Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 10 minutes

Paper reference **1SC0/2PH**

Combined Science

PAPER 6

Higher Tier

You must have:
Calculator, ruler, Equation Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **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*.
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

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.*
- In questions marked with an **asterisk (*)**, marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.
- A list of equations is included at the end of this exam paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

Pearson

If you're taking **GCSE (9–1) Combined Science** or **GCSE (9–1) Physics**, you will need these equations:

HT = higher tier

	distance travelled = average speed × time	
	acceleration = change in velocity ÷ time taken	$a = \frac{(v-u)}{t}$
	force = mass × acceleration	$F = m \times a$
	weight = mass × gravitational field strength	$W = m \times g$
HT	**momentum = mass × velocity**	$\boldsymbol{p = m \times v}$
	change in gravitational potential energy = mass × gravitational field strength × change in vertical height	$\Delta GPE = m \times g \times \Delta h$
	kinetic energy = 1/2 × mass × (speed)^2	$KE = \frac{1}{2} \times m \times v^2$
	efficiency = $\frac{(\text{useful energy transferred by the device})}{(\text{total energy supplied to the device})}$	
	wave speed = frequency × wavelength	$v = f \times \lambda$
	wave speed = distance ÷ time	$v = \frac{x}{t}$
	work done = force × distance moved in the direction of the force	$E = F \times d$
	power = work done ÷ time taken	$P = \frac{E}{t}$
	energy transferred = charge moved × potential difference	$E = Q \times V$
	charge = current × time	$Q = I \times t$
	potential difference = current × resistance	$V = I \times R$
	power = energy transferred ÷ time taken	$P = \frac{E}{t}$
	electrical power = current × potential difference	$P = I \times V$
	electrical power = (current)^2 × resistance	$P = I^2 \times R$
	density = mass ÷ volume	$\rho = \frac{m}{V}$

	force exerted on a spring = spring constant × extension	$F = k \times x$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 \times a \times x$
HT	**force = change in momentum ÷ time**	$\boldsymbol{F = \frac{(mv - mu)}{t}}$
	energy transferred = current × potential difference × time	$E = I \times V \times t$
HT	**force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length**	$\boldsymbol{F = B \times I \times l}$
	For transformers with 100% efficiency, potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_P \times I_P = V_S \times I_S$
	change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta\theta$
	thermal energy for a change of state = mass × specific latent heat	$Q = m \times L$
	energy transferred in stretching = 0.5 × spring constant × (extension)^2	$E = \frac{1}{2} \times k \times x^2$

If you're taking **GCSE (9–1) Physics**, you also need these extra equations:

	moment of a force = force × distance normal to the direction of the force	
	pressure = force normal to surface ÷ area of surface	$P = \frac{F}{A}$
HT	$\boldsymbol{\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}}$	$\boldsymbol{\frac{V_p}{V_S} = \frac{N_p}{N_S}}$
	to calculate pressure or volume for gases of fixed mass at constant temperature	$P_1 \times V_1 = P_2 \times V_2$
HT	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength**	$\boldsymbol{P = h \times \rho \times g}$

END OF EQUATION LIST

Answer ALL questions. Write your answers in the spaces provided.

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) Figure 1 shows a lamp connected to a d.c. power supply.

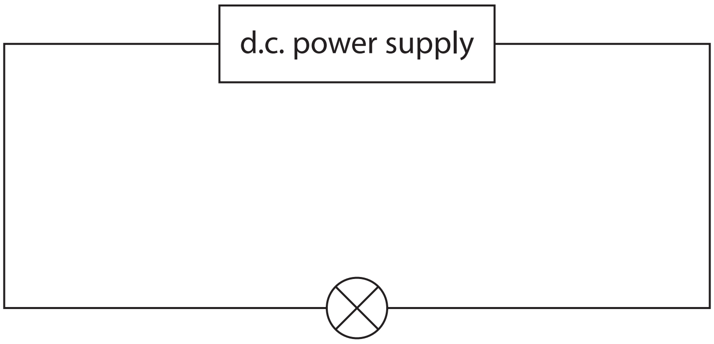

Figure 1

The power supply provides a potential difference (voltage) of 4.5 V.

The current in the lamp is 0.30 A.

(i) Calculate the resistance of the lamp.

Use the equation

$$R = \frac{V}{I}$$

(1)

resistance = ... Ω

(ii) Calculate the power supplied to the lamp.

(2)

power = ... W

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(b) Another **identical** lamp is added to the circuit, as shown in Figure 2.

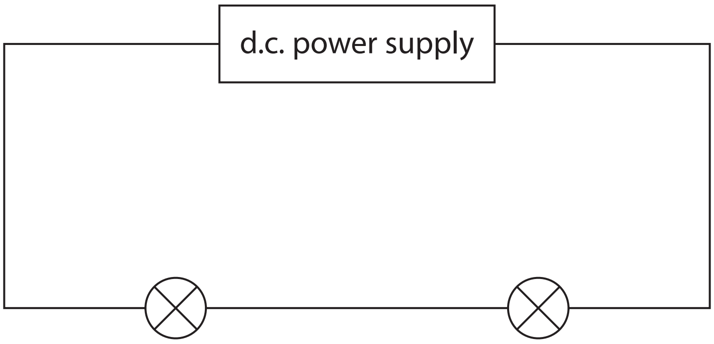

Figure 2

The power supply provides the same potential difference as it provided in the circuit in Figure 1.

State and explain the difference between the brightness of the lamp in Figure 1 and the brightness of a lamp in Figure 2.

(3)

(c) A student is given a low voltage power supply and 1 m of resistance wire.

The student uses these and other pieces of equipment to measure the resistance of just 50 cm of the resistance wire.

Draw a diagram of the circuit that the student should use.

Your circuit diagram should identify the pieces of equipment that the student uses.

(3)

(Total for Question 1 = 9 marks)

2 (a) When water boils and turns into steam, there are changes in the arrangement of particles and the density.

Which of these shows the changes?

(1)

		space between particles in steam	density of steam
☒	**A**	bigger than in water	greater than water
☒	**B**	bigger than in water	less than water
☒	**C**	smaller than in water	greater than water
☒	**D**	smaller than in water	less than water

(b) Figure 3 shows some water in a measuring cylinder and a lump of iron.

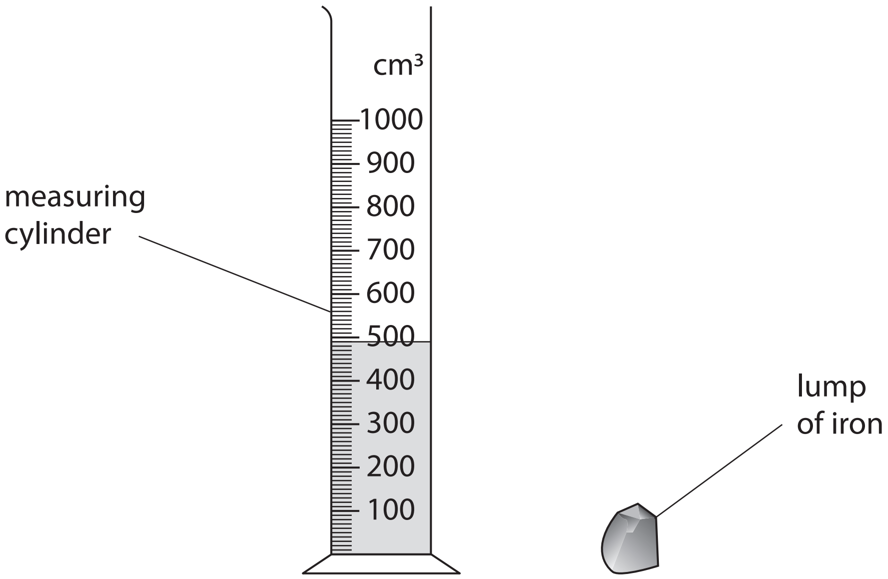

Figure 3

The lump of iron is lowered fully into the water.

The water level in the measuring cylinder rises to 530 cm^3.

The density of iron is 7.9 g / cm^3.

Calculate the mass of the lump of iron.

Use the equation

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

Give your answer to 2 significant figures.

(4)

mass = ... g

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(c) A piece of wood has a similar shape and volume to the lump of iron.

The density of the wood is 0.82 g / cm^3.

The density of water is 1.00 g / cm^3

Explain why the method used in part (b) cannot be used to determine the mass of the piece of wood.

(2)

(d) Describe what happens when a substance experiences sublimation.

(2)

(Total for Question 2 = 9 marks)

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3 (a) Figure 4 shows the shape of the magnetic field near a bar magnet.

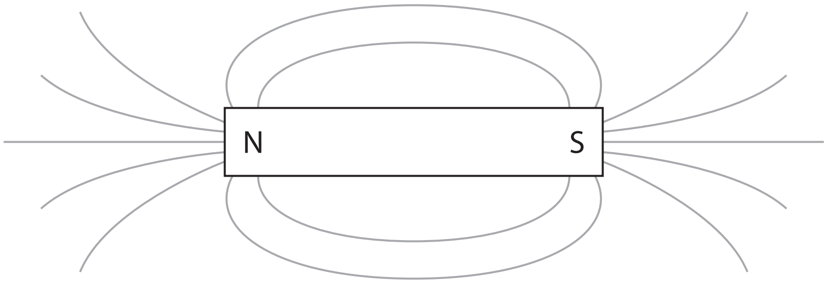

Figure 4

(i) Draw arrows on the field lines in Figure 4 to show the direction of the magnetic field.

(1)

(ii) Place a letter X on Figure 4 at a place where the magnetic field is strongest.

(1)

(iii) Describe **two** differences between the magnetic field shown in Figure 4 and a uniform magnetic field.

(2)

(b) State how a uniform magnetic field may be obtained in a school laboratory.

(1)

(c) Figure 5 shows the directions of some plotting compass needles placed at different points near the Earth's surface.

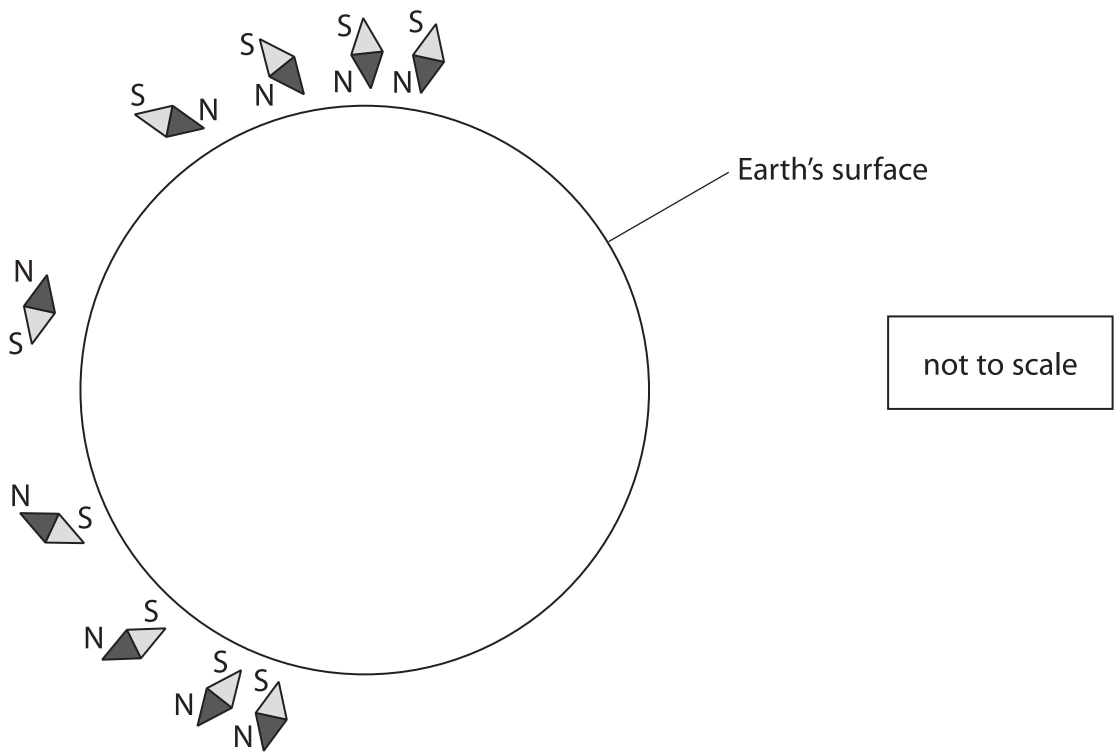

Figure 5

(i) Sketch, on Figure 5, the Earth's magnetic field outside and inside the Earth.

(2)

(ii) State which part of the Earth generates its magnetic field.

(1)

(d) A wire is placed at right angles to the Earth's magnetic field.

The wire is 0.600 m long and carries a current of 93.1 mA.

The force on the wire is 1.11×10^{-5} N.

Calculate the magnetic flux density of the Earth's magnetic field.

Use the equation

$$F = B \times I \times l$$

(2)

magnetic flux density = ... T

(Total for Question 3 = 10 marks)

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4 (a) Figure 6 shows a 'Mars rover' descending to the surface of the planet Mars.

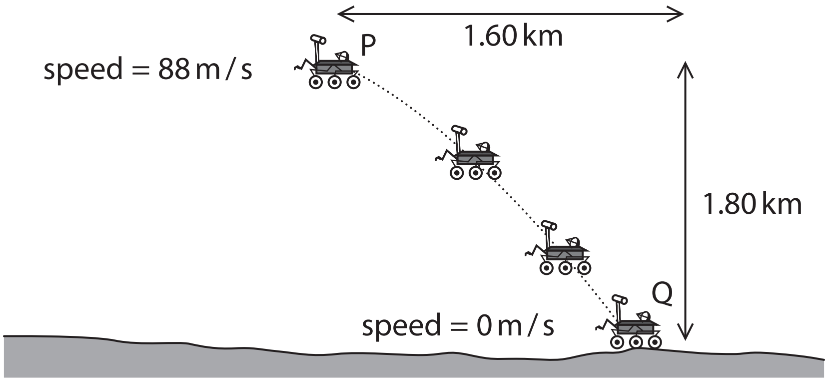

Figure 6

(i) Calculate the change in gravitational potential energy of the rover as it descends from position P to position Q.

Mass of rover = 1100 kg

Gravitational field strength on Mars = 3.7 N / kg

Give your answer to 2 significant figures.

(3)

change in gravitational potential energy = ... J

(ii) Use data from Figure 6 to calculate the change in kinetic energy of the rover as it descends from position P to position Q.

(2)

change in kinetic energy = ... J

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(iii) The rover is slowed down safely using thrusters and a parachute (not shown in Figure 6).

The thrusters use jets of gas to control movements and the parachute is designed to be used in the atmosphere of Mars.

Describe the energy changes involved in terms of the work done by various forces as the rover descends.

(3)

(b) The rover uses solar panels for its power needs.

The solar panels can provide 1200 W of power.

(i) Show that the solar panels can provide 2.16 MJ of energy in 30 minutes.

(1)

(ii) The solar panels convert 27% of the energy they receive from the Sun into electricity.

Calculate the solar energy received by the panels that provides the 2.16 MJ of energy.

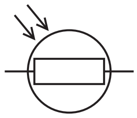
(2)

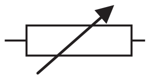
energy received = ... J

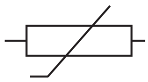
(Total for Question 4 = 11 marks)

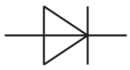
5 (a) Which of these shows the correct circuit symbol for a thermistor?

(1)

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(b) A student investigates how the resistance of a thermistor varies with temperature.

Figure 7 shows a graph of the results of this investigation.

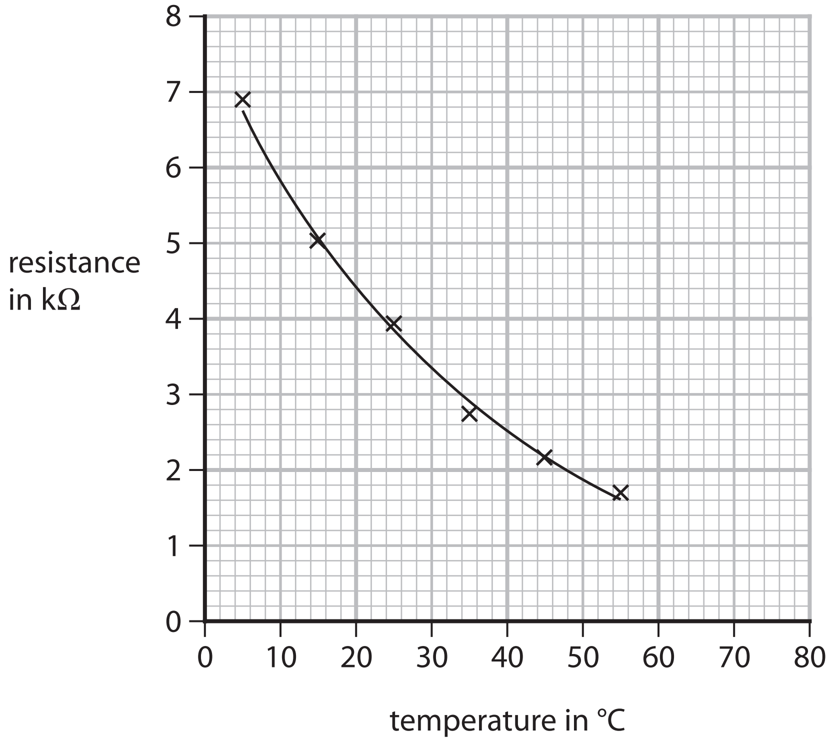


Figure 7

(i) Describe how the resistance of this thermistor varies with temperature.

(2)

(ii) Draw the tangent to the curve at a temperature of 30 °C, to find the rate of change of resistance with temperature at 30 °C.

State the unit.

(3)

rate of change of resistance with temperature at 30 °C = ... unit ....

(c) Figure 8 shows the apparatus used for this investigation.

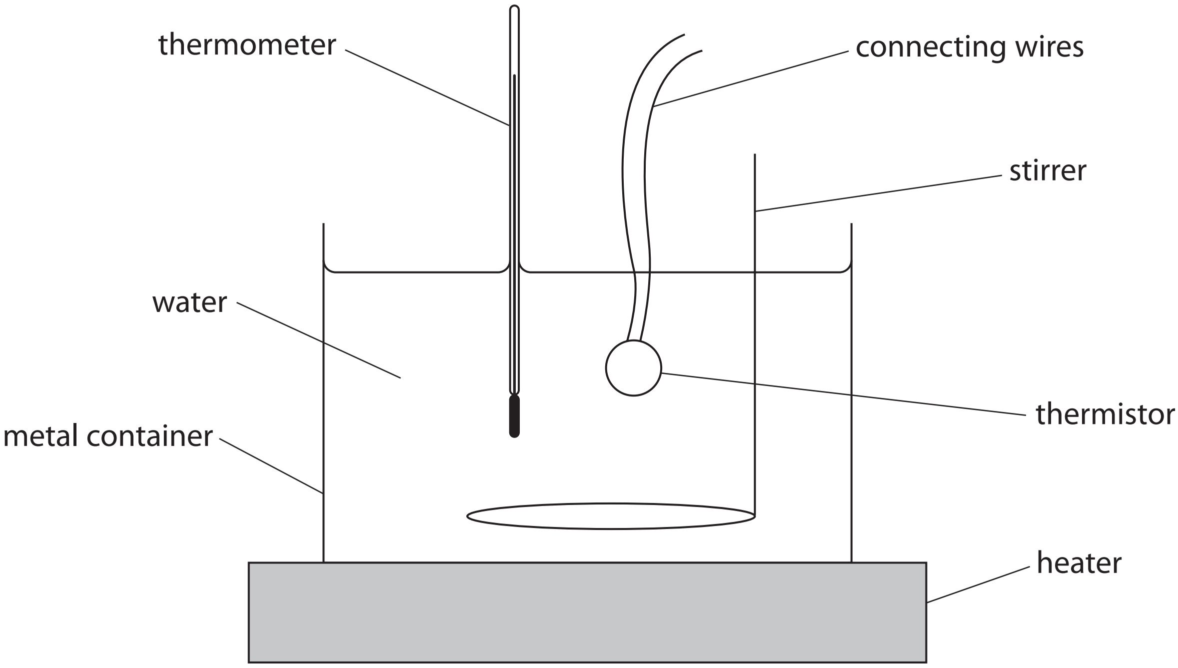


Figure 8

(i) Explain **one** improvement in measurement that the student could make in the investigation.

(2)

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In this investigation, the resistance can be measured in two ways.

Method 1 – use an ohmmeter.

Method 2 – use an ammeter and a voltmeter.

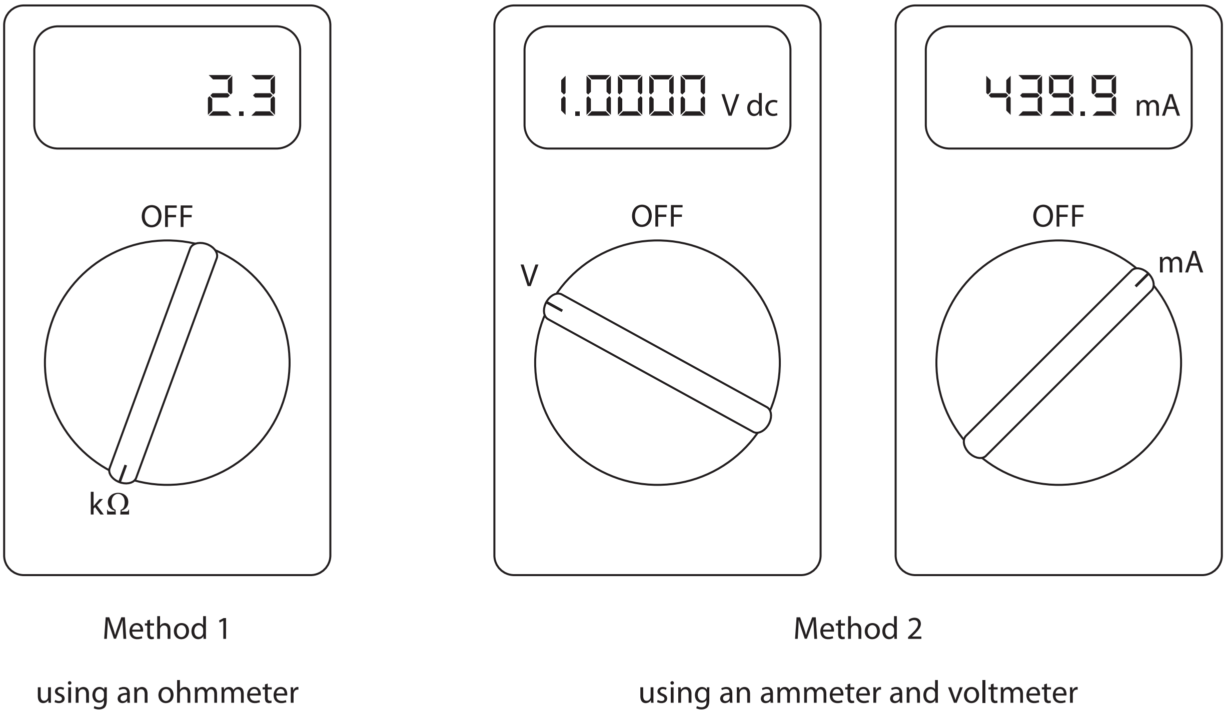

Figure 9

(ii) Explain why method 2 gives more precise results than method 1.

(2)

(Total for Question 5 = 10 marks)

6 (a) Explain the difference between the term 'specific heat capacity' and the term 'specific latent heat' when applied to heating substances.

(2)

(b) Figure 10 shows some apparatus that may be used to determine the specific heat capacity of water.

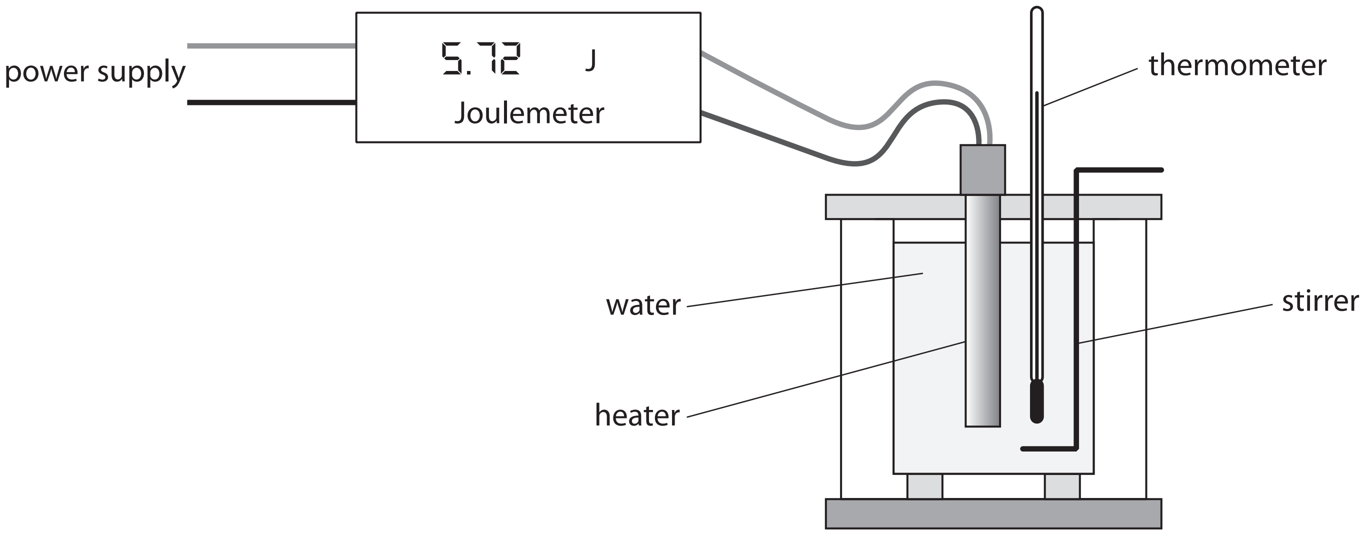

Figure 10

A student measures the initial temperature of the water.

The power supply is switched on for 10 minutes and then switched off.

Explain how the student should then obtain an accurate reading for the final temperature of the water, to be used in the calculation of the specific heat capacity.

(3)

*(c) A container of gas is at room temperature.

The gas is then heated.

The volume of the container remains the same.

By considering changes in velocities of the gas particles, explain how the temperature increase affects

- the average kinetic energy of the particles
- the pressure the particles exert on the walls of the container.

(6)

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS

Equations

(final velocity)^2 − (initial velocity)^2 = 2 × acceleration × distance $v^2 - u^2 = 2 \times a \times x$
force = change in momentum ÷ time $F = \frac{(mv - mu)}{t}$
energy transferred = current × potential difference × time $E = I \times V \times t$
force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length $F = B \times I \times l$
$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$ $\frac{V_p}{V_s} = \frac{N_p}{N_s}$
potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil $V_p \times I_p = V_s \times I_s$
change in thermal energy = mass × specific heat capacity × change in temperature $\Delta Q = m \times c \times \Delta\theta$
thermal energy for a change of state = mass × specific latent heat $Q = m \times L$
to calculate pressure or volume for gases of fixed mass at constant temperature $P_1 V_1 = P_2 V_2$
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = \frac{1}{2} \times k \times x^2$
pressure due to a column of liquid = height of column × density of liquid × gravitational field strength $P = h \times \rho \times g$

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