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 2.9

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 site engineer inspects a steel girder and a delivery lorry.

(a) The engineer weighs the girder and records "mass of girder = 540 kg". State the numerical magnitude and the unit in this physical quantity.

numerical magnitude = ...

unit = ... [1]

(b)

(i) State the difference between a scalar quantity and a vector quantity.

.....

..... [1]

(ii) The lorry leaves the site gate and drives 5.0 km east along a straight road. It then reverses 2.0 km back along the same road and stops. For the whole journey, state the distance the lorry travels and its displacement, and state which of these two quantities is the vector.

distance = ... km

displacement (with its direction) = ...

vector quantity = ... [1]

[Total: 3]

2 A dumper truck drives along a straight road across a building site. Fig. 2.1 is the distance-time graph for part of its journey.

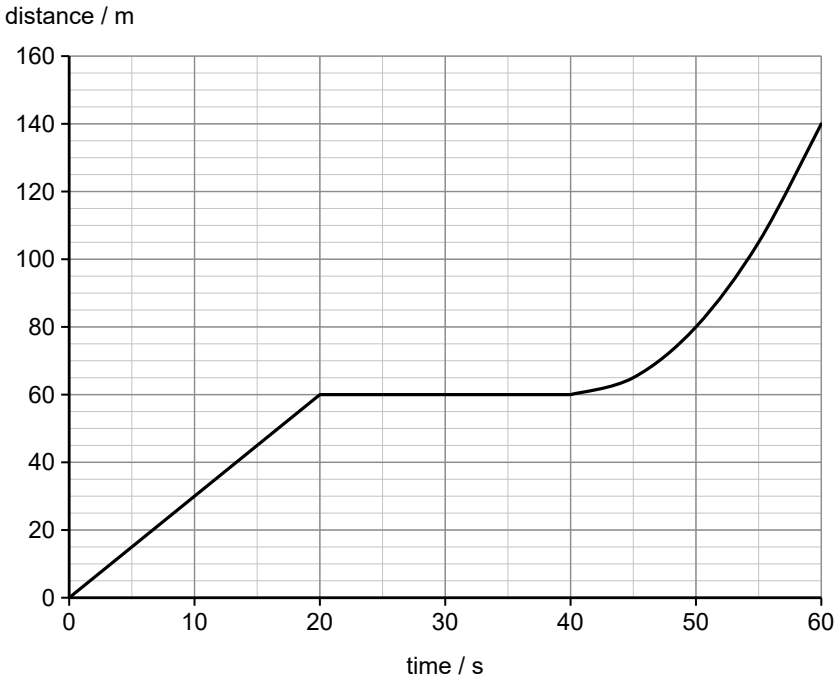


Fig. 2.1

(a) **(i)** Use Fig. 2.1 to calculate the speed of the truck during the first 20 s.

speed = ... m/s [1]

(ii) State what is meant by velocity.

.....

..... [1]

(b) Describe the motion of the truck between 40 s and 60 s. Give the feature of the graph that shows this.

.....

.....

..... [1]

[Total: 3]

3 A builders' hoist raises bricks to the top of a building. Fig. 3.1 is the speed-time graph of the hoist for one upward trip. The graph has three sections, PQ, QR and RS.

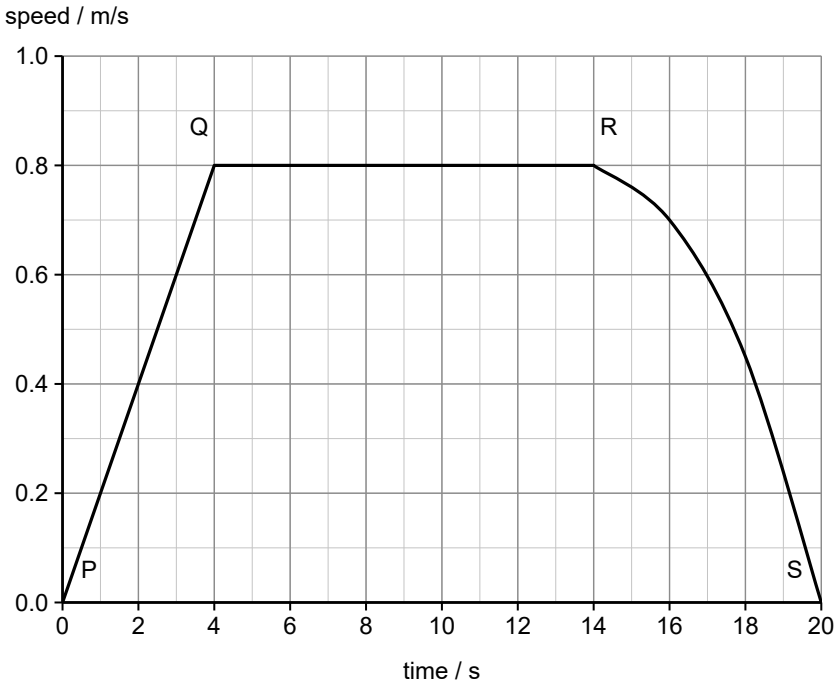


Fig. 3.1

(a) For each section of the graph, state the motion of the hoist and the feature of the graph that shows it.

.....

.....

.....

.....

..... [2]

(b) During section QR the motor of the hoist does 1.2×10^4 J of work on the load. Use Fig. 3.1 to find the time taken for section QR and calculate the power of the motor during QR.

power = ... W [2]

[Total: 4]

4 A kerb stone is a block of granite measuring 0.50 m by 0.20 m by 0.10 m. The mass of the block is 27 kg.

(a) Calculate the density of the granite.

density = ... kg m^{-3} [2]

(b)

(i) Define gravitational field strength.

.....

..... [1]

(ii) The block hangs from a newton meter, which reads 270 N. Calculate the gravitational field strength.

field strength = ... N/kg [1]

(c)

(i) Define pressure.

.....

..... [1]

(ii) The block is placed on level ground. The force that it exerts on the ground is equal to its weight of 270 N. Calculate the greatest pressure that the block can exert on the ground.

pressure = ... Pa [1]

[Total: 6]

5 A bulldozer of mass 8000 kg pushes soil along level ground at a constant speed of 1.5 m/s. The driving force on the bulldozer is 15 000 N.

(a)

(i) State the size of the total resistive force on the bulldozer and explain your answer.

.....

.....

..... [1]

(ii) The tracks push backwards on the ground. State the force that forms the action-reaction pair with this push, and the body on which that force acts.

.....

.....

..... [1]

(b) The driver increases the driving force until the resultant force on the bulldozer is 6000 N. Calculate the acceleration of the bulldozer.

acceleration = ... m/s^2 [1]

(c) The bulldozer moves at the constant speed of 1.5 m/s for 8.0 s. Calculate the work done by the driving force of 15 000 N in this time.

work done = ... J [2]

[Total: 5]

6 A worker uses a long steel bar as a lever to lift one end of a heavy load. He pushes vertically downwards on the bar with a force of 150 N. Fig. 6.1 shows the bar, which turns about the pivot P. His hands are 1.15 m from P, measured along the bar.

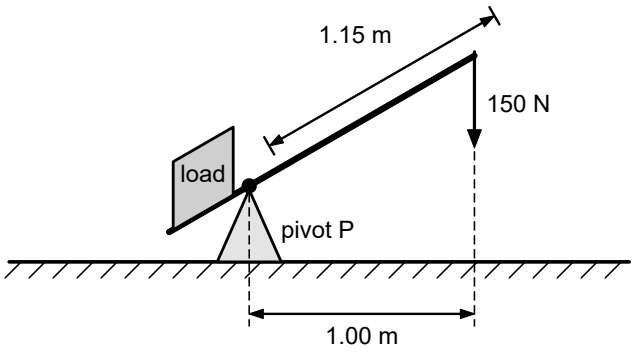


Fig. 6.1

(a) The worker moves his hands further from P along the bar and pushes with the same force. Explain why the load is now lifted more easily.

.....

.....

..... [1]

(b) Calculate the moment of the worker's force about P.

moment = ... N m [2]

[Total: 3]

7 In a foundry, molten aluminium at 800 °C is poured into a mould and left to cool. Fig. 7.1 shows how the temperature of the aluminium changes with time.

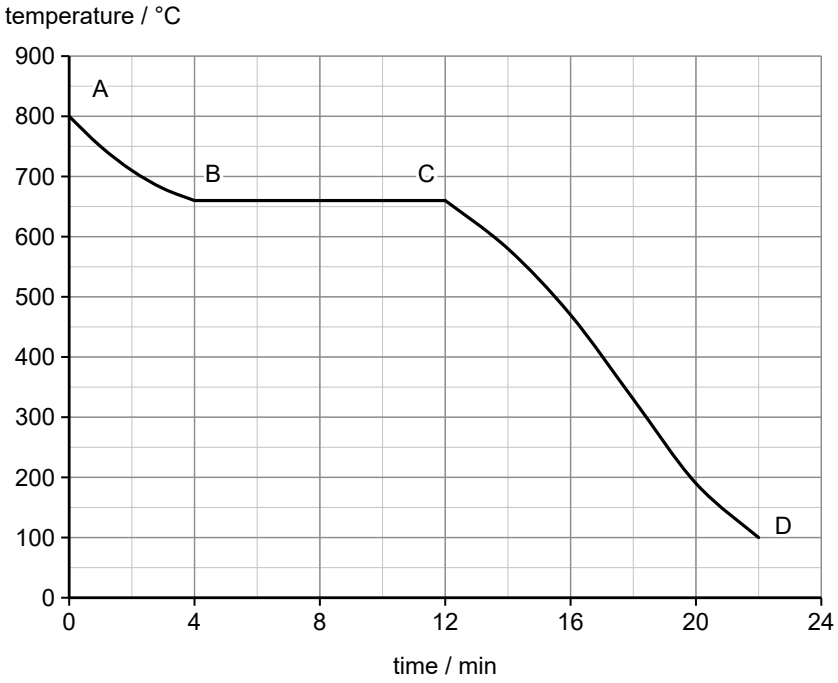


Fig. 7.1

(a) Describe what happens to the aluminium and to its temperature between B and C. Explain this in terms of the energy transferred.

.....

.....

..... [2]

(b) The finished castings are cooled in a tank of water. An electric heater keeps the water at a safe temperature and is fixed near the **bottom** of the tank. Explain, in terms of density, why the water in the whole tank is warmed more quickly than if the heater were fixed near the top.

.....

.....

..... [1]

(c) A worker stands 3 m from the glowing furnace in a suit with a shiny, aluminium-coloured surface. Explain how the energy from the furnace reaches the worker and why the shiny suit keeps him cooler.

.....

.....

..... [2]

[Total: 5]

8 A civil engineer tests the ground at a building site. A vibrating plate on the ground sends waves through the rock to detectors buried in the ground. Later the engineer tests a long steel girder.

(a) State what is transferred from the plate to the detectors by the waves, and what is not transferred.

.....

..... [1]

(b) Some of the waves in the rock are longitudinal and some are transverse. State how the direction of vibration differs in the two types, and give one other example of each type of wave.

.....

.....

.....

..... [2]

(c) A worker taps one end of the long steel girder with a hammer. A second worker presses an ear against the other end of the girder and hears the tap.

(i) State what produces the sound at the end of the girder that is struck.

.....

..... [1]

(ii) Explain how the sound travels along the girder to the second worker.

.....

.....

..... [1]

[Total: 5]

9 A pipeline inspector checks welded steel pipes.

(a) Name the region of the electromagnetic spectrum used (i) by a thermal imaging camera to find hot spots on a pipe and (ii) with photographic film to show hidden cracks in a weld.

.....

..... [2]

(b) The inspector uses a small plane mirror to look at a weld round a bend. In Fig. 9.1 the incident ray makes 40° with the mirror surface. On Fig. 9.1, draw the normal at P, label the angle of incidence *i* and the angle of reflection *r*, and write the size of *r*.

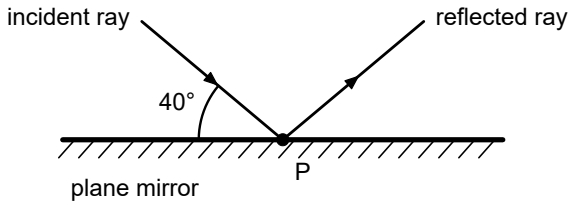


Fig. 9.1

[1]

(c) The inspector then uses a thin converging lens as a magnifying glass. A beam of light parallel to the principal axis passes through the lens. Describe the action of the lens on the beam.

.....

..... [2]

(d) Fig. 9.2 shows the lens forming an image of a weld defect, which is the object. Describe the characteristics of the image by stating whether it is real or virtual, magnified or diminished, and upright or inverted.

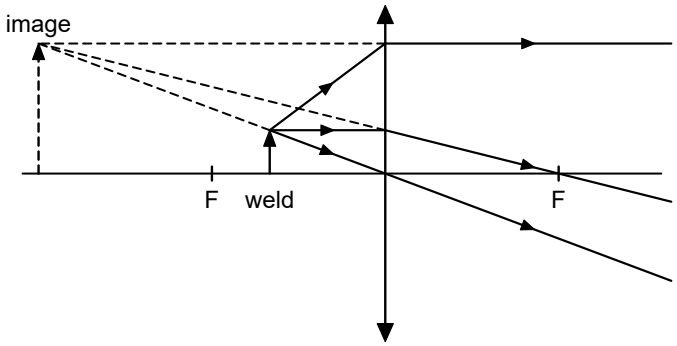


Fig. 9.2

.....

..... [2]

[Total: 7]

10 An alarm system on a production line uses lamps and resistors.

(a) In the circuit in Fig. 10.1 ammeter A_1 reads 0.30 A.

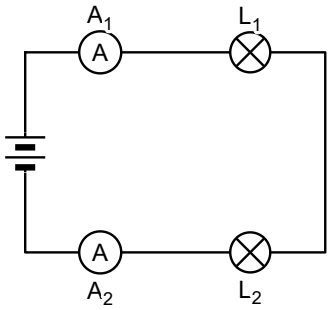


Fig. 10.1

(i) State the reading on ammeter A_2.

reading on A_2 = ... A [1]

(ii) A student says that the current should be smaller at A_2 because the lamps use up current. Explain why the student is wrong.

.....

.....

..... [1]

(b) Fig. 10.2 shows a 12 V battery connected to four resistors. Calculate the potential difference across the 20 Ω resistor.

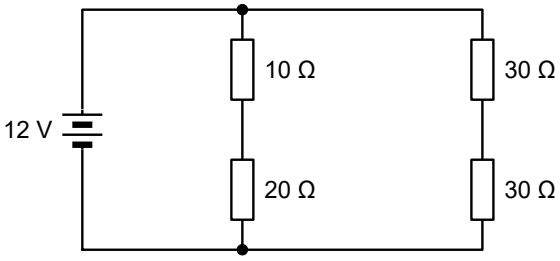


Fig. 10.2

potential difference = ... V [2]

[Total: 4]

11 A hand-held grinder in a workshop has a metal casing. It is connected to the mains supply by a three-pin plug.

(a) State what is meant by the live wire.

.....

..... [1]

(b) The live wire inside the grinder works loose and touches the metal casing. Explain how the earth wire protects the user.

.....

.....

.....

..... [2]

(c) A trainee wires the plug as in Fig. 11.1. The letters on the terminals are E, N and L.

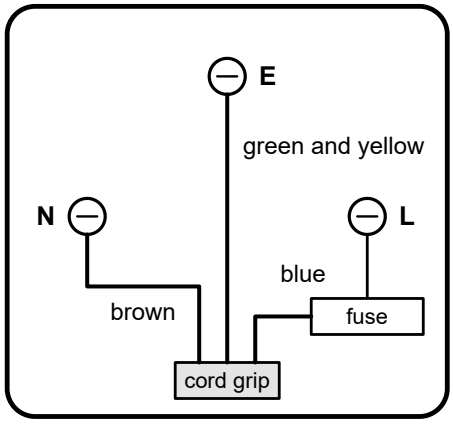


Fig. 11.1

(i) State the mistake in the wiring of the plug.

.....

..... [1]

(ii) State the wire to which the fuse must be connected in a correctly wired plug.

..... [1]

[Total: 5]

12 A technician finds an unmarked steel bar in a store. The bar attracts iron nails.

(a) State two tests that show the bar is a magnet and not just an unmagnetised piece of steel.

.....

.....

..... [2]

(b) Fig. 12.1 shows a bar magnet. In the dashed box, draw the magnetic field pattern around the magnet. Draw at least four field lines and show their directions with arrows.

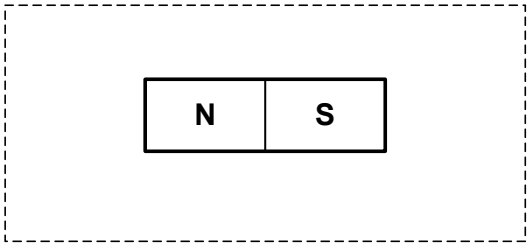


Fig. 12.1

[1]

(c) Fig. 12.2 shows the apparatus for an experiment to show that a force acts on a current-carrying conductor in a magnetic field. The copper wire hangs freely between the poles of the magnet from the terminals X and Y.

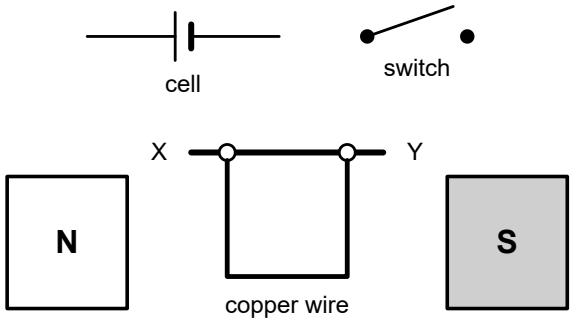


Fig. 12.2

(i) On Fig. 12.2, draw wires to connect the cell and the switch so that a current can flow through the copper wire.

[1]

(ii) Describe what you would see when the switch is closed, and what happens when the connections to the cell are reversed.

.....

..... [1]

[Total: 5]

Section B

Answer **one** question from this section.

13 A factory makes aluminium foil and then paints metal panels.

(a) An atom of aluminium has 13 protons, 14 neutrons and 13 electrons.

(i) Describe where the protons, neutrons and electrons are found in the atom and state the charge of each type of particle.

.....

.....

.....

..... [2]

(ii) Explain why the aluminium atom is electrically neutral.

.....

..... [1]

(b) A beta source is placed on one side of the foil as it is rolled and a detector is placed on the other side to control the thickness of the foil.

(i) The detector records 840 counts per minute when the foil has the correct thickness. During rolling the reading falls to 610 counts per minute. State what has happened to the thickness of the foil and give a reason.

.....

.....

..... [1]

(ii) State one hazard of radioactivity to the workers.

.....

..... [1]

(c) In the paint shop a spray gun gives every paint droplet a positive charge.

(i) The droplets leave the gun as a fine, spreading mist. State why the droplets spread out.

.....

..... [1]

(ii) The metal panel to be painted is given a negative charge. State why the droplets are pulled towards the panel.

.....

..... [1]

(iii) Two other droplets, A and B, hang close together from insulating threads. A is negatively charged and the two droplets repel each other. State the charge on B and give a reason.

.....

..... [1]

(d) Cable P in the factory is made of copper, is 40 m long and has a cross-sectional area of 2.5 mm^2. Cable Q is made of the same copper and has the same resistance as cable P, but its cross-sectional area is 4.0 mm^2. Calculate the length of cable Q.

length = ... m [2]

[Total: 10]

14 A workshop has a machine tool driven by a motor. The motor is rated 1.8 kW, 230 V and is connected to the mains by a plug with a fuse. Fuses rated 3 A, 5 A, 10 A and 13 A are available.

(a)

(i) Calculate the normal current in the motor and choose the most suitable fuse. Give a reason for your choice.

[2]

(ii) Explain how the fuse protects the wiring of the motor if a fault causes too large a current.

.....

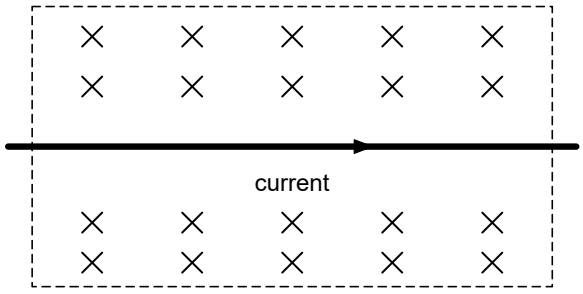
.....

..... [1]

(b) The workshop electricity meter reads 4735 kW h before the motor is used for a month and 4951 kW h afterwards. The motor is the only appliance that was switched on. The cost of electrical energy is $0.26 per kW h. Calculate the cost of running the motor for the month.

cost = ... $ [2]

(c) A straight wire in the motor carries a current in a magnetic field. Fig. 14.1 shows the wire in the plane of the paper. The current is to the right. The magnetic field is into the paper (shown by crosses).



magnetic field into the paper

Fig. 14.1

(i) State the direction of the force on the wire: up the page, down the page, to the left or to the right.

..... [1]

(ii) In another arrangement the current is still to the right but the force on the wire is down the page. State whether the magnetic field is into or out of the paper.

.....

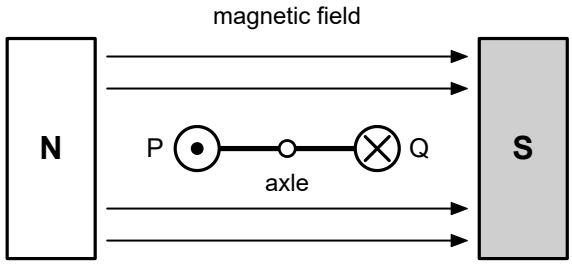
..... [1]

(iii) In Fig. 14.1 both the current and the magnetic field are now reversed. State the direction of the force on the wire and give a reason.

.....

..... [1]

(d) Fig. 14.2 shows the end view of the rectangular coil of the motor between the poles of the magnets. The current is out of the paper at P and into the paper at Q. State the direction of the force on side P and on side Q. Hence explain why the coil experiences a turning effect.



current: out of the paper at P, into the paper at Q

Fig. 14.2

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.....

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..... [2]

[Total: 10]