

1.

Question one

(a)

Table 1

Mass m (g)	100	200	300
Time for 10 oscillations. (s)	4.75	6.74	8.02
Periodic time T (s)	0.475	0.674	0.0802

Award 2 mks 3 correct values for 10 oscillations to 2d.c

1mk for two correct values

Award 1mk for correct evaluation of T

c) $T = \pi \sqrt{\left(\frac{m}{k}\right)}$ (2 marks)

{ $K_1 = 4.375$, $k_2 = 4.346$, $k_3 = 4.605$ } award 1mk

$K = 4.442 \text{ kg/m}$ or 44.42 N/m award 1 mk

(d) $T_0 = 23.0 \text{ }^\circ\text{C}$ (1 mark)

Table 2

Time, t (min)	2	4	6	8	10	12	14
Temperature (T) $^\circ\text{C}$	61.0	57.0	53.0	51.0	49.0	47.0	45.0
(T- T_0)	38.0	34.0	30.0	28.0	26.0	24.0	22.0
Log (T- T_0)	1.580	1.531	1.477	1.447	1.415	1.380	1.342

Award ½ mark for @ correct value of T up to a max. of six points

Award 1 mark for correct evaluation of $(T-T_0)$

Award 1 mark for correct evaluation of $\log(T-T_0)$

(5 marks)

(e) On the grid paper.

Plotting P = 2 marks

Scale S = 1mk

Labeling axes A = 1 mk

Line L = 1 mark with -ve gradient

(f) P = y-intercept

= **1.61** 1 mk

Evidence from the graph

(g) N = the antilog of P

= antilog of 1.61

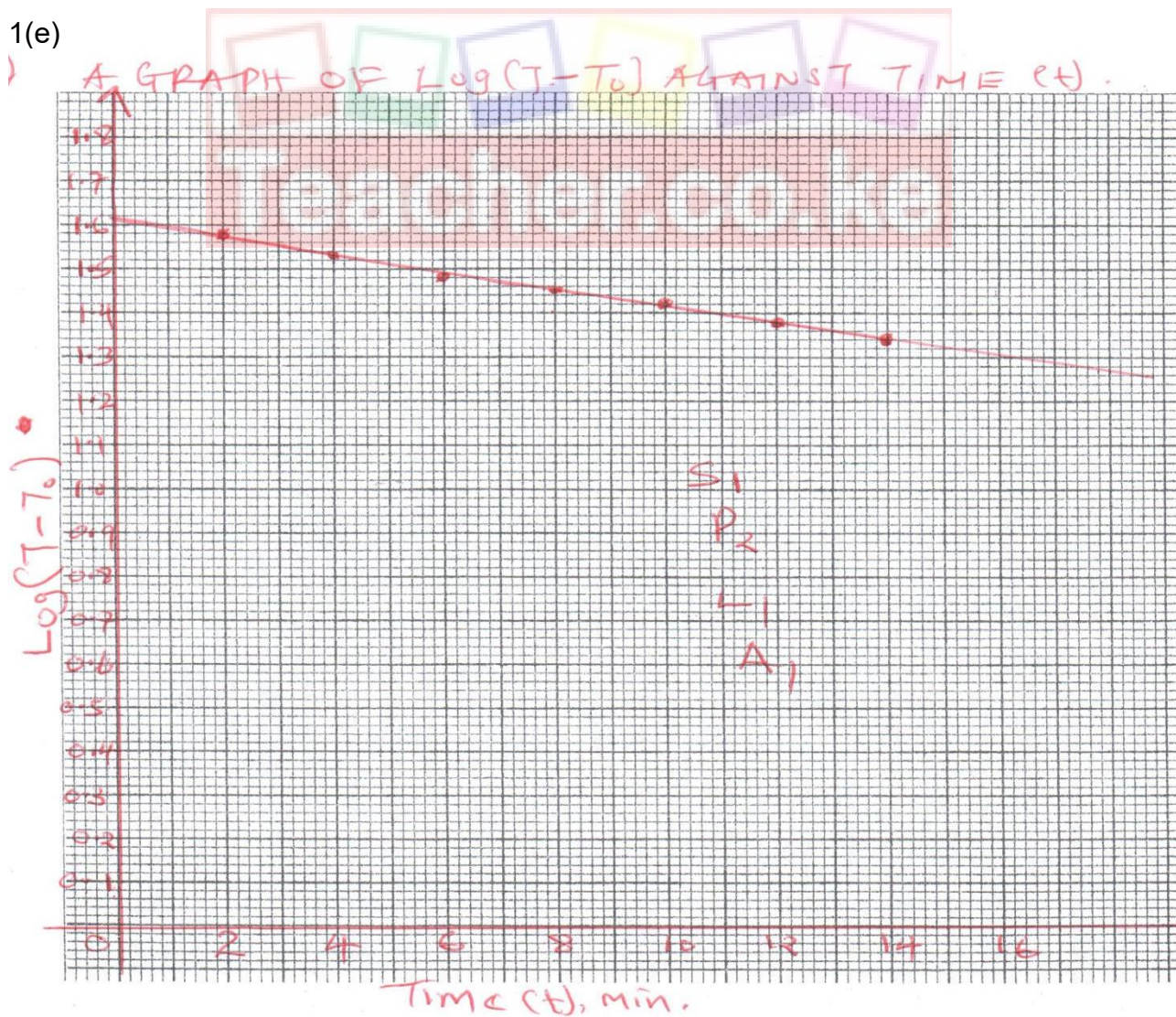
= **40.74 °C** 1 mk

(h) $N = 65 - T_R$

$40.74 = 65 - T_R$ 1 mark

$T_R = \mathbf{24.26 °C}$ 1 mark

1(e)



2. (e) Table 2

x(cm)	100	95	90	85	80	
u ₁ (cm)	25.0	27.0	29.0	30.0	32.0	+1.0cm
u ₂ (cm)	71.0	64.0	61.0	52.0	48.0	+1.0cm
d=u ₂ -u ₁ (cm)	46.0	37.0	32.0	22.0	16.0	
y = $\frac{d^2}{x}$ (cm) x (2dp)	21.16	14.41	11.38	5.69	3.20	(8mks)

u₁ and u₂ values each ½ mk

d value a maximum of 1 mark 4 – 5 = 1mk
3 values = ½ mark

y value a maximum of 2 marks correct to 2d.p

4 – 5 = 2 marks

3 = 1 mark

- (f) Axes with units = 1 mark (each axis = ½ mark)
Simple and uniform scale = 1 mark (vertical axis only)
Plotting within 1 small square = 2 marks (4 – 5 = 2 marks)
(3 = 1 mark)

Straight line drawn with a ruler = 1 mark

(Line should have positive gradient and passes at least 3 plotted points)

- (g) X₀ = 80cm ± 1cm

(h) $k = \frac{X_0}{4} = \frac{80}{4} = 20\text{cm} \pm 0.5\text{cm}$

(i) B₀ = 3.0v ± 0.1v

(k) v = 0.40 volts ± 0.05v

(l) $\frac{1}{v} = \frac{35}{x} + \frac{1}{y}$

$$= \frac{1}{0.40} = \frac{35}{30} + \frac{1}{y}$$

y = 0.75v

(m) $k = \frac{8}{35E_0} = \frac{8}{35 \times 3} = 0.07619 \text{ or } 0.0762 \text{ v}^{-1}$

A GRAPH OF $y(\text{cm})$ AGAINST $x(\text{cm})$

