232/3 – PHYSICS PAPER 3 - MARKING SCHEME

1. (b) E = 2.9V ✓(1mk)

(c)	Length L(m)	0.2	0.3	0.4	0.5	0.6	0.7
	Current I(A)	0.6	0.52	0.44	0.4	0.35	0.29
	$\frac{1}{I}(A^1)$	1.67	1.92	2.27	2.5	2.85	3.4

Correct values each ½mk max 3mks

Correct values $\frac{1}{I}$ ½mk max 3mks

(f) Graph
- Axes well labeled with unit. (1mk)
- Scale simple uniform and easy to plot (1mk)
- Plotting 6 points (2mks)
  5 points (1mk)
  Less than 4 no mark

(g) Gradient = $\frac{\Delta\frac{1}{I}(A^{-1})}{\Delta L(m)}$ (1mk) $= \frac{2.5 - 1.67}{0.5 - 0.2}$ (1mk)

$= \frac{0.83}{0.3}$ $= 2.767A^{-1}M^{-1}$ (1mk)

(h) (i) $d_{ave} = 0.38mm$ (1mk)

(ii) χ - section Area A = $\frac{22}{7} \times (19 \times 10^{-4})^2 = 1.13 \times 10^{-7}m^2$ (1mk)

(i) From the equation

$$\frac{1}{I} = \frac{K}{AE}(L) + \frac{Q}{E}$$

Gradient $= \frac{K}{AE}$ (1mk)

But E = 2.9V, A = $1.134 \times 10^{-7}m^2$

K = $2.767 \times 1.134 \times 10^{-7} \times 2.9$

= $9.10 \times 10^{-7}\Omega m$ (1mk)

$\frac{Q}{E}$ = Intercept = $1.08A^{-1}$

Q = $1.08A^{-1} \times 2.9$

= 3.132Ω (1mk)

2.	(a)	Angle of incidence (i)	LN (mm)	MN (mm)
		15 degrees	13	7.5
		30 degrees	24	14
		45 degrees	35.5	22.5
		60 degrees	43.0	27
		75 degrees	48.5	30

Each correct value ½mk max 5mks

(b) - Graph of LN (mm) against MN (mm)
- 5 points plotted correctly (2mks)
- 4 points plotted correctly (1mk)
- Less than 4 points (0mk)
- Scale consistent (1mk)
- Line of best fit (1mk)

(c) $Slope = \frac{\Delta LN}{\Delta MN}$ (1mk)

$= \frac{48.5 - 130}{30 - 7.5}$

$= \frac{35.5}{22.5}$

$= 1.57$ (1mk)

(d)	i	r	Sin i	Sin r	$\frac{Sin\ i}{Sin\ r}$
	15°	10°	0.2588°	0.1736	1.49
	30°	18°	0.5°	0.3090	1.61
	45°	27°	0.7071°	0.4539	1.55
	60°	33°	0.866°	0.5446	1.59
	75°	38°	0.9659°	0.6156	1.56

r values (1mk)
Sin I values (1mk)
Sin r values (1mk)
Ratio values (1mk) for at least 3 correct

$$\frac{Sin\ i}{Sin\ r}\ Average\ value = \frac{1.49 + 1.61 + 1.55 + 1.59 + 1.56}{5}$$

$= 1.56$ (1mk)

PART II

U(cm)	V(cm)	$M = \frac{V}{U}$
20	19.4	0.97
30	14.6	0.4566

Each ½mk max (1mk)

$$F_1 = \frac{19.4}{1 + 0.97} = \frac{19.4}{1.97}$$

$= 9.848cm$ (½mk) (3mks)

$$F_2 = \frac{14.6}{1 + 0.4866} = \frac{14.6}{1.4866}$$

$= 9.821cm$ (½mk)

F average $= \frac{9.848 + 9.821}{2}$

$= 9.835cm$ (1mk)