A Level Physics
Introduction - Summer 2025

The following work forms an introduction to the AS Physics course. Completing it will enable you to make a good start in September and, hopefully, will ensure that you haven't forgotten too much of the work you will need.

The AS Physics formula sheet has been provided at the back. This is to help you, but also so you can see what you are given in A-Level Physics Exams.

Section	Score
A	/10
B	/24
C	/31
D	/21
E	/24

Part A – Converting Units

1. Convert the following units

   a. 1 mA (milliamp) to A (amps)

   b. 3700 m to km

   c. 1200 V to kV

   d. 0.0056 A to mA

   e. 1 μs (microsecond) to s (seconds)

   f. 0.003 A to mA

   g. 15000 V to kV

   h. 0.0045 m/s to mm/s

   i. 12500 nm (nanometres) to m (metres)

   j. 30 GW (gigawatts) to W (watts)

Part B – Forces

Q1. A car driver sees a rabbit on the road.

The driver makes an emergency stop after he sees the rabbit.

Figure 6 shows the speed of the car from the time the driver sees the rabbit until the car stops.

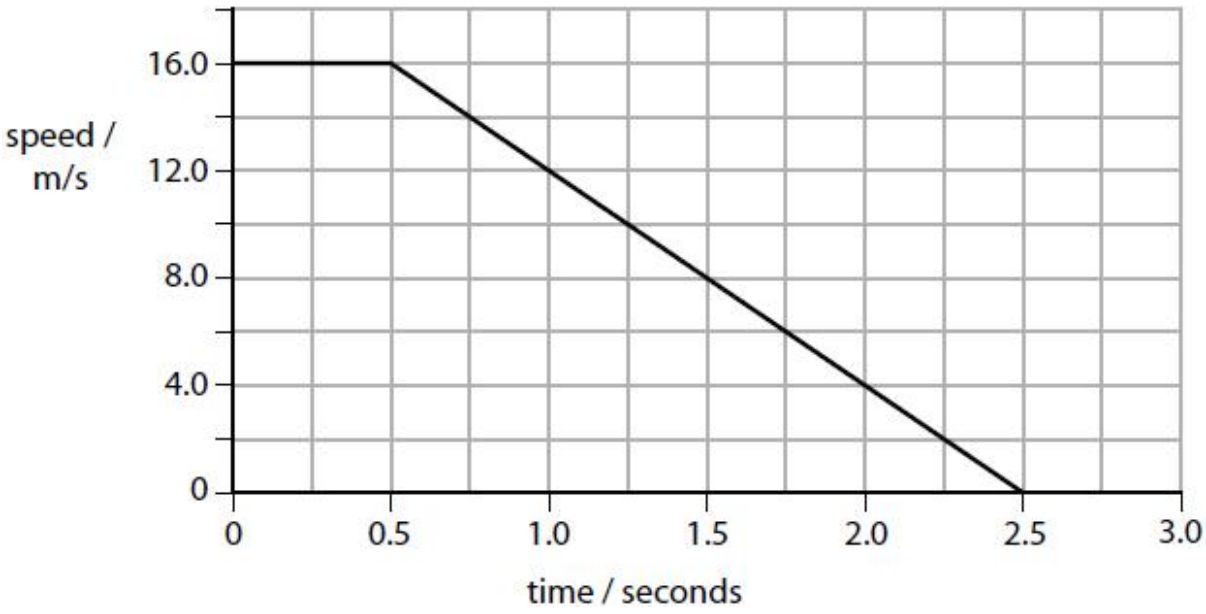

Figure 6

Calculate the distance that the car travels in the first 0.5 seconds.

(3)

distance = ... m

Q2. A student investigates the motion of a trolley along a horizontal runway using the apparatus in Figure 2.

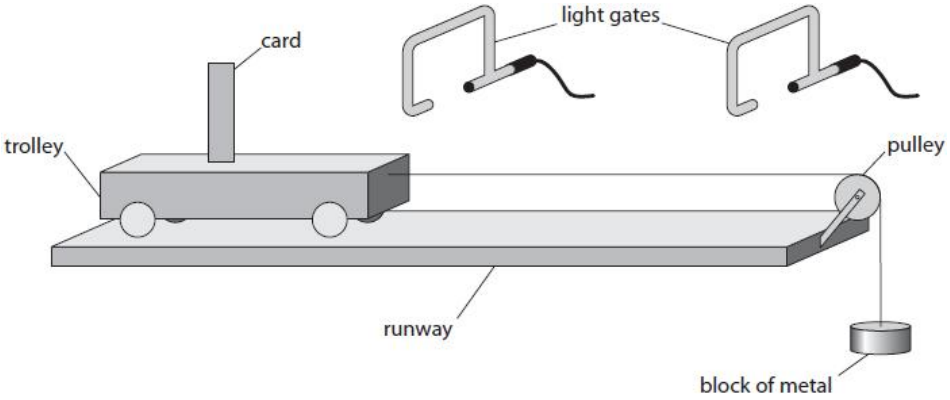

Figure 2

A trolley is attached to a string passing over a pulley.

A block of metal hangs on the end of the string.

Each light gate measures the time it takes for the card to pass through the gate.

When the trolley is released, it moves along the track.

A computer measures the time it takes for the card to pass between each light gate.

Figure 3 shows a graph of acceleration against force for three trollies of different mass that are pulled along the runway.

The graphs for the trollies are labelled P, Q and R.

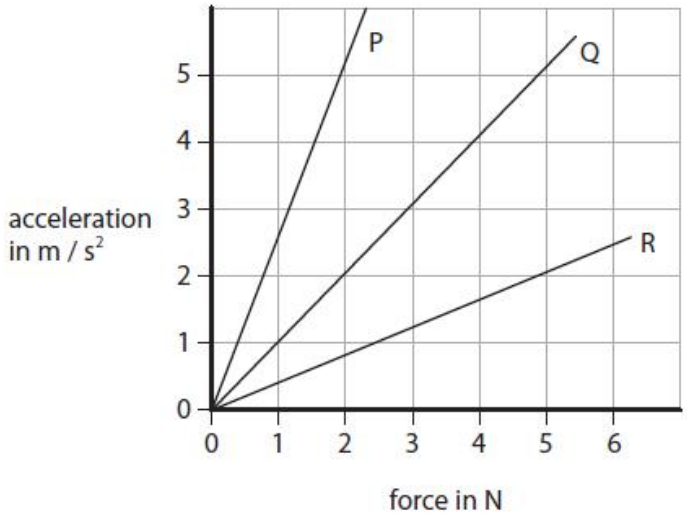

Figure 3

Use the information from the graph.

(i) Calculate the mass of trolley Q

(2)

mass of trolley Q = ... kg

(ii) Describe how the graph shows that trolley R has the greatest mass.

(2)

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.....

Q3. A car is travelling down a slope at 2.0 m/s.

The car accelerates for 4.0 s.

The speed of the car increases to 12 m/s.

Calculate the acceleration of the car.

Use the equation

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

(2)

acceleration of the car = ... m/s^2

Q4. An atom of mass 6.6×10^{-26} kg is moving with a velocity of 480 m / s.

Calculate the momentum of the atom.

(3)

momentum = ... kg m/s

Q5. A motorcycle is travelling at a velocity of 6.2 m/s.

The motorcycle accelerates at 2.5 m/s^2 until its velocity is 10 m/s.

(i) Calculate the time taken for this acceleration.

Use the equation

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

(2)

time taken = ... s

(ii) The motor cycle now decelerates (slows down) from 10 m/s to a stop.

The deceleration is at a constant rate of 4.4 m/s^2.
Calculate the distance the motorcycle travels as it slows down to a stop.
Use the equation

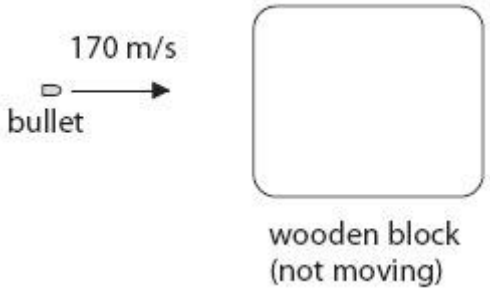
$$v^2 - u^2 = 2 \times a \times x$$

(2)

distance = ... m

Q6.

(a) The diagram shows a bullet moving towards a wooden block.



(i) The bullet is moving with a velocity of 170 m/s.
The mass of the bullet is 0.030 kg.

Show that the momentum of the bullet is about 5.0 kg m/s.

(1)

(ii) The bullet collides with the wooden block and sticks in it.
The bullet and the wooden block move off together.
The mass of the wooden block is 0.80 kg.

Calculate the velocity of the wooden block and bullet immediately after the collision.

(3)

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(iii) The collision between the bullet and the wooden block is an inelastic collision.

State what is meant by an **inelastic collision.**

(2)

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Q7.

Figure 19 shows two forces, P and Q, acting at point X.

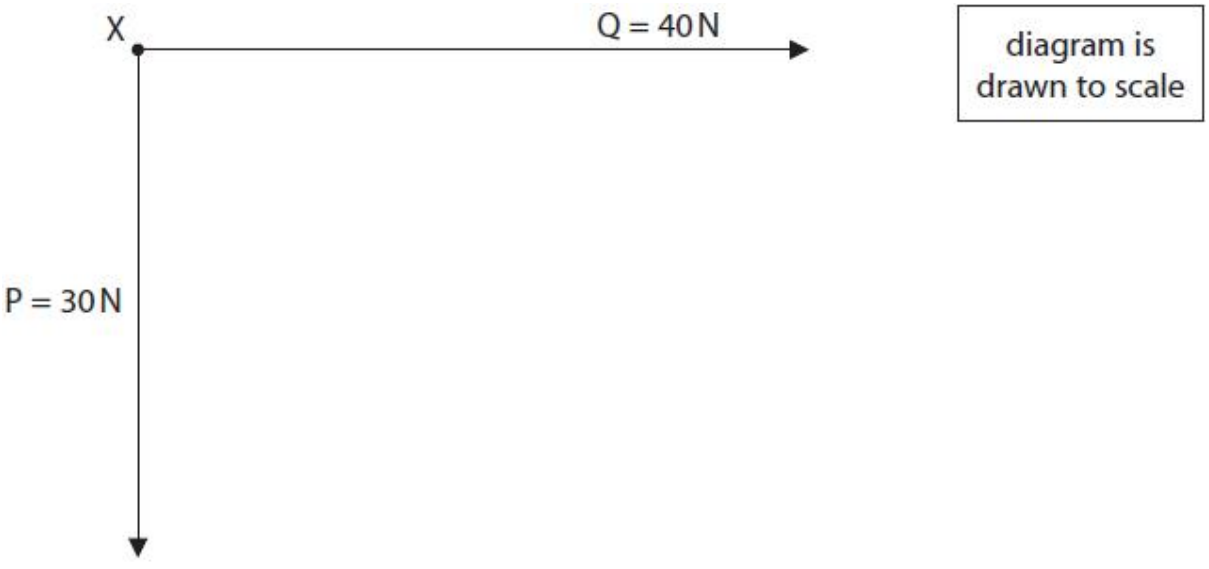

Figure 19

Complete the diagram in Figure 19 to show the size and direction of the resultant force, R, on point X.

(2)

Part C – Electricity

Q1.

A student investigates resistors connected in parallel using a number of resistors.
Each resistor has the same resistance.

Figure 19 shows a circuit diagram with one resistor, R.

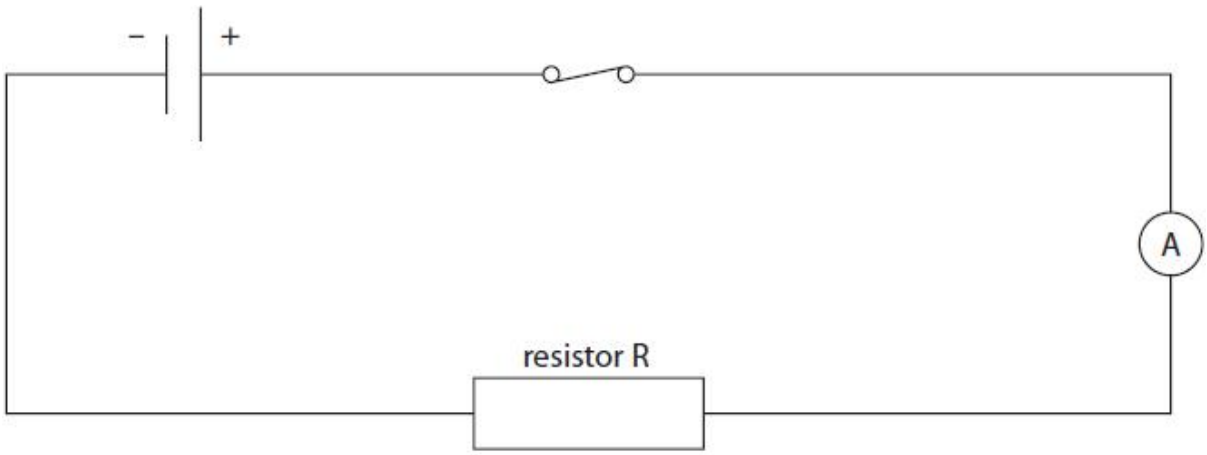

Figure 19

(i) Add to Figure 19:

- a voltmeter to find the potential difference across resistor R
- another resistor in parallel with resistor R.

(2)

(ii) State the measurements that the student must take to find the overall resistance of the resistors in parallel.

(2)

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(iii) The student investigates how the overall resistance of the circuit changes when additional resistors are added in parallel to R.

Each resistor has the same resistance.
Figure 20 shows the results of the student's investigation.

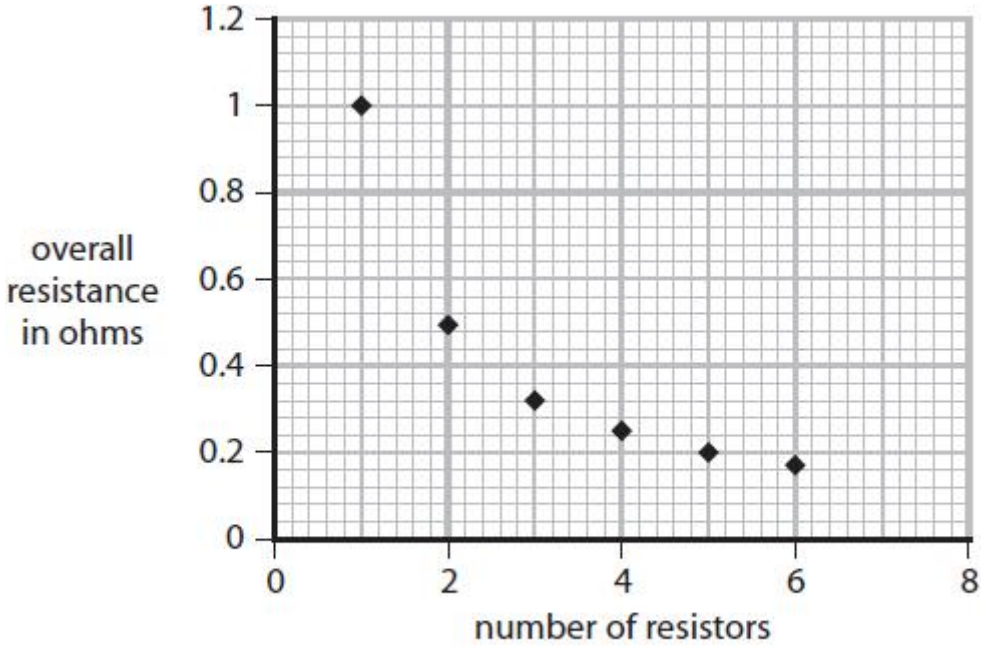

Figure 20

State the resistance of a single resistor.

(1)

resistance = ... Ω

(iv) Comment on the relationship between the overall resistance of the circuit and the number of resistors in parallel.

Use information from Figure 20 to support your answer.

(3)

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Q2.

A student investigates how the current in a lamp changes with the potential difference across the lamp.

The student uses the results to calculate the resistance of the lamp.

The results are shown in the table in Figure 17.

potential difference in V	current in A	resistance in Ω
1.0	0.09	11
2.0	0.14	14
3.0	0.18	17
4.0	0.22	18
5.0	0.26	
6.0	0.30	20

Figure 17

(i) One value of resistance is missing from the table in Figure 17.

Calculate the value of resistance that is missing from the table.

(3)

missing resistance = ... Ω

(ii) The student writes this conclusion:

'The resistance of the lamp is directly proportional to the potential difference.'

Comment on the student's conclusion.
Use information from Figure 17 in your answer.

(3)

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Q3.

A lamp is connected to a potential difference of 0.24 V.

The current in the lamp is 0.12 A.

(i) Calculate the power of the lamp.

Use the equation
$P = I \times V$

(2)

power of the lamp = ... W

(ii) The potential difference is changed to 0.30 V.

The current in the lamp is now 0.13 A.
The lamp is switched on for 35 s.
Calculate the energy that is transferred in this time.
Select an equation from the list of equations at the end of this paper.

(2)

energy transferred = ... J

(iii) The current in the lamp stays at 0.13 A.

Calculate the charge that flows through the lamp in 35 s.
Use the equation
$Q = I \times t$

(2)

charge = ... C

Q4.

A student investigates how current varies with potential difference across a filament lamp.
The student uses a power supply, a variable resistor, the filament lamp and two meters.
Part of the circuit diagram is shown in Figure 19.
Complete the circuit diagram needed for this investigation.

(3)

Figure 19

Q5.

A battery sends a current through a metal wire.
(i) Complete the sentence by putting a cross (x) in the box next to your answer.

Direct current is movement of charge…

(1)

- ☒ **A** backwards and forwards
- ☒ **B** in many directions
- ☒ **C** in one direction
- ☒ **D** up and down

(ii) Complete the sentence by putting a cross (x) in the box next to your answer.

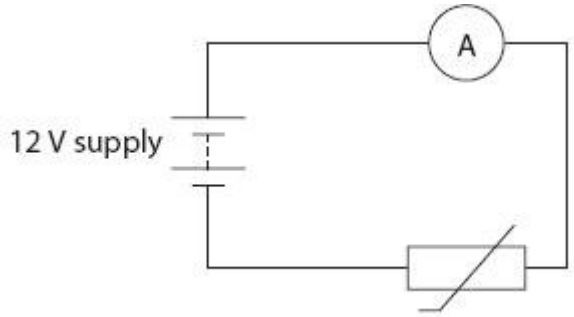
The particles that flow in the metal wire are…

(1)

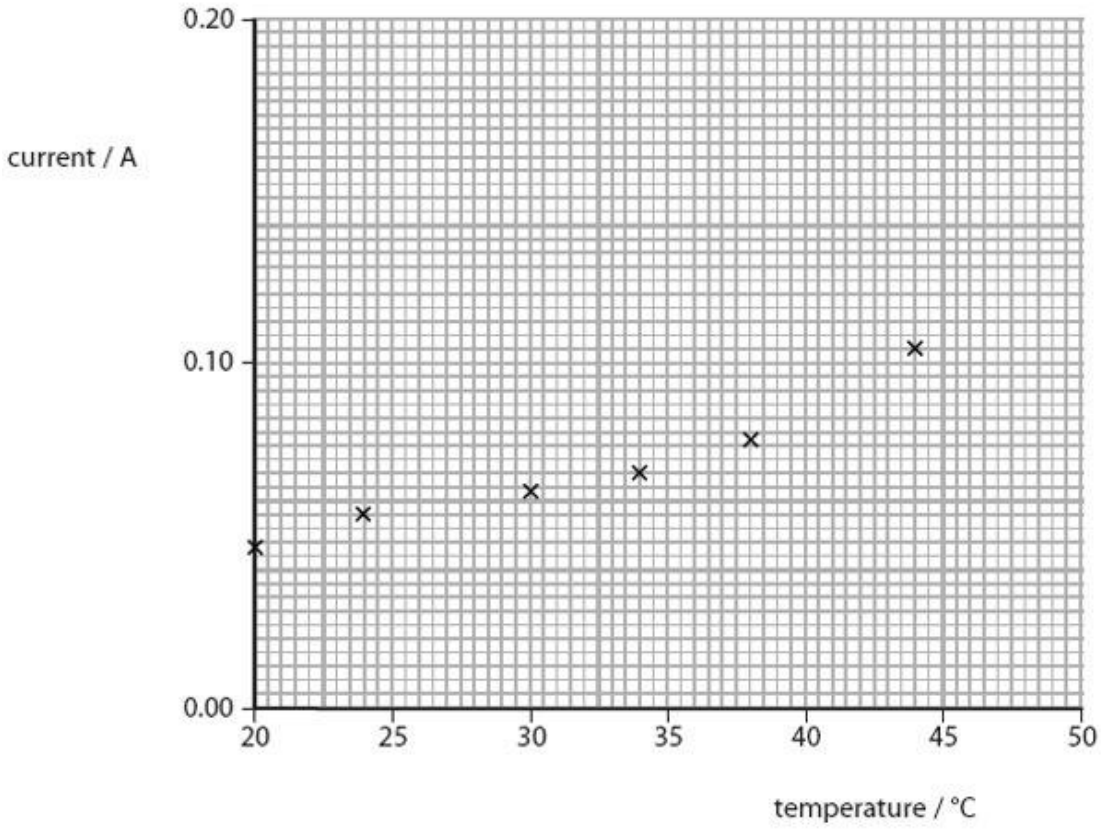
- ☒ **A** atoms
- ☒ **B** electrons
- ☒ **C** protons
- ☒ **D** neutrons

Q6.

(a) A designer is going to use a thermistor in a temperature gauge. He connects the thermistor into this circuit.



He heats the thermistor and measures the current at different temperatures. Here are some of the results plotted on a graph.



At 47 °C the current was 0.138 A.

(i) Plot this value on the graph.

(1)

(ii) Draw the curve of best fit through the points.

(1)

(iii) The supply voltage is 12 V.
At 20 °C the current is 0.047 A.

Calculate the resistance of the thermistor at this temperature.

(3)

Q7.

Figure 15 shows a metal chair being sprayed with paint.

The paint droplets come from a gun with an electric charge.

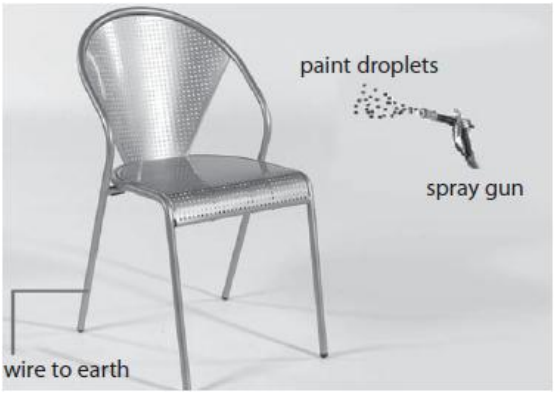


Figure 15

Inside the spray gun, electrons move along a charged wire towards the nozzle to charge the paint.

The charged paint droplets are sprayed from the nozzle.

The chair is connected to earth.

Which row of the table shows the correct combination of the charges as the charged paint droplets get near to the chair?

(1)

	paint droplets	chair
☐ **A**	negative	negative
☐ **B**	negative	positive
☐ **C**	positive	negative
☐ **D**	positive	positive

Part D – Materials

Q1. A different spring is extended.

A force of 0.50 N gives an extension of 13 mm.

Calculate the spring constant *k* in N/m.

(3)

spring constant *k* = ... N/m

Q2.

A weight of 4.0 N is used to extend a spring.
The extension of the spring is 0.06 m.

(i) Calculate the spring constant, *k*, of the spring.

Use the equation

$$F = k \times x$$

(3)

spring constant = ... N/m

State what measurements should be made to determine the extension of the spring produced by the 4.0 N weight.

(2)

.....

.....

.....

.....

Q3. Another spring is extended.

The work done to extend the spring is 0.14 J.

The spring constant of the spring is 175 N/m.

Calculate the extension of the spring.

Use an equation selected from the list of equations at the end of this paper.

(3)

extension of spring = ... m

Q4. A student determines the density of a liquid.

The student puts an empty measuring cylinder on a balance (Figure 5a).
The student then adds liquid to the measuring cylinder (Figure 5b).

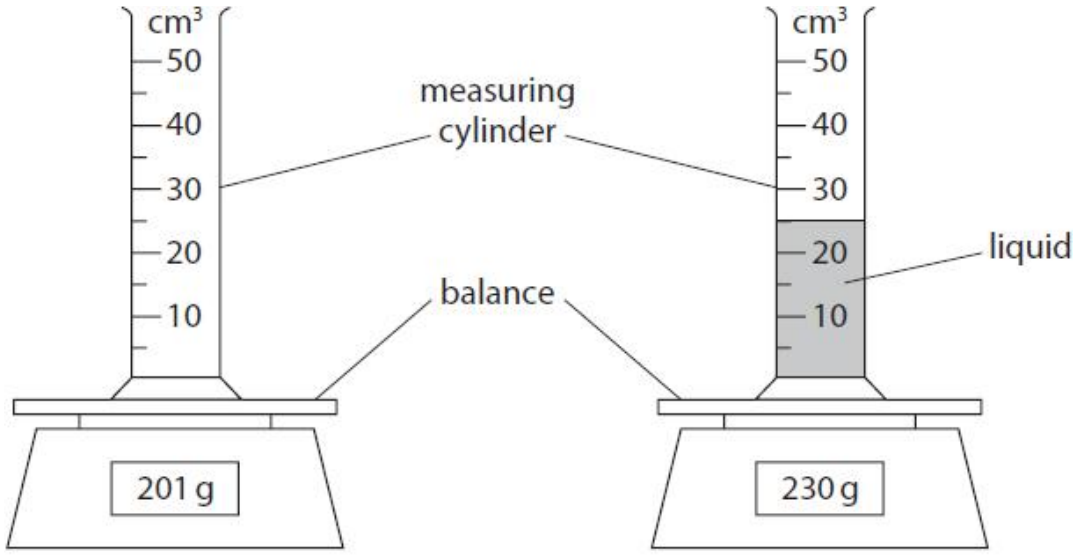


Figure 5a **Figure 5b**

Calculate the mass of liquid added and the volume of liquid added.

Use the information in Figures 5a and 5b.

(i) mass of liquid added = ... g

(1)

(ii) volume of liquid added = ... cm^3

(1)

(iii) Which equation should the student use to calculate the density of the liquid?

(1)

☒ **A** density = mass + volume

☒ **B** density = mass − volume

☒ **C** density = mass × volume

☒ **D** $\text{density} = \frac{\text{mass}}{\text{volume}}$

(iv) State **two** improvements the student could make to this investigation.

(2)

1 .....

.....

2 .....

.....

Q5. Figure 8 shows a small container of carbon dioxide at high pressure.

The pressure, P_1 , in the container is 8.00 MPa.

The volume, V_1 , of the container is 14.5 cm^3.

Figure 8

The container is pierced and all of the carbon dioxide goes into a large balloon.

The volume of gas, V_2, in the large balloon is 1160 cm^3.

Calculate the pressure, P_2, in the large balloon.

Use the equation

$$P_1V_1 = P_2V_2$$

(3)

pressure in the large balloon = ... MPa

Q6. A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

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

(3)

Volume ..... cm^3

Part E – Waves

Q1.

The speed of a sound wave in air is 330 m/s.

The wavelength of this wave is 0.75 m.

Calculate the frequency of this wave.

Use the equation

$v = f \times \lambda$

(3)

frequency = ... Hz

Q2.

Figure 1 shows how the visible spectrum of white light is shown on a screen.

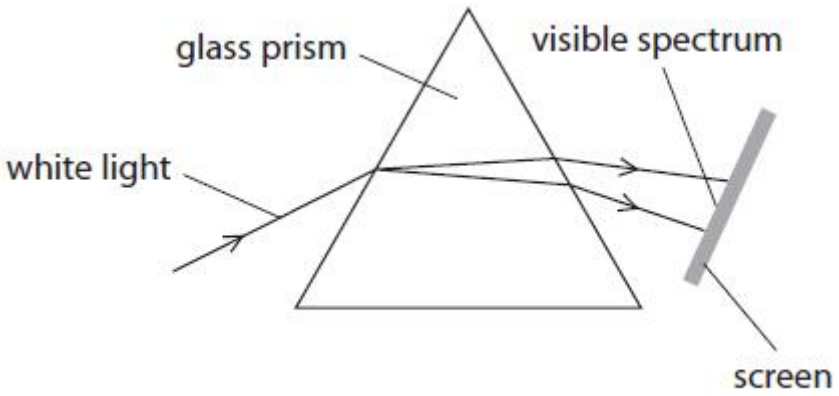


Figure 1

(i) Which of these is the best piece of equipment to produce the white light?

(1)

- ☒ **A** ray box
- ☒ **B** ruler
- ☒ **C** measuring cylinder
- ☒ **D** ammeter

(ii) Which colour is seen between yellow and blue in the spectrum on the screen?

(1)

- ☒ **A** red
- ☒ **B** orange
- ☒ **C** green
- ☒ **D** violet

Q3.

Figure 2 shows the main parts of the electromagnetic spectrum.

radio	microwaves	infrared	visible light	ultraviolet	x-rays	gamma rays

Figure 2

Complete the following sentences using information from Figure 2. Each part of the electromagnetic spectrum may be used once, more than once or not at all.

(i) The part of the electromagnetic spectrum used to detect broken bones is

(1)

.....

(ii) The part of the electromagnetic spectrum used in thermal imaging is

(1)

.....

(iii) The part of the electromagnetic spectrum that

is used to cook food
AND
has a shorter wavelength than microwaves is

(1)

.....

(iv) The part of the electromagnetic spectrum that

is used to sterilise medical equipment
AND
has a shorter wavelength than x-rays is

(1)

.....

Q4.

Water waves are transverse waves.

(i) Give **one** other example of a transverse wave.

(1)

.....

(ii) Give **one** example of a longitudinal wave.

(1)

.....

Q5.

A student investigates how light behaves as it leaves a clear plastic block.
Figure 4 shows some of her equipment and the path of a ray of light through the block.

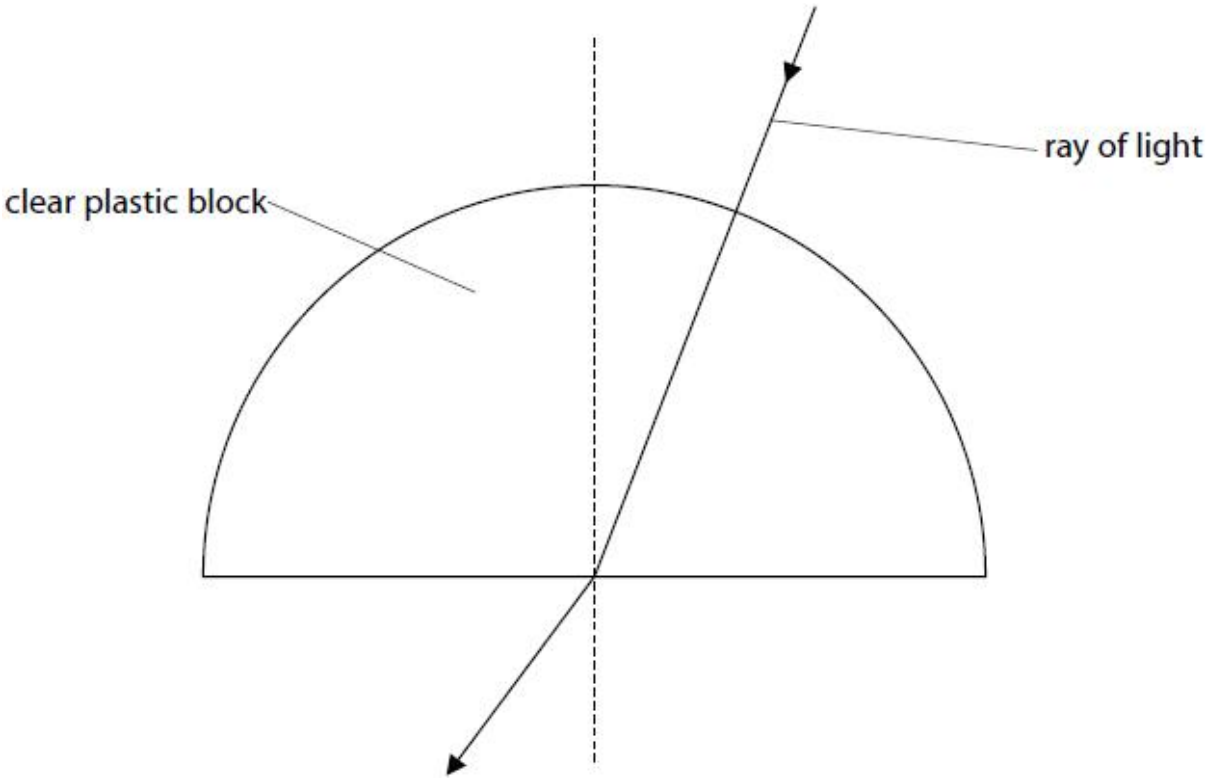


Figure 4

She varies the angle of incidence inside the block and records the angle of refraction.
Figure 5 shows her results.

angle of incidence (°)	angle of refraction (°)
5	7
15	22
30	46
40	69
42	76

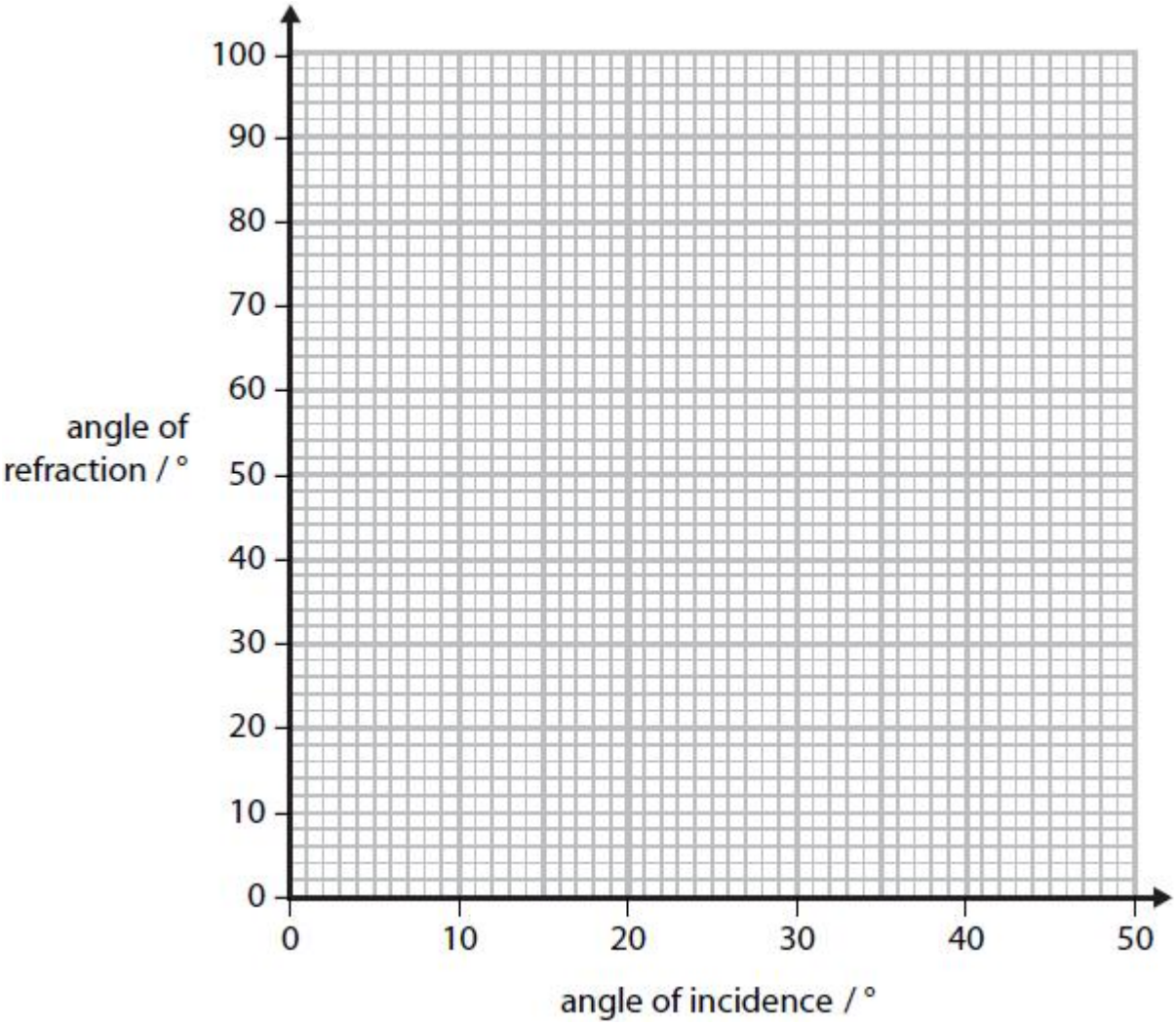
Figure 5

(i) Plot the points on the grid below.

(2)

(ii) Draw the best fit smooth curve through the points.

(1)



(iii) Estimate the angle of incidence which gives an angle of refraction of 90°.

(2)

angle of incidence = ...

Q6.

This question is about waves.

Figure 3 is a diagram of a **water wave** in a ripple tank.

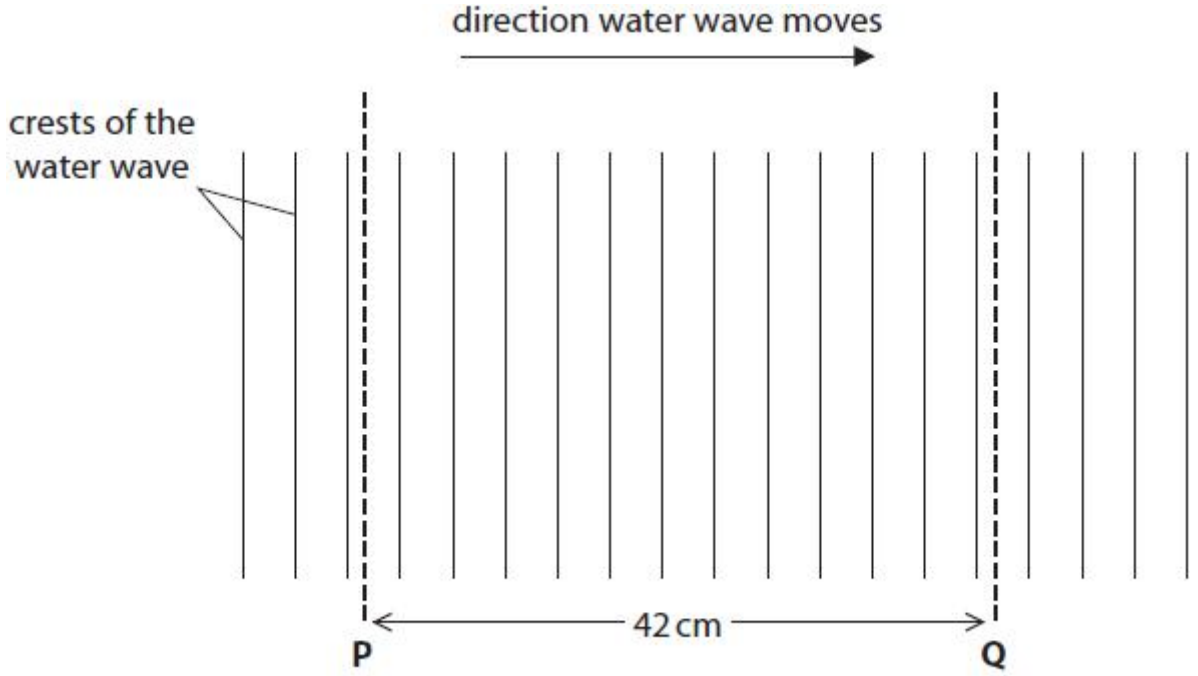


Figure 3

(i) State the number of crests of the wave between **P** and **Q**.

(1)

number of crests = ...

(ii) The distance between **P** and **Q** is 42 cm.

Calculate the wavelength of the water wave in Figure 3.

(2)

wavelength = ... cm

(iii) Describe how a student could determine the wave speed of the water wave in Figure 3.

(3)

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.....

.....

Q7.

(i) Which type of surface will produce a specular reflection?

(1)

- ☒ **A** calm water
- ☒ **B** clothing
- ☒ **C** paper
- ☒ **D** road surface

(ii) A surface appears bright white when white light is shone onto it.

(1)

This is because it

- ☒ **A** absorbs all the white light
- ☒ **B** absorbs only red and blue light
- ☒ **C** absorbs only green and blue light
- ☒ **D** absorbs none of the white light