

PHYSICS PAPER 3

MARKING SCHEME 2020

Question 1

b) $e = 2.9v$

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
$\frac{1}{I} \text{ (A}^{-1}\text{)}$	1.67	1.92	2.27	2.5	2.85	3.4

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

$$= \frac{0.83}{0.3} = 2.767 \text{ A}^{-1}\text{m}^{-1}$$

f)

h)i) $d \text{ arc} = 0.42\text{mm}$

ii) X-section area $A = 22/7 \times (2.1 \times 10^{-4})^2 = 1.38 \times 10^{-7}\text{m}^2$

i) Gradient = $\frac{K}{AE}$ from equation $\frac{1}{l} = \frac{K}{AE}L + \frac{Q}{E}$

but $E = 2.9\text{V}$, $A = 1.38 \times 10^{-7}$

$K = 2.767 \times 1.38 \times 10^{-7} \times 2.9 = 1.107 \times 10^{-6} \Omega\text{m}$

$Q/E = \text{intercept} = 1.08\text{A}^{-1}$

$Q = 1.08 \times 2.9 = 3.132\Omega$

Question 2

U(cm)	40	45	50
V(cm)	39	35	32
Magnification $\frac{v}{u}$	0.98	0.78	0.64

$F = \frac{v}{m+1}$

$F_1 = \frac{39}{0.98 + 1} = 19.6$

$F_2 = \frac{395}{0.98 + 1} = 19.7$

1.78

$$F_3 = \frac{32}{1.64} = 19.5$$

$$F_{\text{avg}} = \frac{19.6 + 19.7 + 19.5}{3} = 19.6\text{cm}$$

$$F_{\text{avg}} = 19.6$$

PART B.

You are provided with the following:

- rubber bung.
- vernier calipers.
- beam balance.

Proceed as follows:

- a) Using a vernier caliper, measure the lengths D , d , and h as shown in figure 2.

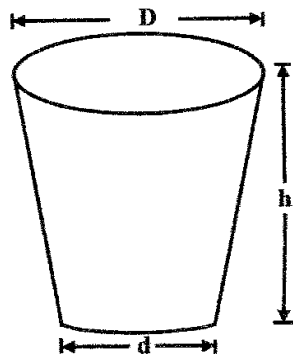


Figure 2

- Accept students will
in cm and give
half the mark.

$D = \dots\dots\dots$ m $0.0253 \text{ m} \pm 0.0030$ (1 mark)
 $d = \dots\dots\dots$ m 0.020 m (1 mark)
 $h = \dots\dots\dots$ m 0.0281 m (1 mark)

- b) (i) Measure the mass, M of the rubber bung using the beam balance.

$M = \dots\dots\dots$ kg $0.0147 \text{ kg} \pm 29$ (1 mark)

→ Answer given in g award 1/2 mark.

- (ii) Given that $Q = \left(\frac{d+D}{4} \right)$, determine the value of Q (1 mark)

$$Q = \frac{0.020 + 0.0253}{4} \checkmark \frac{1}{2}$$

$$= 0.0114 \checkmark \frac{1}{2}$$

- (iii) Determine the value of r given that $\pi r^2 Q = \frac{M}{h}$ (1 mark)

$$r = \sqrt{\frac{M}{\pi h Q}}$$

$$= \sqrt{\frac{0.0147}{\pi \times 0.0281 \times 0.0114}} \checkmark \frac{1}{2}$$

$$= 0.0124 \text{ m}$$

2 dp of sf form. ignore unit (3 s. figs)

Error Traster

SECTION C

a) $G = 50 \pm 0.5\text{cm}$

b) $p = 58.6\text{cm}$

c) when $y = 5\text{cm}$, $x = 8.6\text{ cm}$

$$W \times 5 = 50/100 \times 8.6$$

$$W = 0.05 \times 8.6/5 = 0.086\text{N}$$