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

Mark Schemes

Q1.

(a) (i) (continuous spectrum emitted), but light of particular wavelengths absorbed by (excited) hydrogen atoms (in star's atmosphere)
absorbed wavelengths correspond to particular energy level transitions by electrons in hydrogen atoms
light re-emitted in all directions, thereby reduced in direction of Earth any two **(1) (1)**

QWC 2

(ii) arrow upwards from n = 2 to n = 6 **(1)**

(iii) 410 nm **(1)**

(iv) Balmer **(1)**

(v) A and B **(1)**

max 4

(b) (i) (use of $\lambda_{max}T = 0.0029$ gives) $T = \frac{0.0029}{300 \times 10^{-9}}$ **(1)**

(= 9700 K)

(ii) Vega behaves like a black body **(1)**

2

(c) A, because the temperature is that of class A **(1)**

1

[7]

Q2.

(a) $\frac{\lambda}{20}$ = 0.05 and λ = 1.0 m **(1)**

1

(b) $\theta = \frac{\lambda}{D}$ **(1)**

$= \frac{0.06}{76}$ = 7.9×10^{-4} rad **(1)**

2

(c) advantage 1:

power D^2 much more power detected by

larger diameter telescope **(1)**

ratio of power detected = $\left(\frac{76}{13}\right)^2$ = 34 **(1)**

advantage 2:

resolving power $\propto$ D $\therefore$ larger diameter has greater

resolving power **(1)**

ratio of resolving power = $\frac{76}{13}$ = 5.8 **(1)**

(inverse accepted if angle referred to)

4

[7]

Q3.

(a) (i) the emf (of the battery) **(1)**

(ii) the voltage across the battery when current flows
[or terminal voltage or pd supplied to the circuit]

(iii) V = (3 × 0.5) = 1.5 (V) **(1)**
current = (1.5/14) = 0.11 A **(1)** (0.107 A)

(iv) ($\in = V + Ir$ and emf = 3.5 × 0. 5 = 1.75 (V) gives)

1.75 = 1 .5 + 0.1 07r **(1)**

r = 2.3 Ω

[or use of $\in = I (R + r)$ with I = 0. 107 gives r = 2.4 Ω

and I = 0. 11 gives r = 1.9 Ω]

(allow C.E. for value of I from (iii))

6

(b) (i) peak value = 3.5√2 = 4.9 V **(1)**

(ii) oscilloscope screen to show
vertical line of height 2.5 divisions above central axis **(1)**
and below central axis **(1)**

3

[9]