chermistry.com
Practice paper written from an analysis of every
O-Level Science (Physics) paper, 2010–2025

CANDIDATE NAME									
CENTRE NUMBER	S					INDEX NUMBER				

SCIENCE (PHYSICS)

Specimen

Paper 2 Physics

PRACTICE PAPER · PAPER 2.6

For practice before the next examination

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

This is a **chermistry practice paper**.

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and index number in the boxes above.

You may use an HB pencil for any diagrams, graphs or rough working.

Write in dark blue or black pen.

Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

Take g = 10 m/s^2 (or 10 N/kg) unless you are told otherwise.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **one** question.
Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total mark for this paper is 65.

This document consists of **18** printed pages.

NOT AN OFFICIAL EXAMINATION PAPER

Written for classroom practice from the topic frequencies in the chermistry theory-paper analysis. It follows the layout, wording and mark scheme conventions of the O-Level Science (Physics) papers but is not set, endorsed or marked by any examination board.

Section A

Answer **all** the questions in the spaces provided.

1 A porter wheels a trolley that carries a box of blood samples from a hospital ward to the laboratory. A data logger on the trolley records the distance travelled, the time taken and the temperature inside the box.

(a) Table 1.1 lists three base quantities recorded by the data logger. Complete the table by writing the name and the symbol of the SI base unit of each quantity.

Table 1.1

base quantity	name of SI base unit	symbol of unit
length		
time		
thermodynamic temperature		

[2]

(b) Fig. 1.1 is the distance-time graph for the first part of the journey. The graph has three sections, P, Q and R. Deduce, from the shape of the graph, the motion of the trolley in each of the sections P, Q and R.

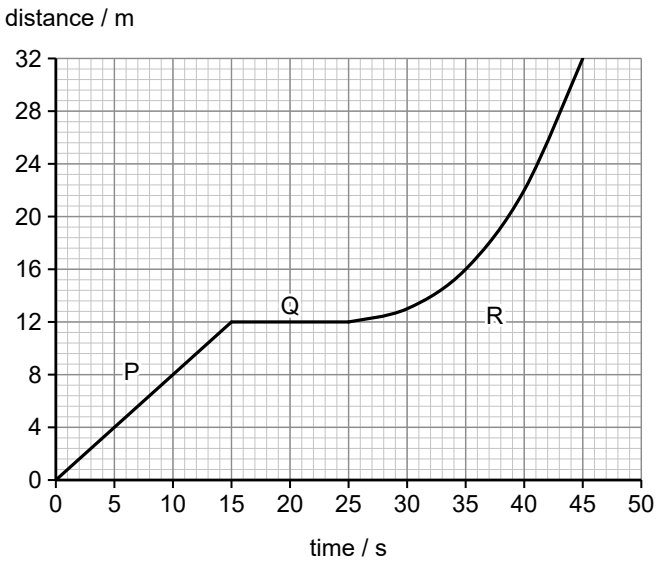


Fig. 1.1

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.....

..... [2]

(c) The trolley is then fitted with a motor for the return journey. Fig. 1.2 is the speed-time graph for the trolley. The graph has four sections, A, B, C and D. Deduce, from the shape of the graph, which section shows the trolley:

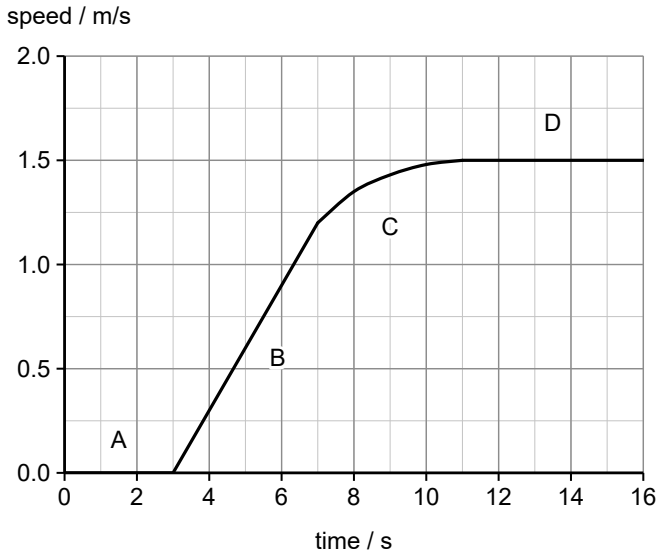


Fig. 1.2

at rest: section = ...

moving with uniform acceleration: section = ...

moving with non-uniform acceleration: section = ...

moving with constant speed: section = ... [2]

[Total: 6]

2 A bag of saline solution hangs at rest from a hook on a drip stand by a light cord. The saline flows through a needle into a patient's arm.

(a) Name the force that the cord exerts on the bag and the force that the Earth exerts on the bag. For each force, state whether it is a contact force or a non-contact force.

.....

.....

.....

..... [2]

(b) The cord breaks and the bag falls towards the floor. Ignore air resistance. State the acceleration of the bag and state whether this value changes as the bag falls.

.....

..... [1]

(c) Explain, using the idea of a gravitational field, why the bag accelerates downwards when the cord breaks.

.....

.....

.....

..... [2]

[Total: 5]

3 A patient lies on a hospital bed. The total mass of the bed and the patient is 130 kg.

(a) The bed has an air mattress that spreads the weight of the patient over a large area. Define pressure, and use your definition to explain why the large area reduces the risk of pressure sores on the patient's skin.

.....

.....

.....

..... [2]

(b) Two nurses push the bed along a level corridor with a total horizontal force of 200 N. The bed accelerates from rest at 1.2 m/s^2. Calculate the friction acting on the bed.

friction = ... N [2]

(c) The nurses stop pushing while the bed is moving. Explain what happens to the motion of the bed.

.....

.....

..... [1]

[Total: 5]

4 In a hospital gym a patient strengthens his arm by pushing down on the right end of a uniform beam. The beam is 100 cm long and weighs 7.0 N. It is balanced horizontally on a pivot 30 cm from the left end. A bag of weight 14 N hangs from the left end, as shown in Fig. 4.1. The patient pushes down with a force *F* at the right end.

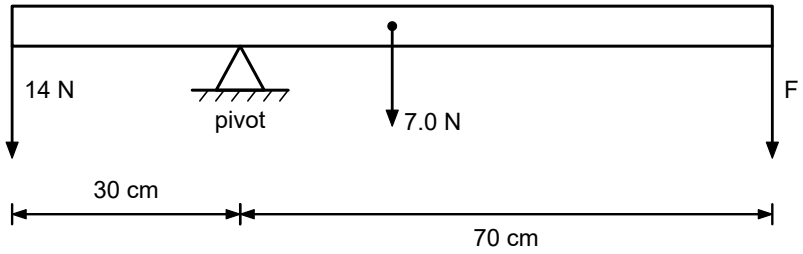


Fig. 4.1

(a) Calculate the moment of the 14 N force about the pivot.

moment = ... N m [1]

(b) Calculate the force *F* that keeps the beam balanced.

force *F* = ... N [2]

(c) Later the patient throws a medicine ball of mass 2.0 kg. At one instant the ball is 1.5 m above the floor and is moving at 6.0 m/s. Take *g* = 10 N/kg. Calculate the total energy in the kinetic store and the gravitational potential store of the ball at this instant.

total energy = ... J [2]

[Total: 5]

5 A physiotherapy clinic warms a block of solid paraffin wax in a wax bath to treat stiff joints. Fig. 5.1 is the temperature-time graph of the wax as it is heated at a steady rate. The wax would form a vapour if it were heated much more.

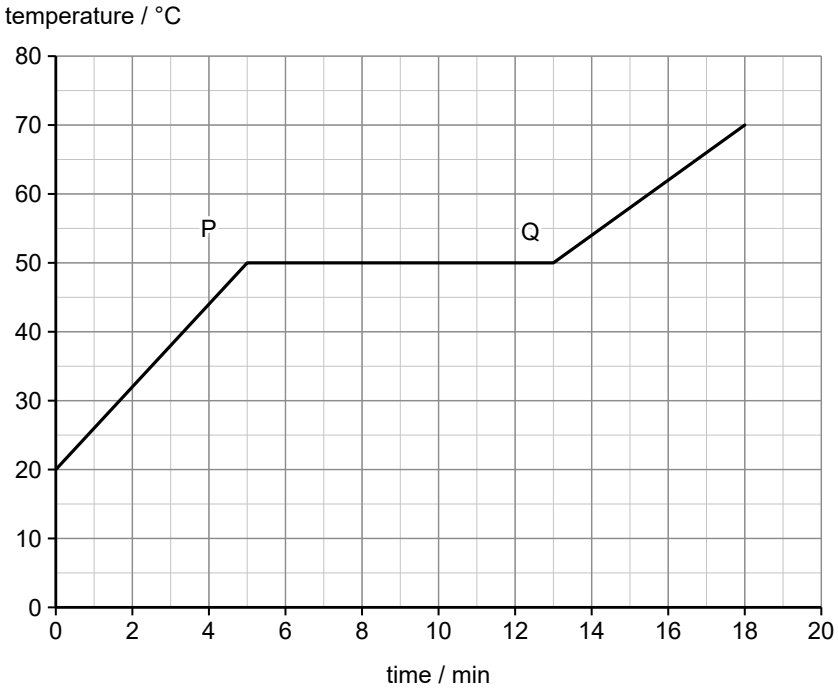


Fig. 5.1

(a) Between P and Q the wax melts.

(i) Use Fig. 5.1 to state the melting point of the wax.

.....[1]

(ii) Describe what happens to the energy supplied to the wax between P and Q, and why the temperature does not rise.

.....

.....

.....[1]

(b) State two differences between the physical properties of the solid wax and the wax vapour (a gas).

.....

.....

.....[2]

[Total: 4]

6 A newborn baby is kept warm in a hospital by an overhead radiant heater, which is connected to the mains supply. A second baby is nursed in an incubator, which has an electric heater near its base.

(a) Describe the energy transfers in the radiant heater. State how the energy is transferred from the mains supply to the heating element and how it is then transferred from the element to the baby.

.....

.....

.....

..... [2]

(b) Explain why the energy from the heater would still reach the baby if all the air between the heater and the baby were removed.

.....

.....

..... [1]

(c) Behind the heating element of the radiant heater is a curved sheet with a shiny, polished surface. Explain how this sheet helps the heater to warm the baby.

.....

.....

..... [1]

(d) Explain how the warm air produced by the heater at the base of the incubator spreads to the top of the incubator.

.....

.....

.....

..... [2]

[Total: 6]

7 An eye specialist uses a small plane mirror to direct light from a lamp into a patient's eye. Fig. 7.1 shows a ray of light from the lamp reaching the point O on the mirror, and the reflected ray that enters the eye. The mirror itself has been left out of the diagram.

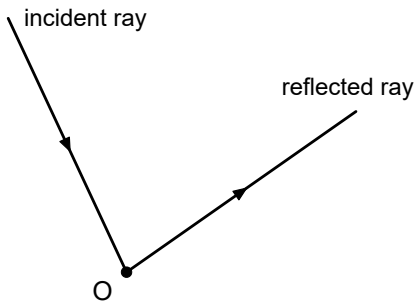


Fig. 7.1

(a) On Fig. 7.1, draw the normal at O and then draw the position of the mirror.

[2]

(b) The cornea at the front of the eye has a refractive index of 1.38. Define refractive index and explain what the value 1.38 tells you about the speed of light in the cornea.

.....

.....

.....

..... [2]

(c) The specialist also uses a lamp that gives out ultraviolet radiation to examine the surface of the eye. State one harmful effect of over-exposure of the body to ultraviolet radiation.

.....

..... [1]

[Total: 5]

8 A hospital heating pad contains a long thin wire. Fig. 8.1 shows the wire connected to a 12 V battery. The current in the wire is 2.0 A.

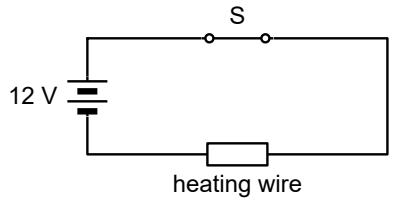


Fig. 8.1

(a) State whether the conventional current in the wire in Fig. 8.1 is clockwise or anticlockwise. The battery is then reversed. State whether the electron flow in the wire is now clockwise or anticlockwise, and give a reason.

.....

.....

..... [2]

(b) Calculate the resistance of the wire in Fig. 8.1.

resistance = ... Ω [1]

(c) Table 8.1 gives data for three wires of the same material. Wire P is the wire in Fig. 8.1.

Table 8.1

wire	length / m	cross-sectional area / mm^2
P	2.5	0.50
Q	6.0	1.0
R	1.0	0.10

(i) State which wire has the greatest resistance, and give a reason.

.....

..... [1]

(ii) Calculate the resistance of this wire.

resistance = ... Ω [1]

[Total: 5]

9 A technician builds a circuit for an operating-theatre lamp whose brightness can be changed.

(a) Draw a circuit diagram that contains a battery, a switch, a lamp and a variable resistor in series. Include an ammeter to measure the current in the lamp and a voltmeter to measure the p.d. across the lamp.

[2]

(b) Fig. 9.1 shows a similar circuit with two ammeters, A_1 and A_2. Complete Table 9.1 to show the readings on the two ammeters in each situation.

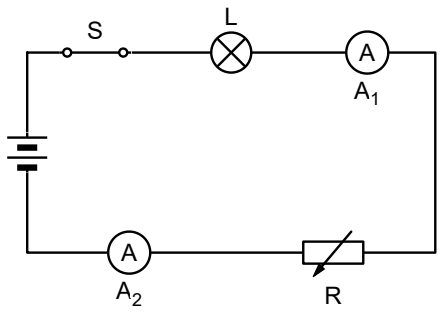


Fig. 9.1

Table 9.1

situation	reading on A_1 / A	reading on A_2 / A
1 The switch is closed (as in Fig. 9.1)	0.30	
2 The resistance of the variable resistor is increased		0.18
3 The filament of the lamp breaks		

[2]

[Total: 4]

10 A technician in the hospital workshop has three steel rods, X, Y and Z. He wants to find out which of them are magnets. He also repairs a small blood pump that contains an electric motor.

(a) He brings the north pole of a bar magnet near each end of each rod in turn. Table 10.1 shows what he observes. State which rod is a magnet, and explain why the other two rods are not magnets.

Table 10.1

rod	end 1	end 2
X	attracted	attracted
Y	repelled	attracted
Z	attracted	attracted

.....

.....

.....

..... [2]

(b) The motor in the pump works because a current-carrying wire in a magnetic field experiences a force. Describe an experiment to show this force and to show the effect of reversing (i) the current and (ii) the direction of the magnetic field.

.....

.....

.....

.....

.....

..... [2]

[Total: 4]

11 A hospital sterilises sealed packs of syringes by exposing them to gamma rays from a source that contains cobalt-60, an unstable nuclide. Gamma rays are part of the electromagnetic spectrum.

(a) Table 11.1 shows seven regions of the electromagnetic spectrum in order of increasing frequency, from the lowest frequency on the left. Two regions are missing.

Table 11.1

radio waves		infrared		ultraviolet	X-rays	gamma rays

(i) Complete Table 11.1 by writing the names of the two missing regions in the empty boxes.

.....[1]

(ii) State how the wavelength changes from the radio waves to the gamma rays.

.....[1]

(b) Explain what is meant by saying that the decay of the cobalt nuclei is random and spontaneous.

.....

.....

.....[2]

(c) Table 11.2 shows how three types of radiation, X, Y and Z, are absorbed.

Table 11.2

radiation	absorbed by	type of radiation
X	a sheet of paper	
Y	aluminium 3 mm thick	
Z	only several centimetres of lead	

(i) Identify the types of radiation X, Y and Z by completing Table 11.2.

.....[1]

(ii) State which of X, Y or Z is suitable for sterilising the syringes inside their sealed paper and plastic packs, and give a reason.

.....

.....[1]

[Total: 6]

Section B

Answer **one** question from this section.

12 A hospital ultrasound scanner examines an organ. A probe sends a short pulse of ultrasound into the body. The scanner is a mains-powered machine (230 V) with a metal casing. The speed of ultrasound in the body is 1500 m/s.

(a) Explain, in terms of the particles of the tissue, how the ultrasound pulse carries energy from the probe through the body although the tissue itself does not travel along with the pulse.

.....

.....

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.....

.....

..... [3]

(b) Fig. 12.1 shows the signal on the scanner screen. The pulse is sent at 1.0×10^{-5} s. The first echo comes from the front surface of the organ and the second echo from its back surface.

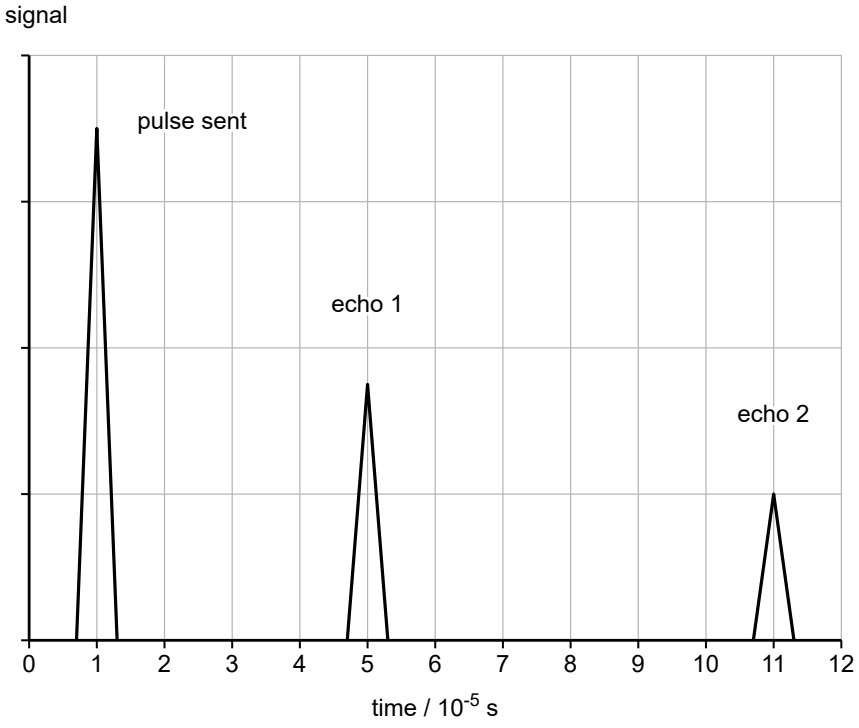


Fig. 12.1

(i) Use the figure to calculate the distance from the probe to the front surface of the organ.

distance = ... m [1]

(ii) Hence calculate the thickness of the organ.

thickness = ... m [1]

(c) The metal casing of the scanner is connected to the earth wire, which has a resistance of 0.10 Ω. A fault makes the live wire (230 V) touch the casing. The live wire is fitted with a 13 A fuse.

(i) Calculate the current in the earth wire when the live wire touches the casing.

current = ... A [1]

(ii) Use your answer to (i) to explain how earthing the metal casing protects a technician who touches it.

.....

.....

..... [1]

(iii) A hand-held probe has a plastic casing with no earth wire. It is marked with the symbol for double insulation. State what is meant by double insulation.

.....

..... [1]

(d) A technician fits a three-pin plug to the cable of the scanner. Describe how the live wire and the earth wire are wired in the plug. In each case state the colour of the insulation and where the wire is connected.

.....

.....

.....

.....

..... [2]

[Total: 10]

13 Fig. 13.1 shows a lamp L of resistance 6.0 Ω and a heater H of resistance 4.0 Ω on a hospital trolley. They are connected in parallel to a 12 V battery. Ammeter A measures the current from the battery.

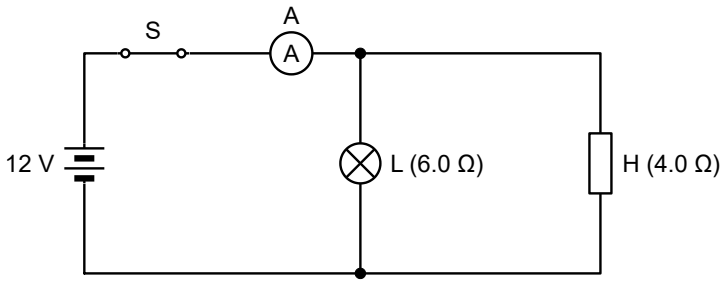


Fig. 13.1

(a)

(i) State the potential difference across the lamp and across the heater, and give a reason for your answer.

.....

..... [1]

(ii) The heater is disconnected. State the potential difference across the lamp now and give a reason.

.....

..... [1]

(b)

(i) State how the current in the battery is related to the currents in the two branches.

.....

..... [1]

(ii) Calculate the reading on ammeter A when both the lamp and the heater are connected.

reading on A = ... A [2]

(c)

(i) State what is meant by the statement that the potential difference across the heater is 12 V.

.....

.....

..... [1]

(ii) The heater is on for 5.0 minutes. Calculate the work done in driving charge through the heater in this time.

work done = ... J [2]

(d) A nurse sprays disinfectant from a nozzle that gives all the droplets a negative charge. Explain (i) why the spray spreads into a fine mist and (ii) why the droplets are attracted to a positively charged metal bed frame.

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.....

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..... [2]

[Total: 10]