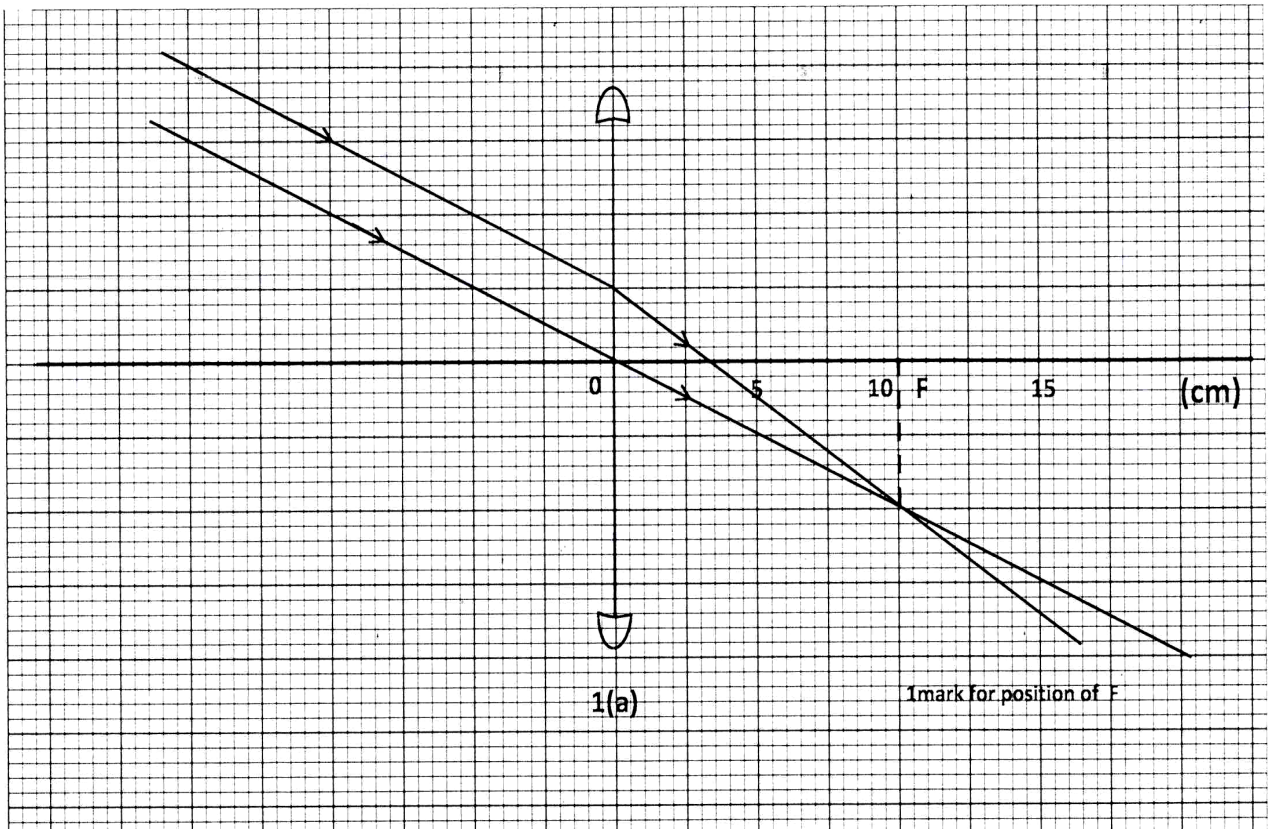
4.5.2 Physics Paper 2 (232/2)

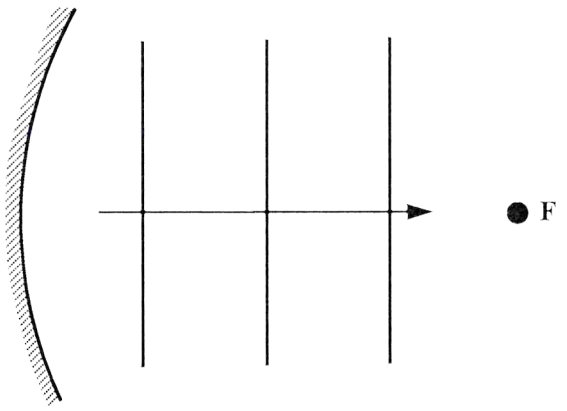
1. (a)



(b) Focal length = 10 cm. √1

2. The capacitance increases. (1 mark)

3.



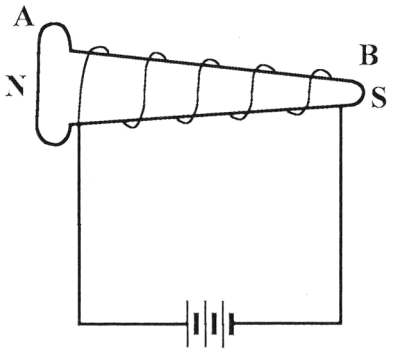
Approximately equally spaced lines √ 1

4. (a) $V = f\lambda$ √ 1

$\lambda = \frac{3.0 \times 10^8}{4 \times 10^6}$ √ 1

75 m√ 1

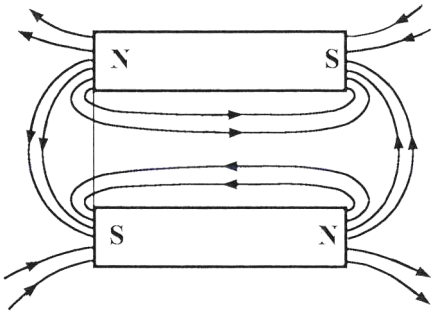
5.



✓ -correct winding (1)

6. (a) Electrons arbsorb enough energy and are ejected√ leaving the electroscope positively charged √ the leaf is repelled by the stem. √

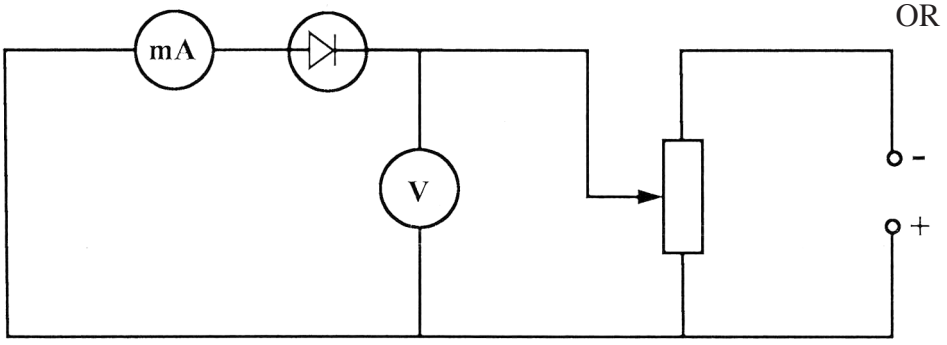
7.



Correct polarity on each magnet

8.

OR equivalent



1 mark for correct bias
1 mark for both ammeter and voltmeter
1 mark for means of varying the p.d. across the diode.

9. $^{226}_{88}Ra \longrightarrow {}^{4}_{2}He + {}^{x}_{y}Q$

(a) $4 + x = 226$
$x = 222\surd$ 1

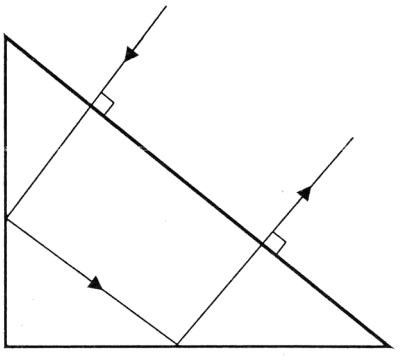
(b) $2 + y = 88$
$y = 86\surd$ 1

10. - estimate the quantity of charge √1
- test for insulating properties √1
- test for the sign of charge √1
- test for presence of charge √1

(any two correct)

11. It stops the fast moving electrons √ whose kinetic energy is converted to heat.

12.



1 mark for ray incident on hypotenuse

1 mark for showing two internal reflections

13. $Q = 1t$
$n = \frac{Q}{e}$
} 1 mark for either formula

$= \frac{2.0 \times 10^{-4} \times 1}{1.6 \times 10^{-19}}$ 1 mark for substitution

$= 1.25 \times 10^{15}$ electrons 1 mark for answer

SECTION B

14. (a) (i) I D - soft iron armature √ 1

II E - contacts √ 1

(ii) I. Soft iron core is magnetised √ and 1
attracts the armature √ the hammer hits 1
the gong.

II. Contact is broken √ when armature is 1
attracted by the core. The core then loses magnetism. √ 1
The armature loses magnetism and √ springs back making
contact again and the process is repeated.

(b) (i) $I = \frac{P}{V}$ √ 1

$= \frac{60}{240}$ √ 1

$= 0.25A$ √ 1

(ii) $R = \frac{V}{I}$ √ 1

$R = \frac{240 \times 240}{60}$ √ OR $\frac{240}{0.25}$ 1

$R = 960\,\Omega$ √ 1

15. (a) (i) resistance in the coils. √ 1

(ii) use of thicker copper wires. √ 1

(b) (i) $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ √ 1

$= \frac{240}{12}$ √ 1

$= \frac{20}{1}$ √ 1

(ii) Power input $= V_p I_p$ √ 1

$= 240 \times 0.36$ √ 1

$= 86.4W$ √ 1

(iii) Power output = 80W √ 1

(iv) Efficiency $\frac{power\ output}{power\ input}$ √ 1

$= \frac{80}{86.4}$

$= 92.59\%$ √ 1

16. (a) (i) (I) $I_1 = \frac{V}{R_1}$ √ 1

(II) $I_2 = \frac{V}{R_2}$ √ 1

(III) $I_T = I_1 + I_2$

$I_T = \frac{V}{R_1} + \frac{V}{R_2}$ √ 1

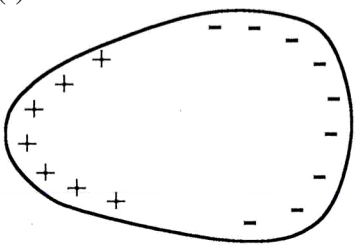
(iii) $I_T = \frac{V}{R_T}$ √ 1

$\frac{V}{R_T} = \frac{V}{R_1} + \frac{V}{R_2}$ √ 1

divide through by V

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$, hence $R_T = \frac{R_1 R_2}{R_1 + R_2}$

(b) (i)



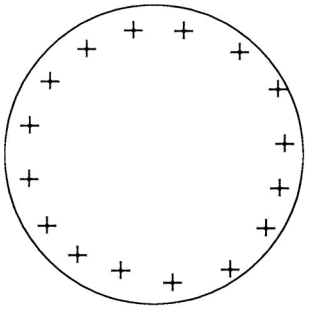
✓ - concentration of positive charges at sharp end — 1

✓ +ve & -ve charges in correct position — 1

(ii) (I) The conductor loses the negative charges to earth. √ 1

(II) The conductor acquires a net √ positive charge/which redistributes itself.

(iii)



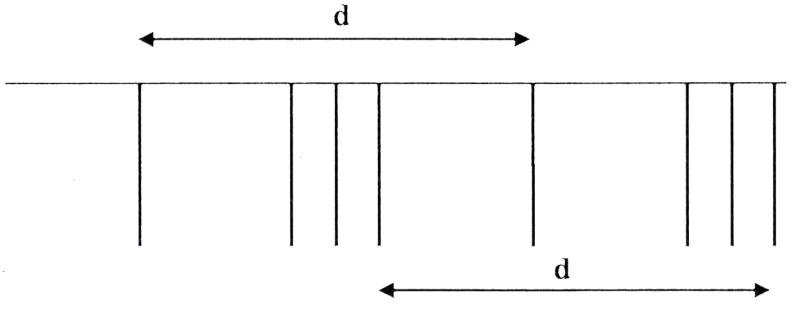
✓ +ve charges uniformly distributed — 1

17. (a) (i) (I) sound is soft when the waves arrive out of phase; √ 1
such waves undergo destructive interference. 1

(ii) same sound - loud. √ 1

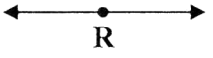
Along PQ the waves undergo 1
constructive intereference as they arrive in phase. √ 1

(b) (i)



✓ -any correct d — 1

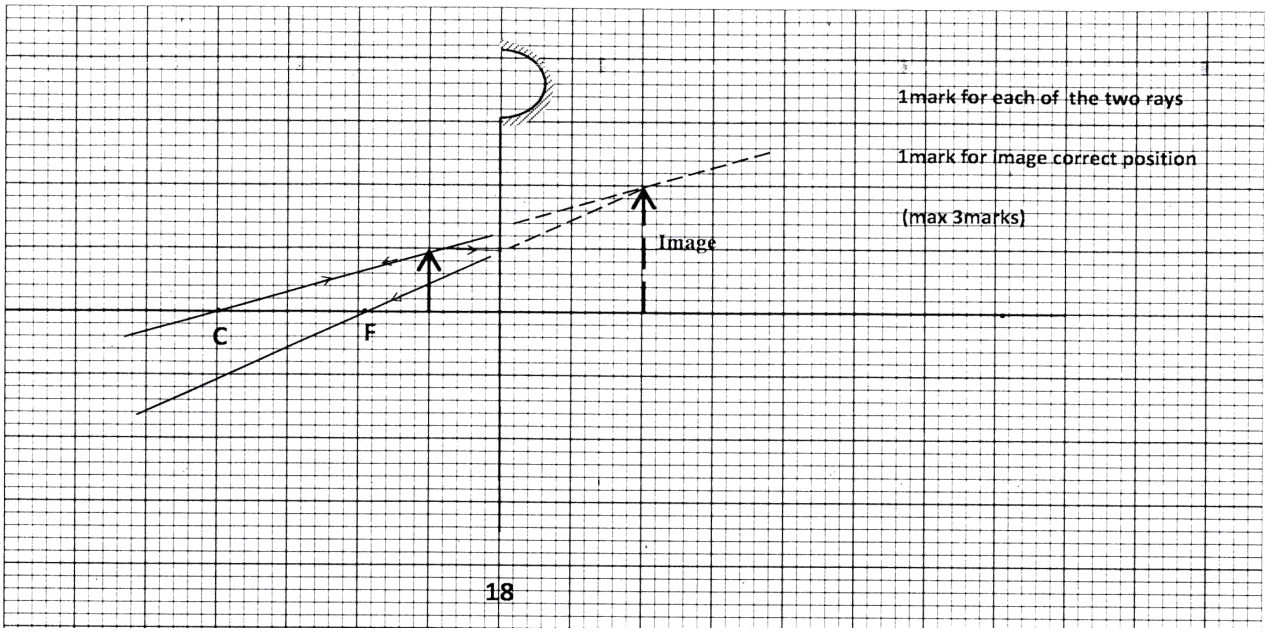
(ii)



√ 1

(iii) As the longitudinal waves pass √ molecule R moves along to either side. 1
For a crest, R moves away from source.

18.



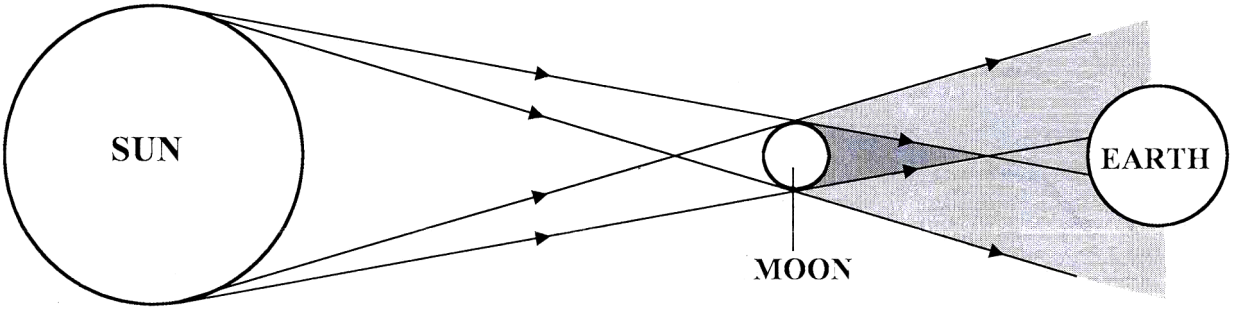
(ii) (I) image distance = 20 cm ± 2 cm √ 1

(II) magnification $= \frac{Image\ dis\tan ce}{Object\ dis\tan ce}$ √ 1

$= \frac{20}{10}$ √ 1

$= 2 \pm 0.2$ √ 1

(iii) Infinity. √ 1



- Outer pair of rays √
- Inner pair of rays √
- proper labelling of umbra and penumbra √