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CANDIDATE NAME

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6038378503

PHYSICS **0625/41**

Paper 4 Theory (Extended) **May/June 2026**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

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[Turn over

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1 Figure 1.1 shows a student holding a rubber ball 1.4 m above a hard floor. The mass of the ball is 0.18 kg.

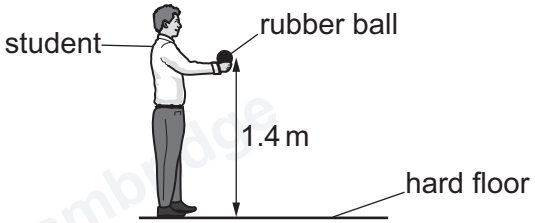

Figure 1.1

(a) State what is meant by the mass of the ball.

.....

..... [1]

(b) The student releases the ball. The ball accelerates downwards due to a force *W*.

(i) State the name of force *W*.

..... [1]

(ii) Calculate *W*. State the equation you use.

W = ... N [2]

(iii) The ball falls 1.4 m. Energy is transferred from the gravitational potential energy store of the ball.

Show that the energy transferred is 2.5 J.

[2]

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(iv) The energy in **1(b)(iii)** is all transferred to the kinetic energy store of the ball.

Calculate the velocity of the ball.

velocity = ... m/s [3]

(c) The ball hits the floor and moves upwards. The magnitude of the velocity is less than the value calculated in **1(b)(iv)**.

State **one** other way the velocity of the ball is different from the velocity calculated in **1(b)(iv)**.

..... [1]

[Total: 10]

2 A solid metal sphere has a volume of 31 cm^3.

(a) The mass of the metal sphere is 87 g.

Calculate the density of the metal. State the unit.

density = ... unit ..... [3]

(b) Describe how a student determines the volume of the sphere using a measuring cylinder.

.....

.....

.....

..... [3]

[Total: 6]

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3 **(a)** A student produces a transverse wave with a rope. The wave travels along the rope. Figure 3.1 shows the wave as seen from above.

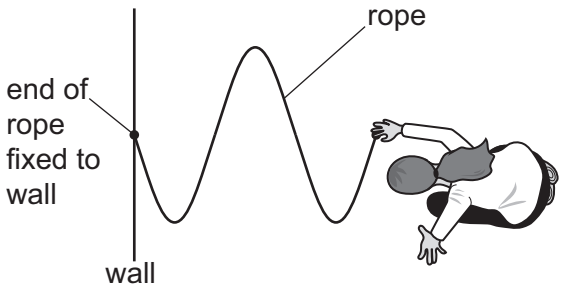

Figure 3.1

(i) Describe how the student produces the transverse wave.

.....

.....

..... [2]

(ii) The wavelength of the wave is 0.80 m.

Determine the distance between the wall and the student's hand.

distance = ... m [2]

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(b) A laser produces a beam of red light with a wavelength of 670 nm in air.

(i) State the approximate speed of light in air.

speed = ... m/s [1]

(ii) Calculate the frequency of the red light. State the unit.

frequency = ... unit ..... [3]

(iii) Complete the sentence.

Light of a single frequency is described as ..... light. [1]

[Total: 9]

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4 Three plotting compasses are placed in the magnetic field of a bar magnet. The circles in Figure 4.1 show the positions of the plotting compasses.

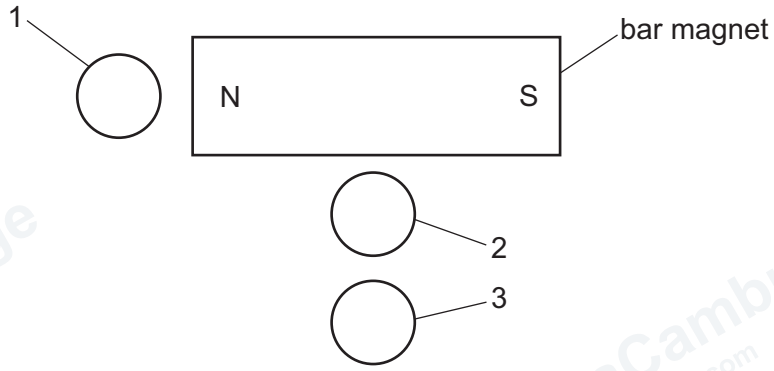

Figure 4.1

(a) State the effect that a magnetic field has on a magnetic pole.

..... [1]

(b) Figure 4.2 shows an arrow that represents the needle in a plotting compass. The needle points in the direction of the magnetic field.



Figure 4.2

On Figure 4.1, draw an arrow in each numbered circle to show the direction in which the compass needles point. [2]

(c) State how the magnetic field at circle 3 is different from the magnetic field at circle 2.

..... [1]

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(d) The bar magnet is moved into a coil of wire as shown in Figure 4.3.

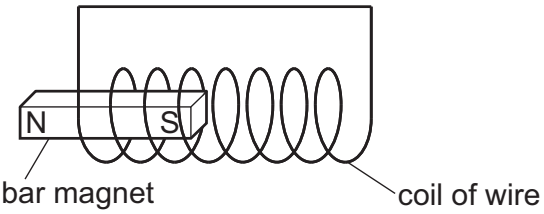

Figure 4.3

Complete the sentences to explain what happens.

As the magnet moves into the coil, the coil experiences a changing magnetic field. An e.m.f. is ..... in the coil. This causes a ..... in the coil which produces a magnetic field around the coil. The magnetic field opposes ..... .

[3]

[Total: 7]

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5 A box contains small dust particles suspended in air.

(a) The dust particles move in a random motion.

Complete the sentences to explain the motion of the dust particles.

Air molecules inside the box are very small and move freely. The air molecules also move ..... and ..... .

Air molecules hit dust particles causing the dust particles to ..... .

[3]

(b) The temperature of the air inside the box increases.

State and explain, in terms of particles, the effect on the air pressure inside the box.

statement .....

explanation .....

.....

.....

.....

[3]

(c) The air temperature inside the box is 296 K.

Calculate the air temperature in °C.

temperature = ... °C [1]

[Total: 7]

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6 A metal sphere is suspended vertically by an insulating thread. The sphere is charged. The charge causes an electric field around the sphere.

(a) Complete the definition of an electric field.

An electric field is a region where .....

experiences ..... .

[2]

(b) A negatively charged metal rod is brought close to the sphere. Figure 6.1 shows the charged rod and charged sphere.

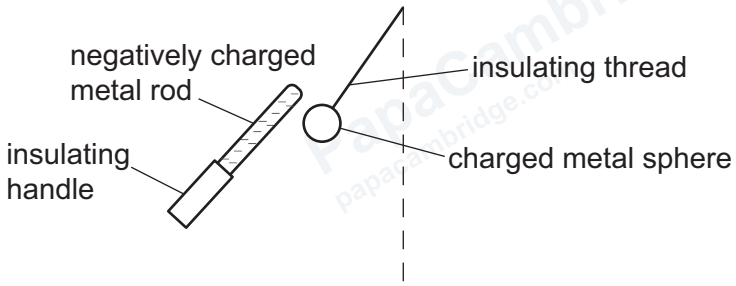

Figure 6.1

(i) State and explain whether the charge on the metal sphere is positive or negative.

statement .....

explanation .....

.....

[1]

(ii) The metal sphere touches the rod.

State what happens to the sphere. Explain this in terms of the movement of particles.

statement .....

explanation .....

.....

.....

[3]

[Total: 6]

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7 Figure 7.1 shows a battery of e.m.f. 6.5 V connected in series with a motor, a fixed resistor and a switch.

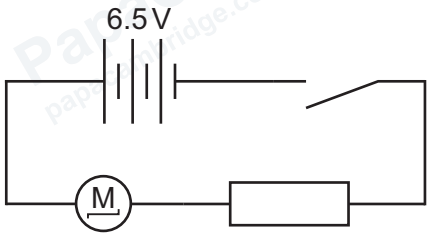

Figure 7.1

(a) Complete the equation that defines e.m.f. E.

E =

[1]

(b) The switch is closed. The battery moves 4300 C around the circuit in 1.8 h.

(i) Calculate the work done by the battery.

work done = ... J [2]

(ii) Complete the equation that defines electric current I.

I =

[1]

(iii) Show that the current in the motor is 0.66 A.

[1]

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(iv) The resistance of the fixed resistor is 2.5 Ω.

Calculate the p.d. across the motor.

p.d. across motor = ... V [3]

[Total: 8]

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8 Figure 8.1 shows a person cutting grass with a lawnmower.



Figure 8.1

The lawnmower is connected to the mains supply of 230 V. The power of the lawnmower is 1200 W.

(a) (i) Calculate the current in the lawnmower.

current = ... A [2]

(ii) The lawnmower circuit contains a trip switch.

Explain the purpose of the trip switch.

.....

.....

..... [2]

(iii) State **one** advantage of using a trip switch instead of a fuse in the lawnmower circuit.

..... [1]

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(b) A person uses the lawnmower for 0.75 h. One kilowatt-hour of energy costs $0.34.

(i) Calculate the energy transferred to the lawnmower in 0.75 h. Give your answer in kW h.

energy = ... kW h [3]

(ii) Calculate the cost of the energy calculated in **8(b)(i)**.

cost = $ ..... [1]

[Total: 9]

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9 A beam of white light is dispersed in a glass prism. Figure 9.1 shows the paths taken by green, indigo, red and yellow light.

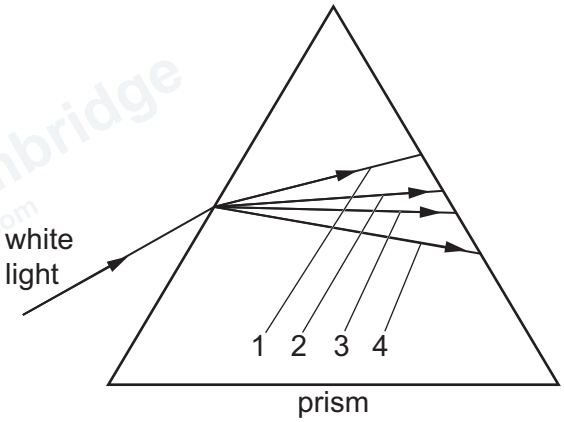

Figure 9.1

(a) (i) State which of the rays, 1, 2, 3 or 4, is:

- the green ray .....
- the red ray. .....

[2]

(ii) The light leaves the prism.

On Figure 9.1, continue ray 1 and ray 4 to show the path of light in the air. [2]

(b) (i) The Sun emits most of its energy in three regions of the electromagnetic spectrum. Visible light is one region.

State the other **two** regions.

1 .....

2 .....

[1]

(ii) The Sun is a star in the Milky Way galaxy.

State the approximate diameter of the Milky Way. Give your answer in light-years.

diameter = ... light-years [1]

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(c) Scientists on the Earth observe light emitted by a distant galaxy. The observed light is redshifted.

(i) State what is meant by redshifted.

.....

..... [1]

(ii) Explain how redshift supports the Big Bang Theory.

.....

.....

..... [2]

[Total: 9]

Question 10 is on the back page.

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10 Nuclear power stations use uranium as the fuel.

(a) An isotope of uranium has 92 protons and 143 neutrons in each nucleus.

Complete the nuclide notation for this isotope.

.....
U
.....

[2]

(b) Complete the following sentences:

In a nuclear reactor, a slow-moving ..... hits a uranium nucleus.

This causes the uranium nucleus to split into smaller ..... .

This reaction is called nuclear ..... .

The reaction releases a large amount of energy.

This energy heats ..... to drive a turbine which turns a

..... to produce electricity.

[3]

(c) Step-up transformers produce high-voltage electricity that is transmitted from the power station to consumers far away from the power station.

(i) Explain why the power loss in the cables during electricity transmission is smaller when the transmission is at a high voltage.

.....

.....

..... [2]

(ii) A transformer in the power station steps up the voltage from 25 000 V to 400 000 V. The transformer has 240 turns on the primary coil.

Calculate the number of turns on the secondary coil of the transformer.

number of turns = ... [2]

[Total: 9]

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