

Question 1

PART A

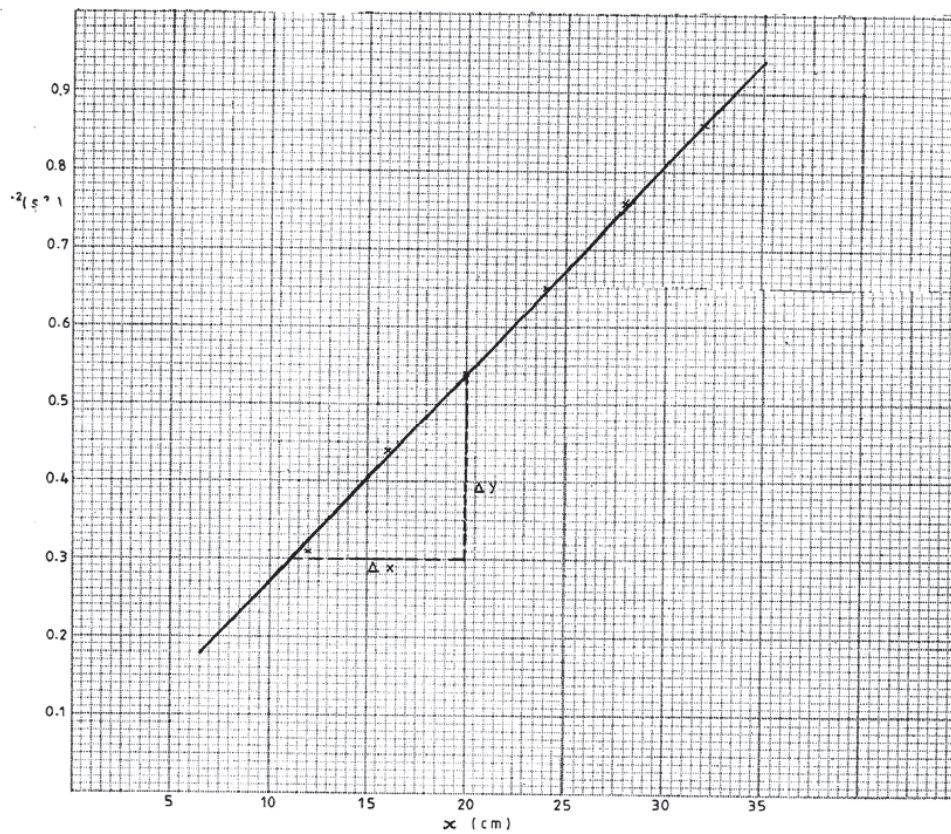
(c)

<i>Length X (cm)</i>	32	28	24	20	16	12
<i>Time t for 20 oscillations</i>	18.50	17.40	16.15	14.75	13.30	11.20
<i>Period</i> $T = \frac{t}{20} (s)$	0.925	0.870	0.808	0.738	0.665	0.560
$T^2 (s^2)$	0.856	0.757	0.652	0.544	0.442	0.314

(5 marks)

(d)

(5 marks)



(e) (i) slope $S = \frac{0.54 - 0.30}{20 - 11}$
 $= \frac{0.24}{9} = 0.0267 \frac{s^2}{cm}$ (3 marks)

(iii) $S = \frac{8\pi}{3k}$
 $0.0267 = \frac{8\pi}{3k}$
 $\therefore k = \frac{8\pi}{3 \times 0.0267}$
 $= 313.767 \text{ cm/s}^2$. (2 marks)

PART B

(g)

$t(s)$	$t_1(s)$	$t_2(s)$	$t_3(s)$	Average $t(s)$	$T = \frac{t}{5}(s)$
	3.46	3.25	3.44	3.34	0.67

(3 marks)

(h) $P = \frac{40L}{T^2} = \frac{40 \times 12}{0.67^2}$
 $= 1069 \text{ cm/s}^2$
 $= 10.7 \text{ m/s}^2$ (accept values between 9 and 11 m/s^2). (2 marks)

Question 2

PART A

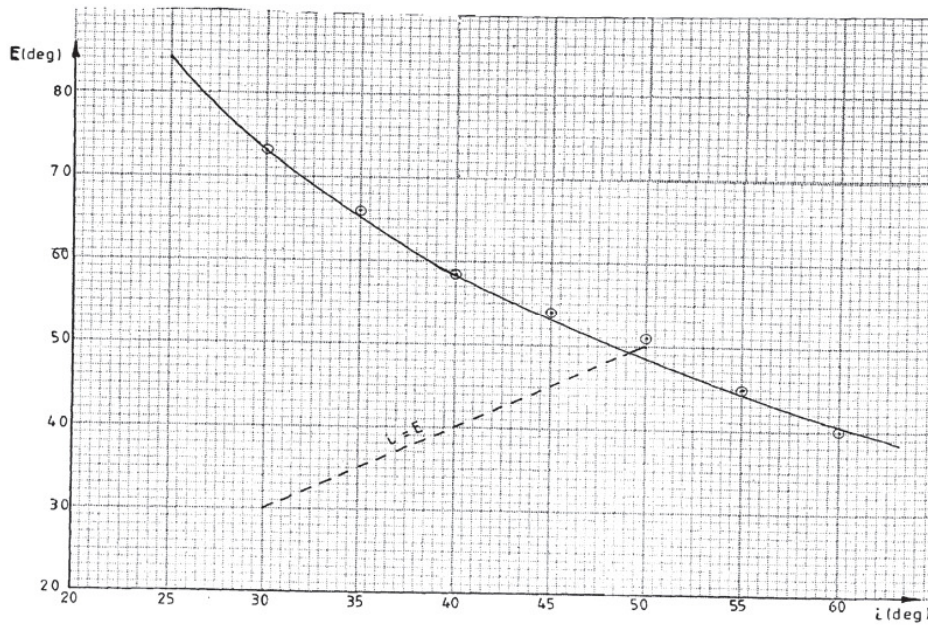
(a) $A = 60^\circ$ (1 mark)

(e)

Angle of incidence i (deg)	30	35	40	45	50	55	60
Angle Q (deg)	16.5	24.0	31.5	36.0	38.9	45.0	50.0
Angle of emergence $E=90-\theta$	73.5	66.0	58.5	54.0	51.1	45.0	40.0

(6 marks)

(f) (i)



(5 marks)

(ii) $i_0 = 49^\circ$

(1 mark)

(iii) (I) $y = 2i_0 - R = 2(49) - 60 = 38^\circ$
 (II) $k = 2 \sin 49^\circ = 1.51$

(1 mark)

(1 mark)

PART B

(g) (i) $V = 60 \text{ cm}$

(ii) $f = \frac{uv}{u+v} = \frac{(30)(60)}{90} = 20 \text{ cm}$

(2 marks)

(h) (i) $d = 10 \text{ cm}$

(1 mark)

(ii) $I = \frac{df}{f-d} = \frac{10 \times 20}{10} = 20$

(1 mark)

II $x = \frac{L}{2f} + 1 = \frac{20}{40} + 1 = \frac{20}{40} + 1 = 1.5$

(1 mark)