1. PART A

(i) h = 15cm ± 1cm ✓½

(ii) d = 2cm ± 1cm ✓½

(iii) t = h – d = (15.0 – 2.0)cm

= 13.0cm✓½

(iv) m = 61.2g ± 10g✓½

(v) D = 2.53cm ± 0.1cm✓½

(vi) $R = \frac{D}{2} = \frac{2.53}{2} = 1.265cm$✓½

(vii) $m = 12\rho\pi R^2$

$\Rightarrow \rho = \frac{m}{13\pi R^2}$

$= \frac{61.2}{12 \times 3.142 \times (1.265)^2}$ ✓2

$= \frac{61.2}{60.335}$

$= 1.014 gcm^{-3}$ ✓1

PART B

(e)

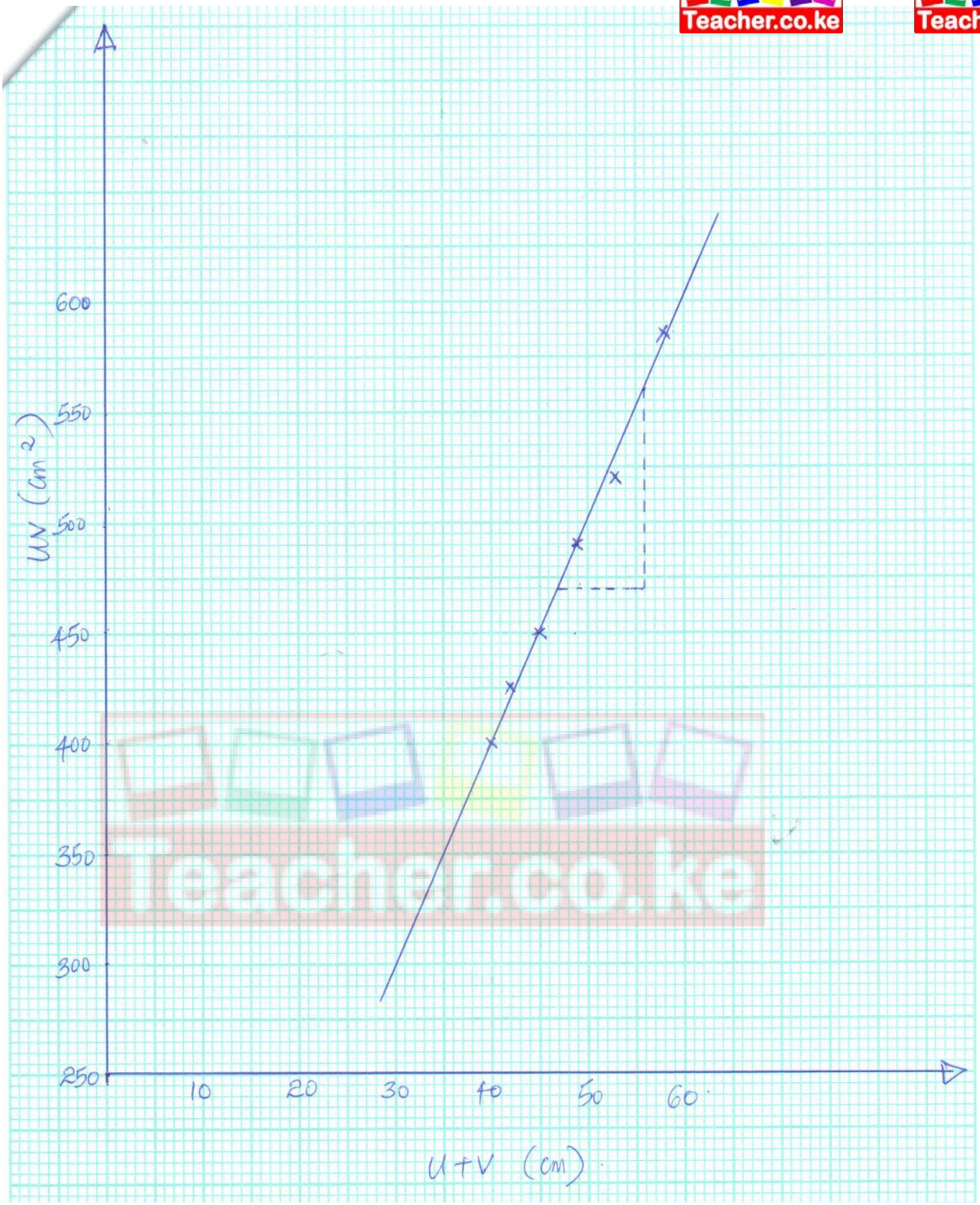
u (cm)	20	25	30	35	40	45	
v (cm)	20	17	15	14	13	13	✓3mks
u + v	40	42	45	49	53	58	✓1½ mks
uv (cm^2)	400	425	450	490	520	585	✓1½ mks

Values of V within ±4cm of the given value – ½mk each.

Values of u + v – Each ½ mk each to a max. of 3 values – use the candidate's value correctly added.

Values of uv – ½ mk each to a max of 3 values – use the candidate's value correctly worked.

(f)



- Axes correctly labelled with correct units – 1mk
- Appropriate scale, simple, covering all values and at least half of the grid – 1mk
- Each point correctly plotted to within one small square – ½ mk to a max of 4 points.
- Line passing through at least 3 correctly plotted points – 1mk.

(g) Slope = $\frac{\Delta uv}{\Delta u}$ ✓½ (Evidence on the graph)

= $\frac{(560 - 470)cm^2}{(56 - 47)cm}$ ✓1

= $\frac{90}{9}$ = 10cm ✓½

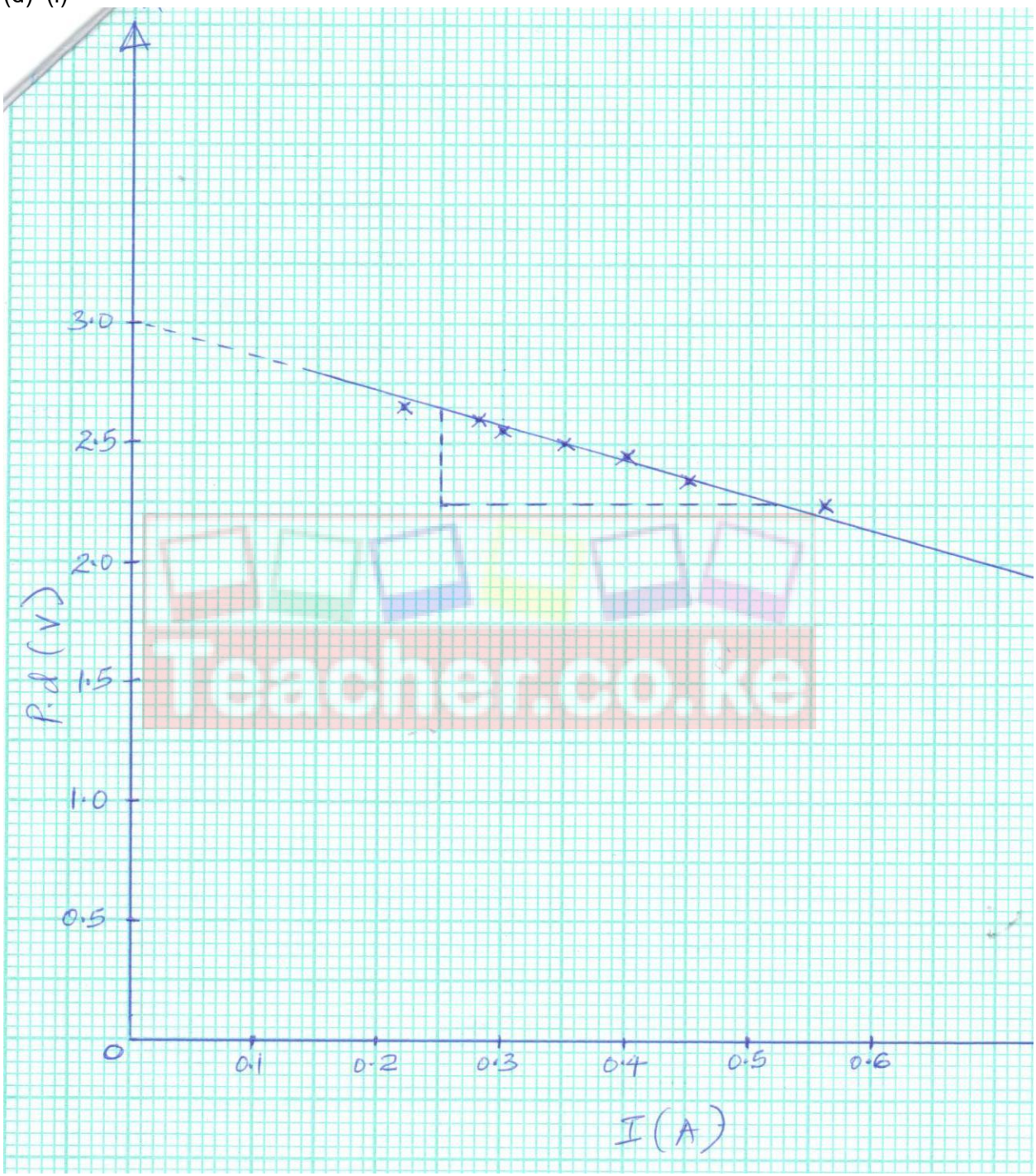
Significance – Focal length of the lens. ✓1

2. (c)

Length (xy) cm	80	70	60	50	40			
Voltmeter reading (V)	2.65	2.60	2.55	2.50	2.45	2.35	2.25	✓3½ mks
Ammeter reading (A)	0.22	0.28	0.30	0.35	0.40	0.45	0.56	✓3½ mks

- Award ½ mk for each correct value of V and I.

(d) (i)



Labelling – 1mk (Axes correctly labelled with correct units).

Scale – 1mk – Appropriate scale, simple, covering all values.

Plotting – 2mks – Each point correctly plotted to within one small square – ½ mk each to a max of 4 points.

Line – 1mk – should pass through atleast 3 correctly plotted points.

(ii) Slope = $\frac{\Delta v}{\Delta I}$ ✓1 (Evidence on the graph)

= $\frac{(2.25 - 2.65)v}{(0.52 - 0.25)A}$ ✓1

= $\frac{-0.4}{0.27}$

= $\underline{-1.481\Omega}$

(e) (i) $V = K_1 I + K_2$

K_1 = Gradient

= $\underline{-1.481\Omega}$✓1

(ii) K_2 = Y – intercept

= $\underline{3.0V}$✓1

(f) K1 – Internal resistance.✓1

K2 – E.M.F. of the cells. ✓1

(g) To minimize errors due to heating✓1 effect of electric current.