19. (a) (i) (I) Volume of water displaced = 2×5 √(1)

= $10\ cm^3$ √(1)

(II) Mass = Volume × density √(1)

= 10×1

= 0.01 kg √(1)

∴weight = 0.01×10 √(1)

= 0.1 N √(1)

(ii) Combined weight = upthrust

= 0.1 N √(1)

(iii) Weight of liquid displaced = 0.1N

Mass of liquid displaced = 0.01 kg = 10 g √(1)

Volume of liquid displaced = $\frac{mass}{density}$ = $\frac{10}{0.8}$

= $12.5\ cm^3$ √(1)

∴ Length submerged = $2l$ = 12.5

(C.S A × l = volume)

$0.8l = 10$ √(1)

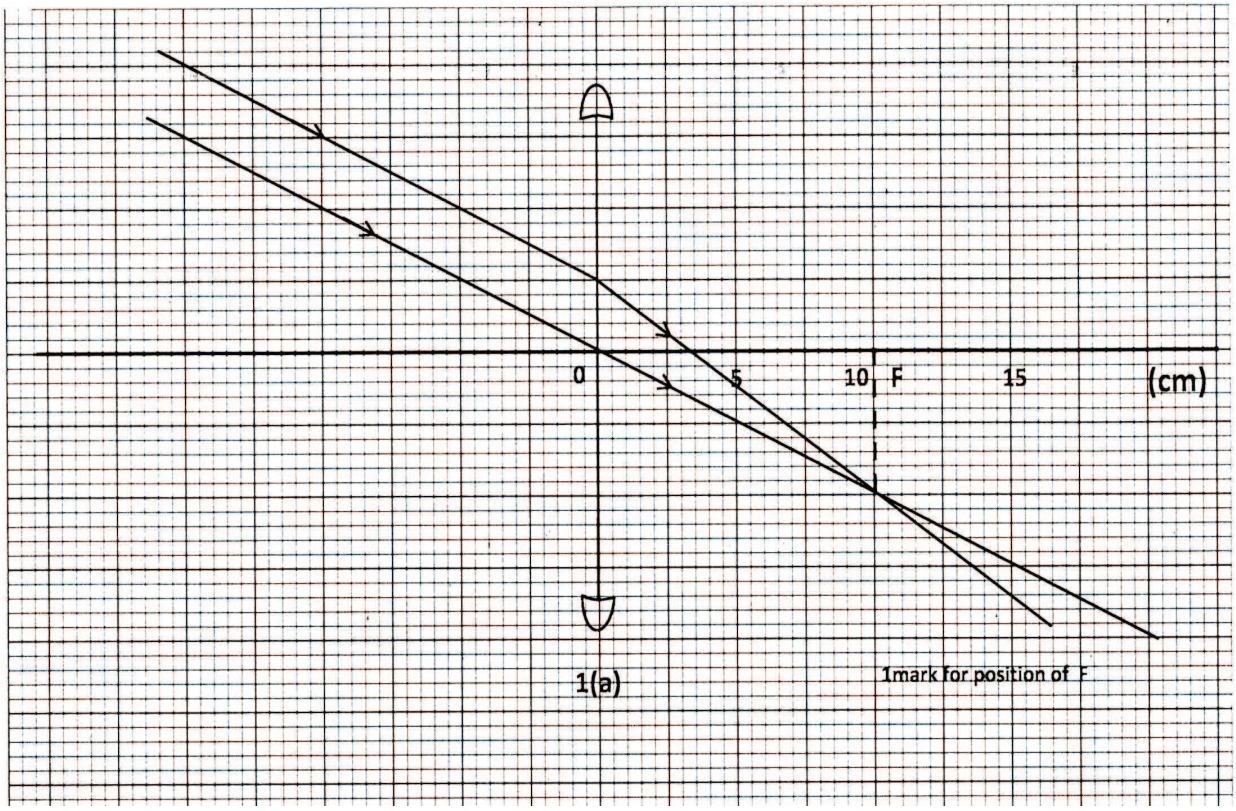
$l = \frac{10}{0.8}$

= 6.25 cm √(1)

(b) Use a narrower test tube. √(1)

4.5.2 Physics Paper 2 (232/2)

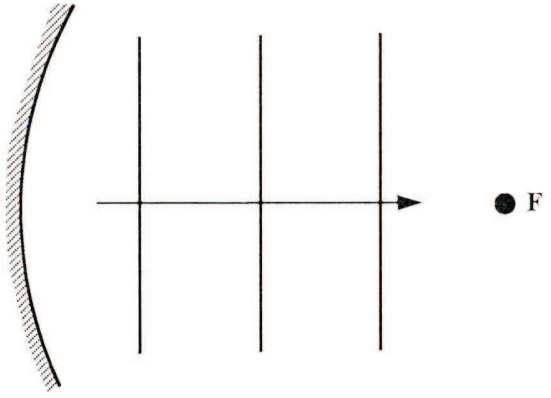
1. (a)



(b) Focal length = 10 cm. √1

2. The capacitance increases. (1 mark)

3.



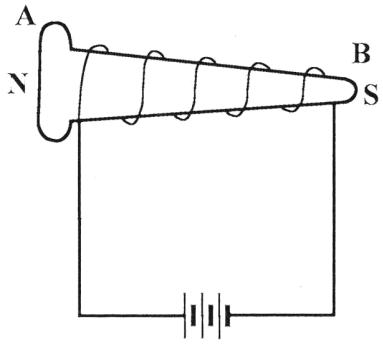
Approximately equally spaced lines √ 1

4. (a) $V = f\lambda$ √ 1

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

75 m√ 1

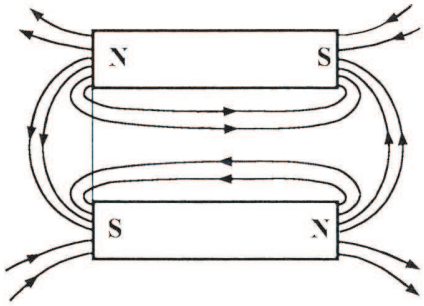
5.



✓ -correct winding (1)

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

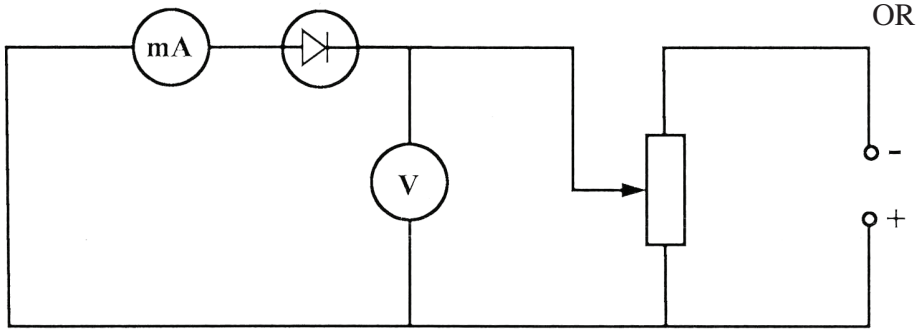
7.



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

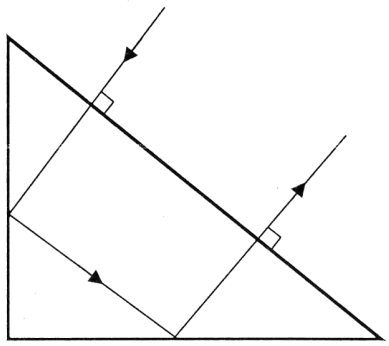
(b) $2 + y = 88$
$y = 86\surd$ 1

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

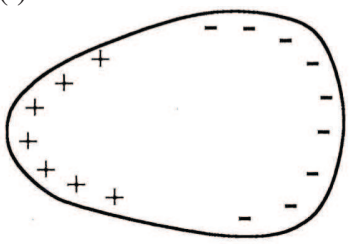
(iii) $I_T = \frac{V}{R_T}$ √ 1

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



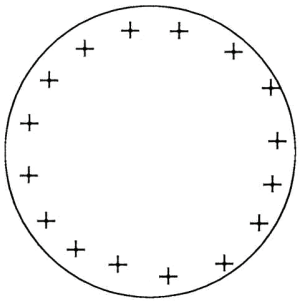
✓ - concentration of positive charges at sharp end 1

✓ +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)



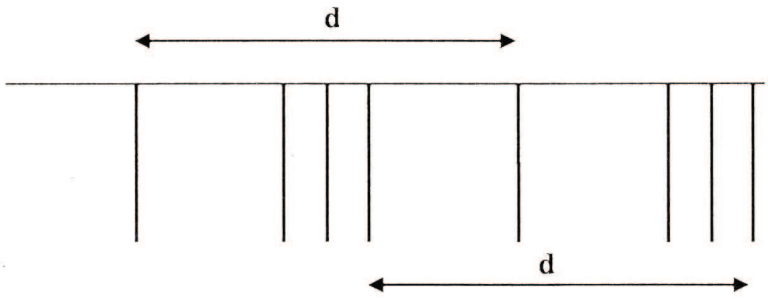
✓ +ve charges uniformly distributed 1

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

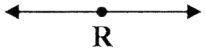
Along PQ the waves undergo 1
constructive intereference as they arrive in phase. √ 1

(b) (i)



✓ -any correct d 1

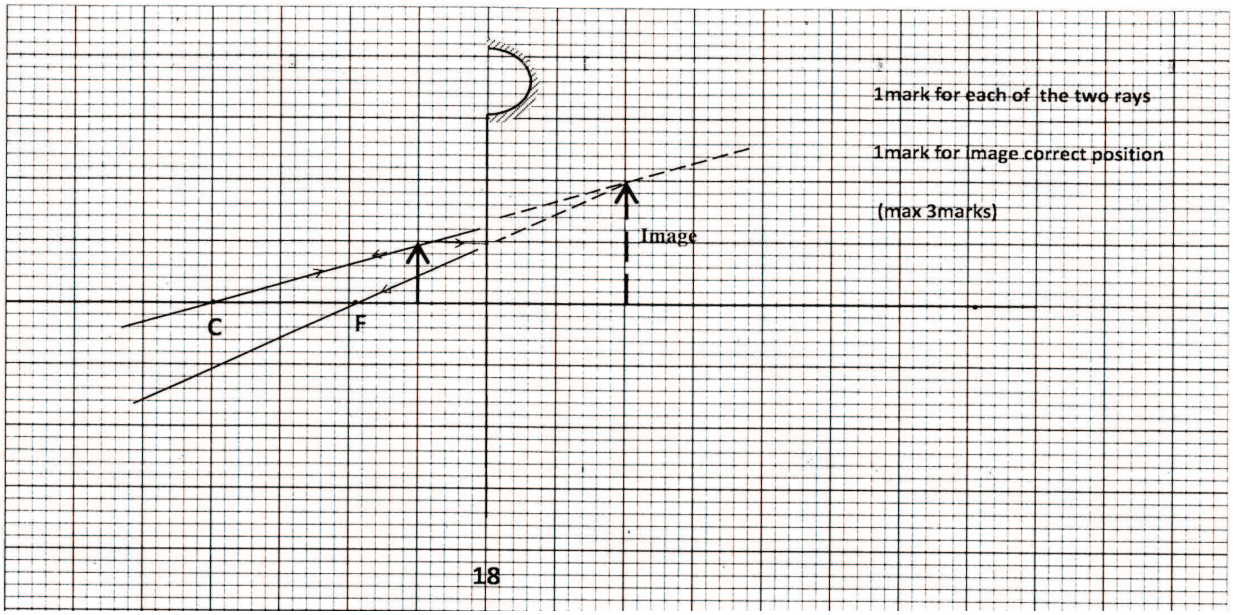
(ii)



√ 1

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

18.



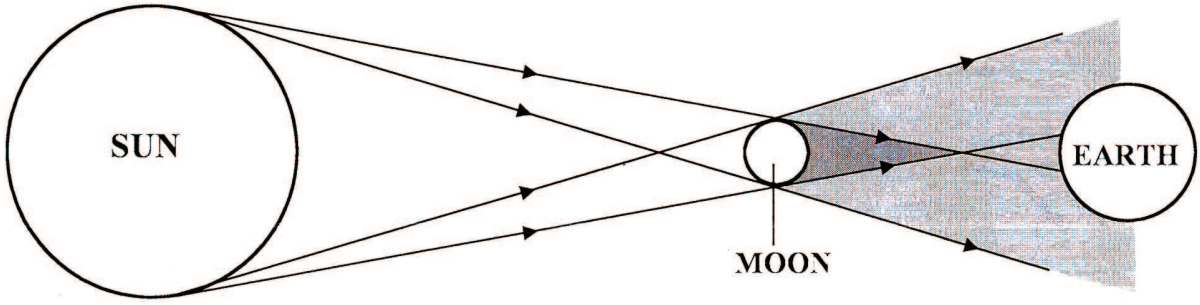
(ii) (I) image distance = 20 cm ± 2 cm √ 1

(II) magnification $= \frac{Image\ distance}{Object\ distance}$ √ 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 √

4.5.3 Physics Paper 3 (232/3)

QUESTION ONE PART A

(a) (i) D = 0.38 mm ± 0.02 (1 mark)

(ii) d = 0.28 mm ± 0.05 (1 mark)

(b) $C_1 = \frac{D}{d} = \frac{0.38}{0.28} = 1.357$

(1 mark)

(c) l_1 = 38.5 cm (1 mark)

l_2 = 61.5 cm (1 mark)

$(l_1 < l_2)$

$\frac{R_p}{9} = \frac{38.5}{61.5}$

$\therefore R_p = 5.63\Omega$

(2 marks)

$C_2 = \sqrt{\frac{9}{5.63}}$

= 1.264 (2 marks)

(ii) C_1 and C_2 are nearly equal (to the nearest whole number).

(1 mark)

QUESTION ONE PART B

V = 3.1 volts ± 0.1

$I_0 = \frac{V}{R} = \frac{3.1}{4.7 \times 10^3}$ A

= 0.659 mA

(3 marks)

I_1 = 0.63 mA

For $\frac{I_1}{2}$

t_1 = 3.9 s

(1 mark)

For $\frac{I_1}{10}$

t_2 = 13.5 s (1 mark)