Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) *w* from $\frac{R2-R1}{6} = 0.408\text{mm} = 4.08\times10^{-4}\text{m}$ ✔

3 sf answer ✔

2

(b) double slit formula rearranged to give $d = \frac{\lambda \times D}{w}$ $_1$✔

$d = \frac{589.3\times10^{-9}\times0.395}{0.408\times10^{-3}} = 5.7(1)\times10^{-4}\text{m}$ $_2$✔

allow ecf in $_2$✔ for wrong w but not for POT error

2

(c) use of $PQ = \frac{d\times(D+L)}{L} = 5.46\times10^{-3}\text{m}$ $_1$ ✔

allow ecf for wrong d in $_1$ ✔

number of fringes seen $= \frac{PQ}{w} = \frac{5.46}{0.41_2}$ ✔

number of fringes seen = 13 (integer only)$_3$ ✔

allow 12 or 14 fringes

3

(d) close jaws using ratchet ✔

confirm that instrument reads zero ✔

2

(e) mean = 0.57(0) mm; uncertainty = 0.5 × range ✔

percentage uncertainty $= 100\times\frac{0.5\times(0.574-0.566)}{0.570} = 0.70(2)\%$ ✔

2

[11]

Q2.

(a) Principal axis drawn and principal foci shown to coincide on it ✔

three non-axial rays drawn correctly with final virtual image shown ✔

Downloaded from www.merit-minds.com

PA needs to be drawn

2

(b) Mirrors do not suffer from chromatic aberration, ✔

Mirrors can be larger and therefore have greater collecting powers ✔

Mirrors can be larger and therefore have smaller minimum angular resolution ✔

Parabolic mirrors with axial rays do not suffer from spherical aberration ✔

4

(c) **The mark scheme gives some guidance as to what statements are expected to be seen in a 1 or 2 mark (L1), 3 or 4 mark (L2) and 5 or 6 mark (L3) answer. Guidance provided in section 3.10 of the *Mark Scheme Instructions* document should be used to assist marking this question.**

L3 5−6 marks	clear description of what is meant by apparent magnitude, with discussion of logarithmic scale; explanation of Hipparcos scale in terms of visibility of stars	The student presents relevant information coherently, employing structure, style and sp&g to render meaning clear. The text is legible.
L2 3−4 marks	Either apparent magnitude or Hipparcos scale discussed in detail, with other not discussed fully or containing errors	The student presents relevant information and in a way which assists the communication of meaning. The text is legible. Sp&g are sufficiently accurate not to obscure meaning.
L1 1−2 marks	Either one discussed fully and other not at all, or both discussed with some errors.	The student presents some relevant information in a simple form. The text is usually legible. Sp&g allow meaning to be derived although errors are sometimes obstructive.
0 marks	Little or no discussion of relevant content.	The student's presentation, spelling, punctuation and grammar seriously obstruct understanding.

(d) **The following statements could be present**

- *apparent magnitude is based on how bright a star appears on the Earth*
- *this depends on how bright a star actually is and how far away it is*
- *larger values of apparent magnitude are given to dimmer stars*
- *the difference of 1 on the apparent magnitude scale is associated*

Downloaded from www.merit-minds.com

with a difference in brightness of a factor of 2.51.

The Hipparcos scale assumed the brightest stars have a magnitude of 1 and the dimmest a magnitude of 6.
Magnitude 1 stars are 100 times brighter than magnitude 6 stars.

Applying apparent magnitude to the Hipparcos scale means that some stars (the brightest) have a negative apparent magnitude.

6

[12]

Downloaded from www.merit-minds.com