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 2.7

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 **19** 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 technician checks a replacement charging cable for a phone. The cable is about 1.20 m long and can be laid straight on a bench. The technician has a metre rule (1.00 m long, smallest division 1 mm), a pair of vernier calipers (reads to 0.1 mm, maximum opening 15 cm) and a measuring tape (3.0 m long, smallest division 1 mm).

(a) Select the instrument that is most suitable for measuring the length of the cable. Explain your choice.

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.....

.....

..... [2]

2 A bus-tracking app on a phone shows that a bus left stop A at 08:04 and reached stop B at 08:25. The road distance between the two stops is 12.6 km.

(a) Calculate the average speed of the bus between the two stops. Give your answer in m/s.

average speed = ... m/s [2]

(b) Fig. 2.1 is the speed-time graph for the first 30 s of the bus journey after it leaves stop A. Calculate the average acceleration of the bus between 0 and 4 s and between 8 s and 12 s. Use your answers to describe how the acceleration of the bus changes, and state the time at which the acceleration becomes zero.

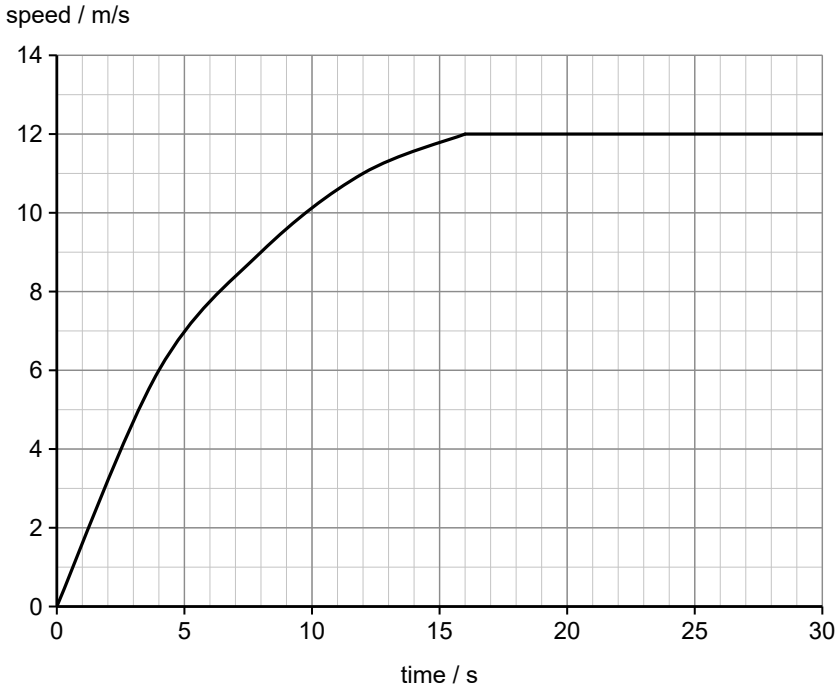


Fig. 2.1

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..... [2]

[Total: 4]

3 A recycling centre processes old computer equipment.

(a)

(i) State what is meant by the mass of an object.

.....

..... [1]

(ii) A pile of 300 identical aluminium laptop casings is compared with a pile of 100 of the same casings. Explain why the pile of 300 casings has three times the mass of the pile of 100 casings.

.....

.....

..... [1]

(b) The centre has a rack-mounted computer server.

(i) Define gravitational field strength.

.....

..... [1]

(ii) The server has a mass of 15 kg and a weight of 150 N at the recycling centre. Calculate the gravitational field strength at the centre.

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

(c) The server is packed in a wooden crate that has a weight of 40 N. The server alone weighs 150 N. Use your value of gravitational field strength from (b)(ii) to calculate the total mass of the server and the crate.

total mass = ... kg [2]

[Total: 6]

4 A computer mouse of mass 0.10 kg is pushed across a flat desk by a horizontal force from a hand. When the push is 0.40 N, the mouse moves at a constant velocity.

(a)

(i) State the size of the friction force on the mouse. Give a reason for your answer.

.....

..... [1]

(ii) The hand pushes the mouse. State the size and direction of the force that the mouse exerts on the hand when the push is 0.40 N.

.....

..... [1]

(b) The hand stops pushing while the mouse is still moving. The friction force stays the same and is now the only horizontal force on the mouse. Calculate the deceleration of the mouse.

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

[Total: 3]

5 The lid of a laptop turns about a hinge at the back of the base.

(a) A student opens the lid by pushing up at the front edge, far from the hinge. Explain why a smaller force is needed there than when pushing near the hinge.

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.....

..... [2]

(b) Fig. 5.1 shows a rectangular circuit board of uniform thickness and density. Mark with a cross (X) the position of the centre of gravity of the board.

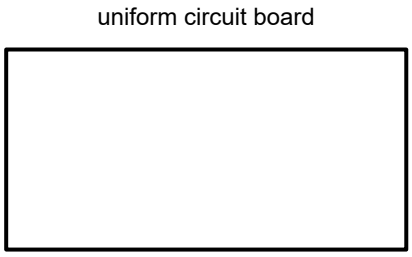


Fig. 5.1

[1]

[Total: 3]

6 A key on a computer keyboard contains a small spring. A force of 0.60 N is needed to push the key down through a distance of 3.0 mm.

(a) A typist presses 450 keys. Each key press needs the force and distance given above. Calculate the total work done by the typist on the keys.

work done = ... J [2]

(b) The spring is compressed when the key is pressed. Name the energy store that increases, and state how energy is transferred to this store.

.....

.....

..... [2]

[Total: 4]

7 The processor in a computer server is a piece of silicon. When the server is working hard, the temperature of the processor rises from 35 °C to 75 °C. A copper heat sink, which has many more particles than the processor, is attached to it to carry thermal energy away; the heat sink also reaches 75 °C. The server stands in a server room.

(a) Explain, in terms of the particles of silicon, what a rise in temperature tells you about the particles.

.....

.....

..... [2]

(b) The processor and the heat sink are both at 75 °C. Use your answer to (a) to explain why the heat sink has more internal energy than the processor.

.....

.....

.....

..... [2]

(c) Thermal energy is conducted through the copper heat sink by vibrating atoms and by one other process. State this other process.

.....

..... [1]

(d) Cool air enters the server room through vents in the floor. Warm air leaves through vents in the ceiling. Explain, in terms of density, why this arrangement allows convection currents to carry energy away from the servers.

.....

.....

.....

..... [2]

[Total: 7]

8 Electromagnetic waves are used in communication and many other devices.

(a) A radio signal and a pulse of X-rays are sent at the same instant from one satellite towards a second satellite, across the vacuum of space. State which of the two reaches the second satellite first. Give a reason.

.....

..... [1]

(b) Complete Table 8.1. For the first two uses, name the region of the electromagnetic spectrum. For X-rays and for radio waves, state one typical use of each.

Table 8.1

Use	Region of the electromagnetic spectrum
A mobile phone call sent from the phone to a mast	
A thermal-imaging camera on a phone showing which part of a circuit board is hottest, by detecting the waves that the hot parts give out	
	X-rays
	radio waves

[2]

[Total: 3]

9 A phone has a camera, a flash and a glass screen. Light is reflected, refracted or focused in each of them.

(a) Fig. 9.1 shows a ray of light from the flash reaching a plane mirror, and the ray reflected from it. The angle between the incident ray and the reflected ray is 76°. On Fig. 9.1, draw the normal at the point where the ray meets the mirror and state the angle of reflection.

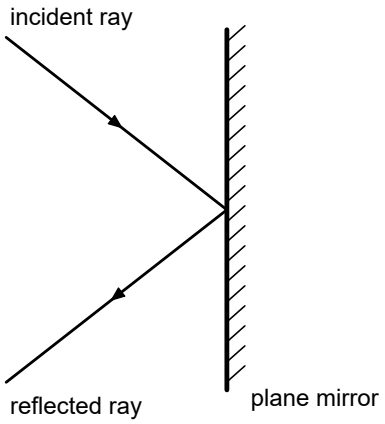


Fig. 9.1

angle of reflection = ... ° [1]

(b) Fig. 9.2 shows a ray of light entering the glass cover of the screen. The angles given are measured from the surface of the glass. Determine the angle of incidence and the angle of refraction.

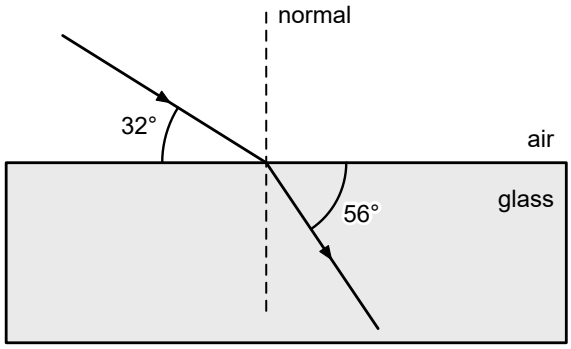


Fig. 9.2

angle of incidence = ... °

angle of refraction = ... ° [2]

(c) Fig. 9.3 shows a parallel beam of light about to pass through the thin converging lens of the camera. F is the principal focus on each side of the lens. Complete Fig. 9.3 to show the action of the lens on the beam. Draw the three rays on the other side of the lens.

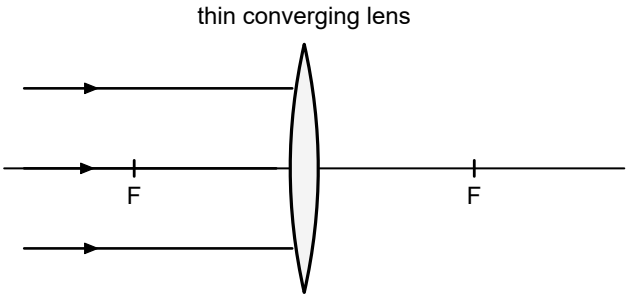


Fig. 9.3

[2]

[Total: 5]

10 The screen of an old computer monitor attracts dust after it has been wiped with a dry cloth. The monitor contains a speaker. Fig. 10.1 shows part of the speaker circuit. The battery has an e.m.f. of 6.0 V.

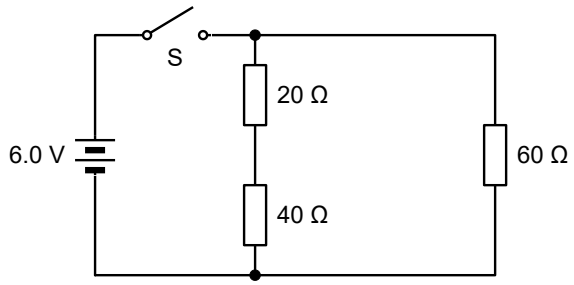


Fig. 10.1

(a) The wiping gives the screen an electric charge. State the unit in which charge is measured, and name the two kinds of electric charge.

.....

..... [1]

(b) Calculate the effective resistance of the three resistors in Fig. 10.1.

resistance = ... Ω [1]

(c) Calculate the potential difference across the 20 Ω resistor when the switch is closed.

potential difference = ... V [2]

[Total: 4]

11 A server room has a rack of servers. The servers are connected to the 230 V mains supply through a circuit breaker.

(a) State the electrical hazard caused by

(i) a technician plugging six high-power servers into one multi-way adaptor that is connected to a single wall socket,

.....

..... [1]

(ii) a cable behind the rack, the insulation of which has been gnawed away by a rat so that the wire is exposed.

.....

..... [1]

(b) The cable of one server contains three wires, P, Q and R. Table 11.1 describes each wire. Complete Table 11.1 by naming each wire as live, neutral or earth.

Table 11.1

Wire	Description	Name of wire (live, neutral or earth)
P	carries both the high voltage and the current to the appliance	
Q	is kept at zero voltage and completes the path for the current through the appliance	
R	is a safety wire that is connected to the metal case of the appliance	

[2]

(c) A fault inside one server makes the live wire touch the metal case of the server. A very large current flows and the circuit breaker trips. Explain why it is important that the circuit breaker is connected to the live wire, with reference to the metal case.

.....

.....

.....

..... [1]

[Total: 5]

12 A technician repairing a phone uses a screwdriver with a strong magnet in its tip to pick up tiny steel screws.

(a) A steel screw is not a magnet, but it is attracted when it is placed close to the magnet in the screwdriver. Describe how the screw becomes magnetised and explain why it is attracted.

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..... [2]

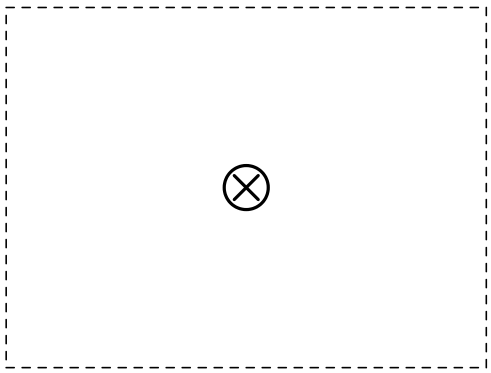
(b) Fig. 12.1 shows two bar magnets with unlike poles facing each other. Draw the magnetic field pattern between the poles of the two magnets. Include at least three field lines and their directions.



Fig. 12.1

[1]

(c) The speaker of the phone is connected by a cable. Fig. 12.2 shows the end view of a straight wire in the cable. The current in the wire is into the paper. On Fig. 12.2, draw the magnetic field pattern due to the current, and state what happens to the field when the current is increased.



wire (current into the paper)

Fig. 12.2

.....

..... [2]

[Total: 5]

13 Polonium-210 is a trace impurity in the packaging of some memory chips. It decays to lead-206. Lead also exists as lead-208. A nucleus of lead-206 has proton number 82 and nucleon number 206.

(a) **(i)** Calculate the number of neutrons in a nucleus of lead-208.

number of neutrons = ... [1]

(ii) Explain why lead-206 and lead-208 are called isotopes of lead.

.....

.....

..... [1]

(b) **(i)** State what is meant by background radiation.

.....

..... [1]

(ii) A student says that most background radiation comes from computers and phones. Explain why she is wrong.

.....

.....

..... [1]

[Total: 4]

Section B

Answer **one** question from this section.

14 A smartphone is charged from a power bank. The phone also uses signals from a router. A student uses a ripple tank to model how the router signal spreads.

(a) The power bank supplies a constant current of 1.5 A through the charging cable.

(i) State what is meant by electric current, and state the unit in which it is measured.

.....

.....

..... [2]

(ii) The phone needs 5400 C of charge to be fully charged. Use your answer to (i) to calculate the time, in minutes, that the power bank takes to supply this charge.

time = ... minutes [1]

(b) The e.m.f. of the battery in the phone is 3.7 V. State the unit in which e.m.f. is measured, and explain what an e.m.f. of 3.7 V means.

.....

.....

.....

..... [2]

(c) A small cork floats on the water in the ripple tank, some distance from the dipper bar.

(i) As the waves pass, the cork bobs up and down but stays at about the same distance from the dipper bar. State what this shows about what a wave transfers and what it does not transfer.

.....

..... [1]

(ii) The dipper bar makes straight wavefronts. State what is meant by a wavefront.

.....

..... [1]

(d) Fig. 14.1 is a plan view of the tank at one instant. The distance between the first and the sixth wavefront is 10.0 cm. The dipper bar makes 40 vibrations in 5.0 s. Calculate the speed of the water waves.

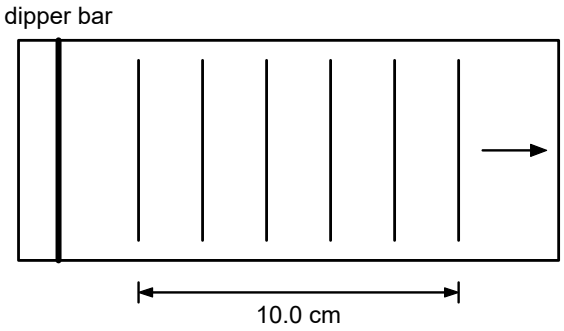


Fig. 14.1

speed = ... cm/s [3]

[Total: 10]

15 A phone rests on a sloping charging stand. In Fig. 15.1 the phone is the shaded rectangle.

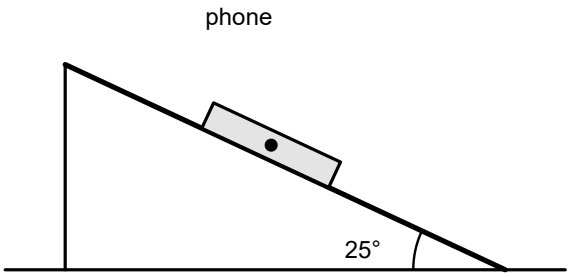


Fig. 15.1

(a) On Fig. 15.1, draw and label arrows from the centre of the phone to show the three forces acting on it.

[3]

(b) The phone stays at rest on the stand. When the stand is wiped with an oily cloth, the phone slides down. Explain the effect of friction in each case.

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..... [2]

(c) Later, the phone, of mass 0.20 kg, is dropped from a window 8.0 m above the ground. It hits the ground at a speed of 12 m/s.

(i) State the principle of the conservation of energy.

.....

..... [1]

(ii) Calculate the energy transferred to the surroundings by air resistance during the fall.

energy transferred = ... J [2]

(d) The battery of the phone stores 12 kJ of energy. A fast charger transfers this energy to the empty battery in 20 minutes. Calculate the average power supplied to the battery.

power = ... W [2]

[Total: 10]