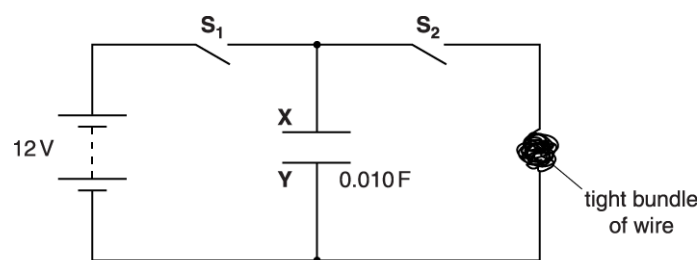


Fig. 4.1

A tight bundle of wire is made from 5.0 m of insulated wire of diameter 0.12 mm and resistivity $4.9 \times 10^{-7} \Omega \text{ m}$. The material of the wire has density 8900 kg m^{-3} and specific heat capacity $420 \text{ J kg}^{-1} \text{ K}^{-1}$.

- i. Calculate the time constant of the circuit.

time constant = s [3]

- ii. Switch **S**₂ is open. Switch **S**₁ is closed. Explain in terms of the movement of electrons how **X** and **Y** acquire equal but opposite charge.

[3]

- iii. Switch **S**₁ is opened. The potential difference across the capacitor is 12V. Switch **S**₂ is now closed. Assume that all the energy stored by the capacitor is used to heat up the bundle of wire. Calculate the increase in the temperature of the bundle of wire.

increase in temperature = °C [4]

- iv. State and explain how your answer to (iii) would change when a 24V power supply is used to carry out the experiment.

[2]