Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a) (i) light year : distance travelled by light in one year **(1)**

(ii) parsec : distance to an object subtending 1 sec of arc to Earth's orbit **(1)**

2

(b) (i) $d = \left(\frac{450}{3.26}\right)$ = 123 pc **(1)**

$m - M$ (= 5 log(d/10)) = 5 log(123/10) = 5.5 **(1)** **(**5.45)

M = (5.1 – 5.5) = – 0.6 **(1)**

(allow C.E. for value of d)

(ii) A OBAFGKM is order of spectra for decreasing temperature (or similar reference to spectral class related to temperature) **(1)**

(iii) G same brightness/power, but A is hotter **(1)**
∴ since $P = \sigma AT$, star A must be larger for smaller T **(1)**

max 5

(c) θ (= 1.8×10^{-3} °) = 3.1×10^{-5} rad **(1)**

(use of $\theta = \frac{\lambda}{d}$ gives) $d = \frac{5.0 \times 10^{-7}}{3.1 \times 10^{-5}}$ = 1.6×10^{-2}m **(1)**

2

[9]

Q2.

(a) (i) correct shape of graph (steeper on left of peak) **(1)**

(ii) region to left of peak **(1)**

(iii) ozone **(1)**

(iv) lower temperature, shifts peak (λ_{max}) to longer wavelengths **(1)** $\lambda_{max}T$ = constant **(1)**

max 4

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(b) (i) (use of $f = \frac{c}{\lambda}$ gives) $f \left(= \frac{3 \times 10^8}{2.7} \right)$ ^{8} Hz,

(in range) **(1)**

(ii) (double) Doppler **(1)**

(iii) (reflection off moving object gives double Doppler),
frequency shift = 150 Hz

$$v = \frac{150 \times 3 \times 10^8}{1.1 \times 10^8}$$ **(1)**

(allow C.E. for shift = 300 Hz)

= 4.1 × 10^2 m s^{-1} (towards each other) **(1)**

5

[9]

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