

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

- (a) (i) apparent magnitude: brightness as seen from Earth **(1)**
- (ii) absolute magnitude: inherent brightness or brightness seen from 10 pc **(1)**

2

(b) (i) distance = $\frac{470}{3.26} = 144$ (pc) **(1)**

(ii) $m - M = 5 \log \left(\frac{d}{10} \right)$ **(1)**

$$m = -4.2 + 5 \log \left(\frac{144}{10} \right) = 1.6$$
 (1)

(allow C.E. for value of d from (i))

- (iii) Elnath **(1)**
 reason: (either by calculation or reference to -4.2 being brighter than -3.2)
 Elnath is actually dimmer than Bellatrix **(1)**
 but appears to have same brightness, so must be closer **(1)**

6

[8]**Q2.**

- (a) circuit diagram to show:
 ammeter in series, voltmeter in parallel **(1)**
 variable source (e.g. battery + rheostat or potential divider) **(1)**

2

(b) (i) $R_x = \frac{0.70}{12.5 \times 10^{-3}} = 56 \Omega$ **(1)**

(ii) $R_x = (\text{e.g.}) \frac{0.90}{39 \times 10^{-3}} = 23 (\Omega)$ **(1)**

 R_x depends on current (or voltage) $\therefore$ non-ohmic

3

- (c) (i)

col C	col D
0.15	2.53
0.20	2.83
0.25	3.09
0.30	3.37
0.35	3.66
0.40	3.94

four pairs of values correct **(1)**

all six pairs correct and col D to no more than 4 s.f **(1)**

- (ii) axes labelled **(1)**
suitable scales chosen **(1)**
at least five points plotted correctly **(1)**
acceptable straight line **(1)**

- (iii) $k = \text{gradient}$ **(1)**

$$\text{gradient} = \frac{3.95 - 1.68}{0.40} = 5.7 \text{ (V}^{-1}\text{)} \text{ **(1)**}$$

intercept on y-axis = $\ln A$ **(1)**

(intercept = 1.68 gives) $A = e^{1.68} = 5.4 \text{ (mA)}$ **(1)**

unit for k or A correct **(1)**

- (iv) the points define a straight line **(1)**
valid over given range **(1)**

max 10

[15]