24.5.3 Physics Paper 3 (232/3)

1. (a) Diameter of the marble = 1.70 cm *(1 mark)*
Radius of the marble r = 0.85cm *(1 mark)*

(b) (i) M = 5.7g *(1 mark)*

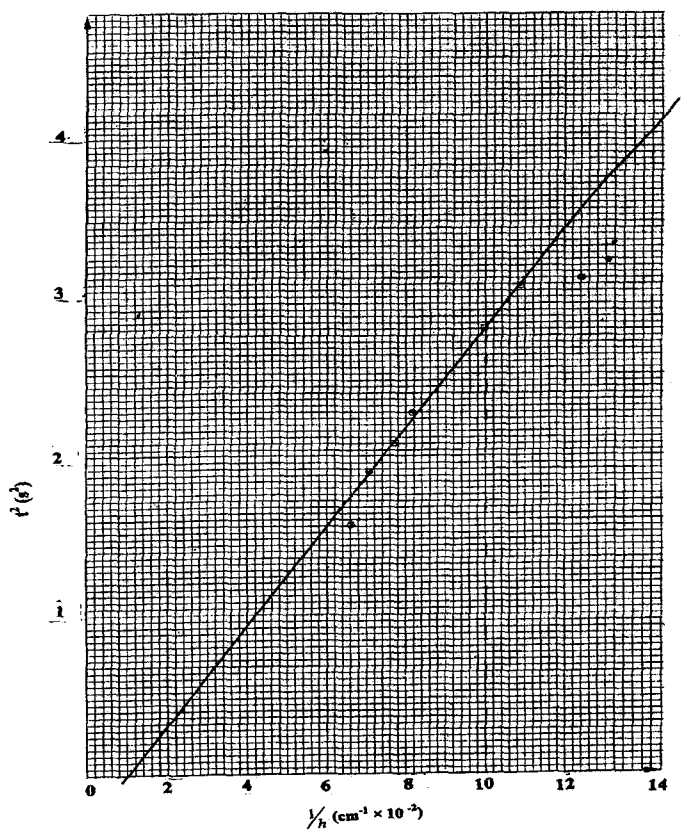
(ii) P = $0.4\ Mr^2$
= $0.4 \times 5.7 \times 0.85^2$
= $1.65\ gcm^2$ *(1 mark)*

(c)

Height h (cm)	8	9	10	11	12	13	14	15
Average time (s)	1.75	1.74	1.61	1.49	1.52	1.43	1.38	1.25
t^2 (s^2)	3.06	3.03	2.59	2.22	2.31	2.04	1.90	1.56
$^1/_h$ (cm^{-1})	0.125	0.111	0.100	0.090	0.083	0.077	0.071	0.067

(6 marks)

(d) (i)



(5 marks)

(ii) Slope S = $\dfrac{3.6 - 0}{(12.6 - 1.0) \times 10^{-2}}$

= 31.03 ± 0.10 *(3 marks)*

(iii) $G = Mr^2 \left[\frac{s}{20} - 1\right] = 5.7 \times 0.85^2 \left[\frac{31.01}{20} - 1\right]$

$= 2.27$ *(2 marks)*

2. (a) (i)

$L_0 = 80$ cm

$d_1 = 0.35$ mm $\quad d_2 = 0.37$ mm *(1 mark)*

$d = 0.36$ mm *(1 mark)*

Radius, $r = 0.18$ mm

$r = 1.8 \times 10^{-4}$ m *(1 mark)*

(b) (i) $V_R = 0.7$ Volts *(1 mark)*

$V_G = 1.8$ Volts *(1 mark)*

(ii) $V_R = IR$

Therefore, $I = \frac{V_R}{R} = \frac{0.7}{4} A$

$= 0.175$A *(1 mark)*

(iii) $H = \frac{100 \times 1.8}{0.175 \times 80}$

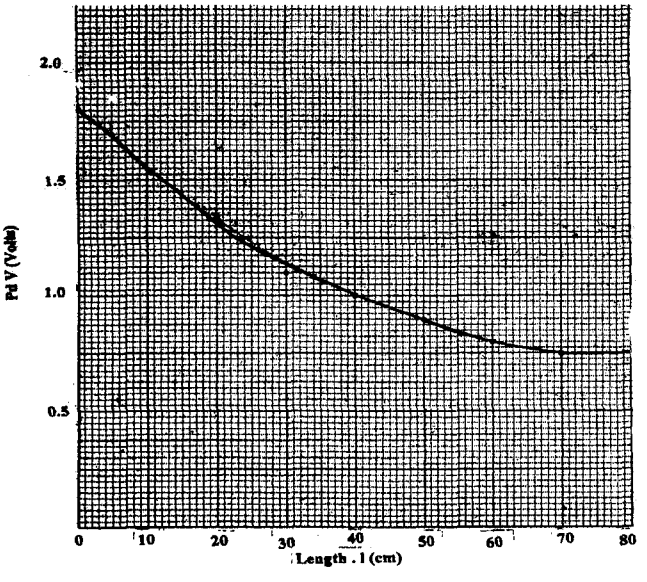
$= 12.86\ \Omega\ m^{-1}$ *(1 mark)*

(c) and (d)

distance *l* (cm)	0	5	10	20	30	40	50	60	70
pd across R (V)	1.80	1.70	1.55	1.35	1.10	1.00	0.90	0.80	0.75

(3 marks)

(e) (i)



(5 marks)

(ii) $V_1 = \frac{V_0}{2} = \frac{1.8}{2}$

$= 0.9$ Volts

Therefore, $l_1 = 50$ cm (correct reading from graph)

(1 mark)

(f) $D = \frac{R}{l_1} \times \frac{300}{1.8} = \frac{4}{50} \times \frac{300}{1.8}$

$= 1333.3\ \Omega\ m^{-1}$ ***(1 mark)***

(g) $\rho = \frac{\pi r^2}{2}(D + H)$

$\rho = \frac{\pi(1.8 \times 10^{-4})^2}{2}$

$= (1333.3 + 1285.7)$

$= 13322 \times 10^{-8}\ \Omega m$

$= 1.33 \times 10^{-4}\ \Omega m$ ***(1 mark)***