

# 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
$\frac{1}{I}$ (A <sup>-1</sup> )	1.67	1.92	2.27	2.5	2.85	3.4

d) Gradient =  $\Delta \frac{1}{I} (A^{-1}) = \frac{2.5 - 1.67}{\Delta L (m)} = \frac{0.83}{0.3} = 2.767 A^{-1}m^{-1}$

f)

h)i) d arc = 0.42mm

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  $\frac{1}{I} = \frac{K}{AE}L + \frac{Q}{E}$

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

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

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

$$F_2 = \frac{395}{0.78 + 1} = 19.7$$

1.78

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

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

$$F_{avg} = 19.6$$

**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.

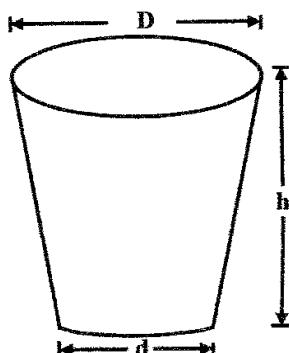


Figure 2

- *Allow Students work in cm and give half the mark*

$$D = \underline{0.0253} \text{ m } 0.0253 \pm 0.0030 \quad (1 \text{ mark})$$

$$d = \underline{0.020} \text{ m } 0.020 \quad \text{II} \quad (1 \text{ mark})$$

$$h = \underline{0.0281} \text{ m } 0.0281 \quad \text{II} \quad (1 \text{ mark})$$

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

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

*Answer given in g award 1/2 mark.*

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

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

$$\frac{0.0453}{4} \quad \checkmark$$

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

*Error noted*

-5-

*2 def of st form. (3 s. figures)*

*Ignore unit*

*(3 s. figures)*

## **SECTION C**

- a)  $G = 50 \pm 0.5\text{cm}$
- b)  $p = 58.6\text{cm}$
- c) when  $y = 5\text{cm}$ ,  $x = 8.6 \text{ cm}$   
 $W \times 5 = 50/100 \times 8.6$   
 $W = 0.05 \times 8.6 / 5 = 0.086\text{N}$