Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) 3 parallel off-axis rays through objective lens correct **(1)**

rays continued through to the eyepiece emerging parallel to construction line **(1)**

correct position of labelled foci **(1)**

3

(b) (i) use of $f_o + f_e = 3.7$

and $f_o/f_e = 50$

(to give $51f_e = 3.7$) **(1)**

$f_o = 3.6$ (m) and $f_e = 0.074$ (m) **(1)**

2

(ii) use of $s = r\theta$

to give $\theta = 23/380000 = 6(.053) \times 10^{-5}$ rad **(1)**

use of $M = \theta_2/\theta_1$

to give $\theta_2 = 50 \times \theta_1 = 3(.026) \times 10^{-3}$ (rad) **(1)**

2

(c) diagram to show dispersion of different colours in the correct order **(1)**
rays crossing each other or principal axis correctly **(1)**

2

[9]

Q2.

(a) brightness (or apparent magnitude) of star from a distance of 10 pc **(1)**

1

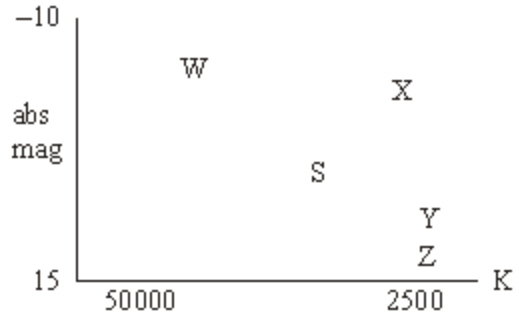
(b) (i) temperature from 50000 K to 2500 K **(1)**
absolute magnitude from +15 to –10 **(1)**

(ii) S at 6000 K, and abs mag 5 **(1)**

(iii) W above and to left of S **(1)**
X above and to right of S **(1)**
Y below and to right of S **(1)**
Z below and to right of S **(1)**

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[8]

Q3.

(a) (i) Segin: spectral class B is hottest **(1)**

(ii) Shedir: class K is closest towards red end **(1)**

(iii) Shedir: 2.2 is smallest value of apparent magnitude **(1)**

(iv) Achird: apparent magnitude lower (brighter) than absolute magnitude and they are equal when star is 10 pc away **(1)**

4

(b) (i) (use of $m - M = 5 \log(d/10)$ gives) $2.2 - (-4.6) = 5 \log \left(\frac{d}{10}\right)$ **(1)**

$d = 229$ pc **(1)**

(ii) (use of $\lambda_{max} T = 0.0029$ gives) $\lambda_{max} = \frac{0.0029}{12000} = 2.4(2) \times 10^{-7}$ m **(1)**

3

[7]

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