

232/2

— **PHYSICS** —
(THEORY)

Paper 2



Apr. 2021 – 2 hours

Name Index Number

Candidate's Signature Date

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in sections **A** and **B** in the spaces provided.
- (e) **All** working **must** be clearly shown in the spaces provided in this booklet.
- (f) Non-programmable silent electronic calculators may be used.
- (g) **This paper consists of 14 printed pages.**
- (h) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (i) **Candidates should answer the questions in English.**

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Section	Question	Maximum Score	Candidate's Score
A	1–13	25	
B	14	9	
	15	11	
	16	11	
	17	13	
	18	11	
Total Score		80	

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SECTION A (25 marks)

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

- 1. State the observation made on the image in a pin hole camera when the distance between the object and the pin hole is reduced. (2 marks)

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- 2. Figure 1 shows a gold leaf electroscope.

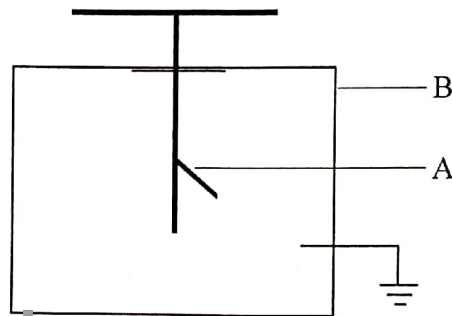


Figure 1

- (a) Name the part labelled A. (1 mark)

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- (b) State the function of the part labelled B. (1 mark)

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- 3. State **two** measurements that should be taken for one to decide whether a lead acid accumulator is due for charging. (2 marks)

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4. Explain what happens to the speed of a water wave as it moves from the shallow to the deep end in a ripple tank. (2 marks)

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5. The critical angle for a ray travelling from glass to air is 42° . Determine the refractive index of the glass. (3 marks)

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6. Figures 2(a) and 2(b) show two circuit diagrams with identical lamps and identical cells.

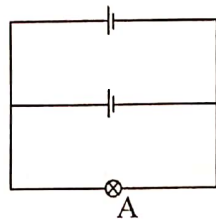


Figure 2(a)

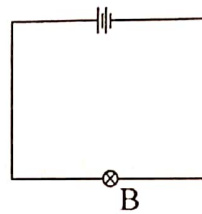


Figure 2(b)

State with a reason which of the bulbs will be brighter. (2 marks)

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7. Figure 3 shows an annular ring.

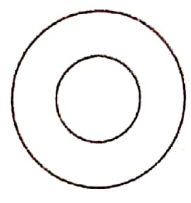


Figure 3

On the diagram, sketch the distribution of the charge on the ring, when the ring is negatively charged. (1 mark)

8. When iron filings are sprinkled onto a bar magnet, it is observed that there are more iron filings at the ends than in the middle. Explain this observation. (2 marks)

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9. Draw a diagram to show a *p-n junction* connected in the reverse bias mode. (2 marks)

10. A broadcasting station produces radio waves of wavelength 800 m. Determine their frequency. (speed of air is $3 \times 10^8 \text{ms}^{-1}$) (2 marks)

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11. Explain how x-rays are produced in the x-ray tube. (2 marks)

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12. State the purpose of a fuse in an electrical circuit. (1 mark)

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13. Figure 4 shows circular water waves incident on a plane reflector placed at an angle to the path of the waves.

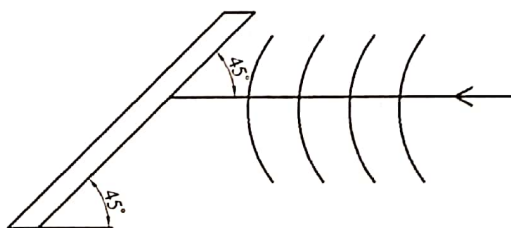


Figure 4

Complete the diagram to show the reflected waves. (2 marks)

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SECTION B (55 marks)

Answer all the questions in this section in the spaces provided.

14. (a) State **two** ways of minimising power losses during the transmission of electric power. (1 mark)

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- (b) An electric cooker is rated 2.5 kW, 250 V. State the meaning of these values. (1 mark)

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- (c) A consumer has the following appliances in the house:

- *An electric iron rated 1500 W*
- *A water heater rated 500 W*
- *An electric cooker rated 2500 W*
- *Three bulbs each rated 60 W.*

The house is fitted with a 12 A fuse. Determine:

- (i) whether the consumer can connect all the appliances to the 240 V power supply at the same time; (4 marks)

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(ii) the resistance of the heating element used in the electric cooker. (3 marks)

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15. (a) Describe how the focal length of a concave mirror can be determined using a screen and a metre rule. (1 mark)

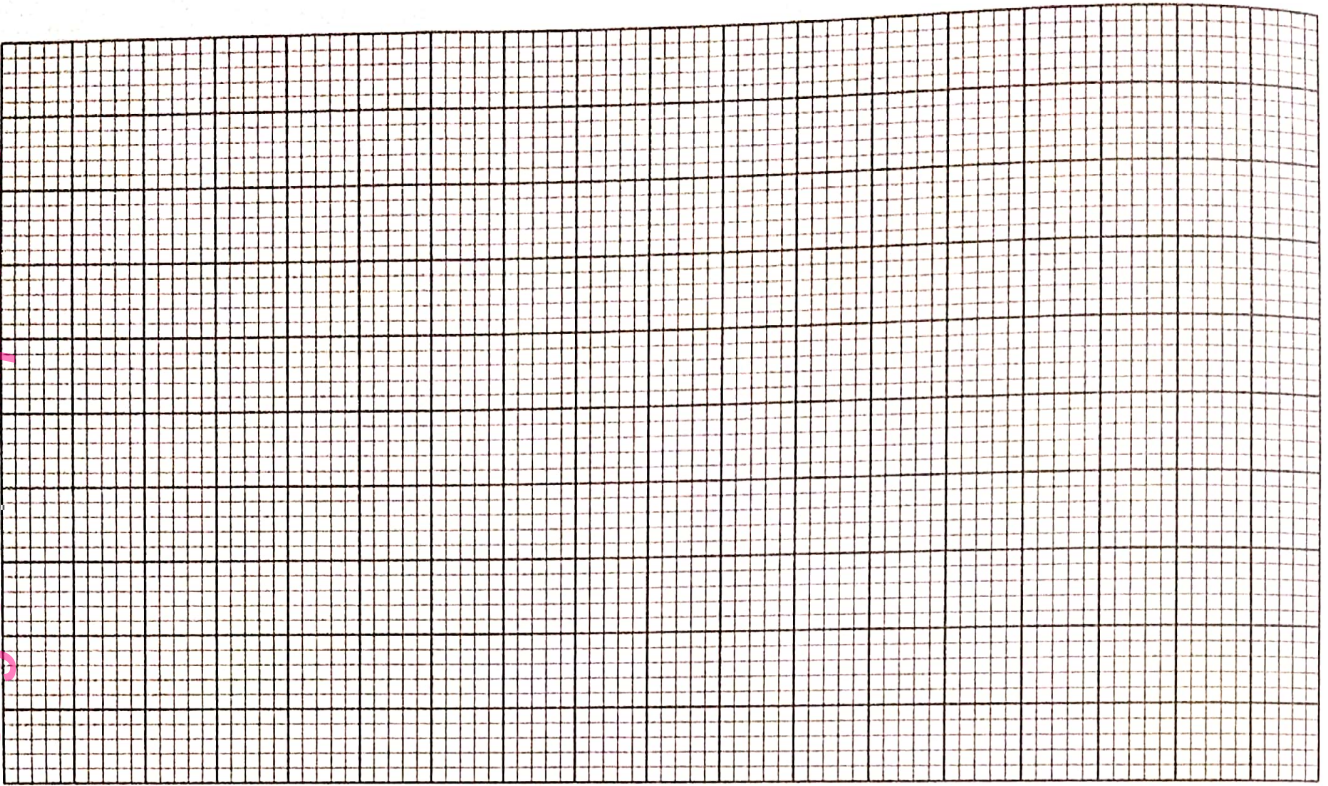
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(b) An object is placed 8 cm from a concave mirror whose radius of curvature is 20 cm. Determine the position of the image. (3 marks)

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- (c) An object of height 10 cm is placed 30 cm from a converging lens of focal length 18 cm.
- (i) On the grid provided, draw a ray diagram to locate the position of the image formed. (3 marks)



- (ii) From the diagram in part (i), determine the:

I. image height; (2 marks)

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II. image distance. (2 marks)

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16. (a) State **two** uses of radioactivity in medicine. (1 mark)

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(b) The following is a nuclear reaction equation: ${}^6_3\text{Li} + {}^1_0\text{n} \Rightarrow {}^3_1\text{H} + {}^x_y\text{P}$
 Determine the values of x and y . (2 marks)

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(c) **Figure 5** shows a radioactive element placed in an evacuated glass chamber. The element produces alpha, beta and gamma emissions.

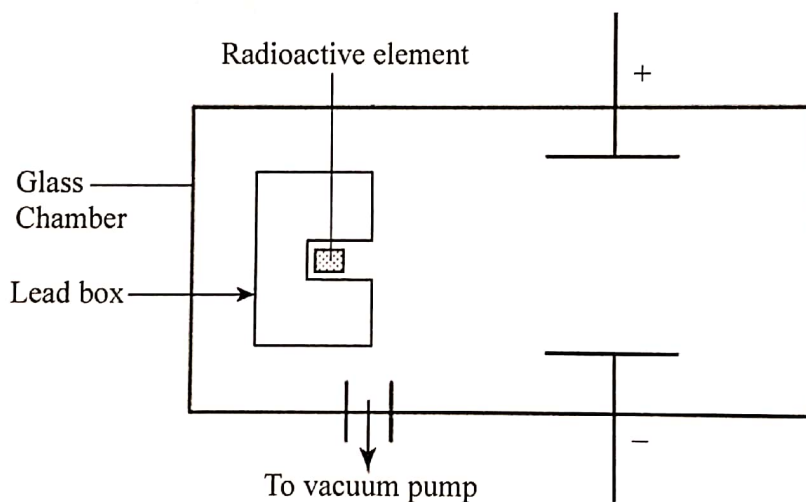


Figure 5

The three emissions pass through an electric field.

(i) Complete the diagram to show the path of each of the emissions. (3 marks)

(ii) State the reason why:

I. the radioactive element is kept inside a lead box; (1 mark)

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II. the chamber is evacuated.

(1 mark)

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(d) (i) Arrange the following electromagnetic waves in the order of decreasing frequency:

Microwaves; Gamma rays; Radiowaves; X-rays.

(1 mark)

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(ii) The half life of a certain radioactive substance is 24 days. Given that the initial sample of the substance has a mass of 64 g, determine the mass which is left after 72 days.

(2 marks)

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17. (a) (i) Name the **three** components of the electron gun in a cathode ray tube.

(3 marks)

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(ii) State **one** difference between the deflection systems of a cathode ray tube and the television tube. (1 mark)

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(b) **Figure 6** shows a graph of stopping potential against the frequency for a certain photo emissive surface, drawn by a student from the data collected when carrying out an experiment on photoelectric effect.

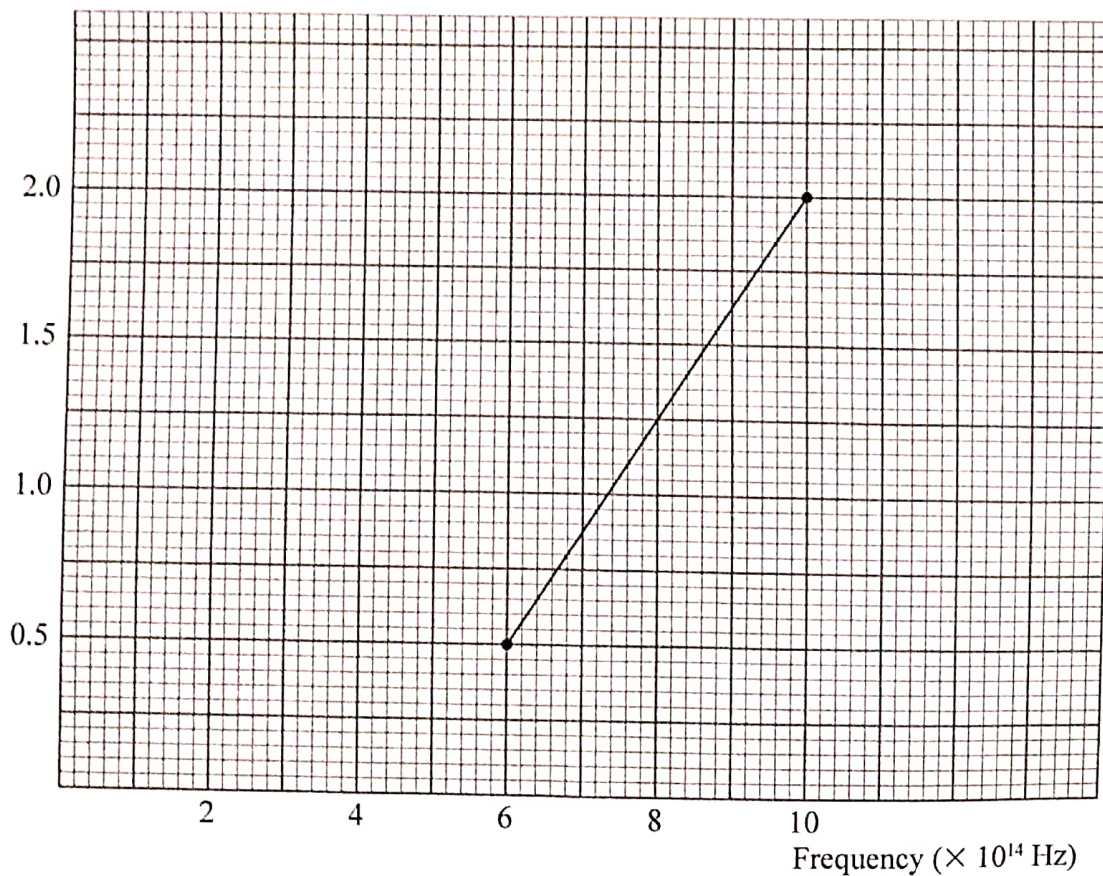


Figure 6

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From the graph, determine the:

(i) threshold frequency of the surface;

(3 marks)

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(ii) plank's constant h , given that the energy of the incident photon is $1.6 \times 10^{-19} \text{ J}$;

(3 marks)

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(iii) work function of the surface.

(3 marks)

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18. (a) **Figure 7** shows a soft iron ring placed between the poles of two bar magnets.

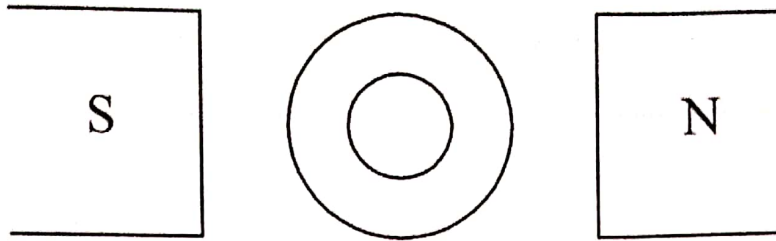


Figure 7

On the figure, draw the magnetic field lines between the poles. (2 marks)

- (b) **Figure 8** shows two straight conductors **P** and **Q** connected to a battery and a variable resistor.

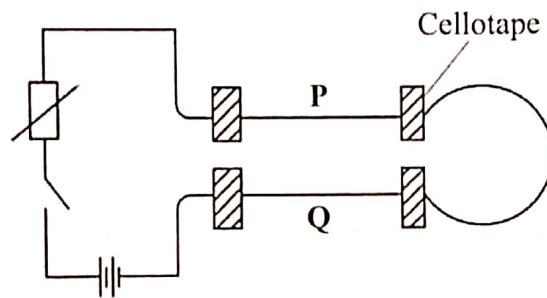


Figure 8

- (i) Using arrows, indicate on the diagram the direction of current that flows through **P** and **Q** when the switch is closed. (1 mark)
- (ii) State what is observed as the current flows through the conductors. (1 mark)

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(3 marks)

(iii) Explain the observation in (ii).

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(c) (i) State how eddy currents are minimised in a transformer.

(1 mark)

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(ii) A step down transformer has 600 turns in the primary coil. The input voltage is 120 V while the output voltage is 24 V. Determine the number of turns in the secondary coil. (3 marks)

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