

Physics 2
0580

GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination

JUNE XXXX

ORDINARY LEVEL

Subject Title	Physics
Paper No.	2
Subject Code No.	0580

Duration: Two and a Half Hours

Answer ALL questions.

Section I is designed to be answered in 1 ½ hours and Section 2 in 1 hour.

You are advised to divide your time accordingly.

In section II answer EITHER the a, b and c OR the d, e, and f of each question

For your guidance the approximate mark for each part of a question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

In calculations you are advised to show all the steps in your working, giving your answer at each stage.

Where necessary, assume:

- the acceleration of free fall, $g = 10 \text{ m s}^{-2}$*
- the speed of light in air, $c = 3 \times 10^8 \text{ m s}^{-1}$*
- the charge on an electron, $e = 1.6 \times 10^{-19} \text{ C}$*

Calculators are allowed.

Turn over

SECTION I (1 ½ hours)

Answer all the questions

1. Figure 1 shows how an instrument, X, is used to measure a physical quantity, the length of a book.

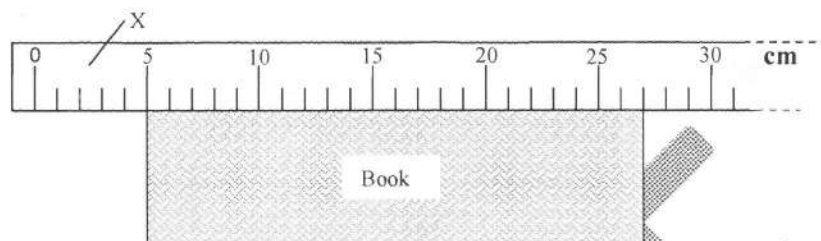


Figure 1

- (a) Define physical quantity. (2 marks)
- (b) Name the instrument, X. (1 mark)
- (c) From the diagram, determine the length of the book. (3 marks)
-
2. One of the methods by which heat can be transmitted is by convection.
- (a) Define convection. (2 marks)
- (b) Explain one daily situation where convection occurs. (2 marks)
- (c) Name two other methods by which heat energy is transmitted. (2 marks)
-
3. (a) An n-type semiconductor is produced by doping a piece of pure silicon.
- (i) Define doping. (2 marks)
- (ii) Name a dopant that can be used in the process. (1 mark)
- (iii) State the effect of doping on the conductivity of a semiconductor. (1 mark)
- (b) Carbon-14 ($^{14}_6\text{C}$) has a half-life of 5700 years and decays by emitting a beta particle ($^0_{-1}\beta$) to an element N.
- (i) Define half-life. (2 marks)
- (ii) How long will it take for the count rate of a sample of carbon-14 to drop from 2000 counts min^{-1} to 500 counts min^{-1} ? (3 marks)
- (iii) Write a balanced equation for the decay of a carbon-14 nucleus. (2 marks)
-
4. (a) Magnetic materials can be classified as either hard or soft magnetic materials.
- (i) What do you understand by a soft magnetic material? (2 marks)
- (ii) Name an example of a soft magnetic material. (1 mark)
- (iii) Name one device that makes use of a soft magnetic material. (1 mark)

- (b) Figure 2 shows a transformer which has an input a.c voltage of 240 V. It has 4000 turns in the primary coil and 250 turns in secondary. The transformer is used to operate a small radio set.

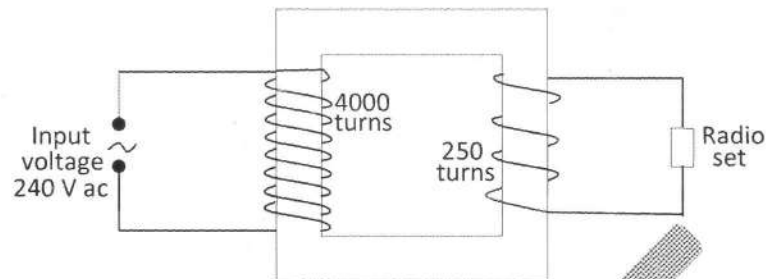


Figure 2

- (i) Identify with a reason the type of transformer in figure 2. (2 marks)
- (ii) Using the information on the diagram, calculate the output voltage. (3 marks)
- (iii) State two sources of energy lost in the transformer. (2 marks)

- (5) Figure 3 shows a uniform bar of length 100 cm and weight 20 N pivoted at the 30 cm mark. A load X is placed at the end of the bar closer to the pivot to balance the weight of the bar.

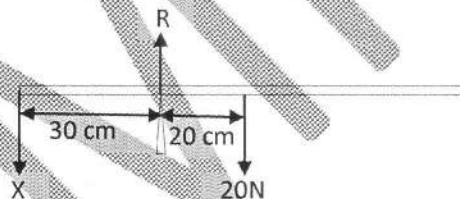


Figure 3

- (a) Define moment. (2 marks)
- (b) State two conditions necessary for the system to be in equilibrium. (2 marks)
- (c) Determine the value of the load, X. (3 marks)
- (d) Determine the reaction force, R, exerted by the pivot on the bar. (3 marks)

- (6)(a) A polythene rod is charged by rubbing it with a piece of dry cloth.

- (i) Name the type of charge acquired by the rod. (1 mark)
- (ii) Explain the origin of the charge on the rod. (2 marks)
- (iii) Name two other methods by which the rod could have been charged. (2 marks)

- (b) Calculate the total charge that flows round a circuit in 180 s when the current in the circuit is 8 A. (3 marks)

- (7) A dam used to power a hydroelectric power plant has a water height of 80 m above the turbines. It is noticed that 500 kg of water from the dam falls on the turbines every second.
- (a) Calculate the potential energy of the 500 kg of water at the top of the turbines given that the acceleration due to gravity, $g = 10 \text{ m s}^{-2}$. (3 marks)
- (b) Given that the power plant produces 300,000 J of electrical energy per second, calculate its efficiency. (3 marks)
- (c) State two hazards that may result from a careless use of electricity. (2 marks)
-

SECTION II (1 hour)

Answer all the questions choosing, EITHER the a, b and c OR the d, e and f of each question.

Answer EITHER 8 a, b and c

- (8)(a) (i) Define refractive index. (2 marks)
- (ii) Describe an experiment you can use to measure the refractive index of water.
- Your description should include:
- a labelled diagram of the experimental set-up
 - the procedure you will follow
 - the data you will collect
 - how you will calculate the value of the refractive index of water
 - any precaution you will take to ensure better results. (8 marks)
- (b) (i) Define critical angle. (2 marks)
- (ii) State the conditions necessary for total internal reflection to occur. (2 marks)
- (iii) A glass block has a refractive index of 1.5. Calculate the critical angle of the glass material. (3 marks)
- (c) (i) Define resonance. (2 marks)
- (ii) Give one application of resonance. (1 mark)
-

OR 8 d, e and f

8. (d) (i) Define acceleration.

(2 marks)

(ii) Describe an experiment you can use to measure the acceleration due to gravity. Your description should include:

- a labelled diagram of the experimental set-up
- the procedure you will follow
- the data you will collect
- how you will calculate the value of the acceleration due to gravity.
- any precaution you will take to ensure better results.

(8 marks)

(e) (i) State the law of conservation of linear momentum.

(2 marks)

(ii) A car of mass 2000 kg moving with a velocity of 15 m s^{-1} collides with a stationary car of mass 1000 kg . After the collision, the two cars stick together and move with a common velocity. Calculate the common velocity with which the locked cars move.

(3 marks)

(iii) Describe one other daily situation where the law of conservation of linear momentum applies.

(2 marks)

(f) (i) State Newton's first law of motion.

(2 marks)

(ii) Give one daily application of the law you have stated in f(i).

(1 mark)

Answer EITHER 9 a, b and c

9. (a) (i) State Hooke's law.

(2 marks)

In an experiment to verify Hooke's law, a certain material was stretched using different forces (F) and the corresponding extensions (e) measured. The results are recorded in the table below.

F/N	10	20	30	40	50	60
e/mm	9	22	34	44	56	66

(ii) Plot a graph of force (y-axis) against extension (x-axis).

(6 marks)

(iii) Determine the slope of your graph.

(3 marks)

(iv) From your graph, explain if the material obeys Hooke's law.

(2 marks)

(b) (i) Define pressure.

(2 marks)

(ii) State two factors that affect the pressure exerted by a liquid.

(2 marks)

(c) (i) Define density.

(2 marks)

(ii) Give one use of density in daily life.

(1 mark)

OR 9 d, e and f

(d) (i) State Ohm's law.

(2 marks)

In an experiment to verify Ohm's law, different p.ds (V) was applied across the ends of a conductor and the corresponding currents (I) flowing through it were measured. The results are recorded in the table below.

V/V	15	30	45	60	75	90
I/A	11	21	32	44	56	64

(ii) Plot a graph of p.d (y-axis) against current (x-axis).

(6 marks)

(iii) Determine the slope of your graph.

(3 marks)

(iv) From your graph, explain if the material obeys Ohm's law.

(2 marks)

(e) (i) Define electrical resistance.

(2 marks)

(ii) State two factors that affect the resistance of a wire.

(2 marks)

(f) (i) Define electromotive force (emf).

(2 marks)

(ii) Name one source of emf.

(1 mark)