1

$$m - M = 5(\log r - 1) \quad (1)$$

- **a)** $m = -30.32,\ M = 1.25$

$$\text{Despejando } r \quad (2)$$

$$r = 10^{\frac{m-M}{5}+1} \quad (3)$$

$$\text{Reemplazando los valores de } m \text{ y } M \quad (4)$$

$$r = 10^{1-\frac{31.57}{5}} \approx 4.85 \times 10^{-6}\text{pcs} \quad (5)$$

$$r = (4.85 \times 10^{-6})(3.262) = 1.58 \times 10^{-5}\text{A-L} \quad (6)$$

- **b)** $B - V = 0.55$

$$B - V = 0.55 = -2.5 \log \frac{F_B}{F_V} \quad \rightarrow \quad \frac{F_B}{F_v} = 10^{\frac{0.55}{-2.5}} \quad (7)$$

2

Paralaje anual de $0.5''$

- **a)**

$$p = 0.5'', \qquad d = \frac{1}{p} \quad (8)$$

$$d = \frac{1}{1/2} = 2\text{pcs } = 412,53\text{UA} \quad (9)$$

- **b)**

$$d_1 = 2\text{pcs} \quad d_2 = \frac{1}{1} = 1\text{pcs} \quad (10)$$

$$\frac{d_1}{d_2} = \frac{2}{1} \quad \rightarrow \quad d_1 = 2d_2 \quad (11)$$

d_2 es la mitad de d_1, por lo tanto $d_1 > d_2$.

- **c)** Si $M_1 = M_2 = M = -2.0$

$$\text{Para la estrella 1 ,} \quad m_1 = -2 + 5\log 2 - 5 \approx -5.495 \quad (12)$$

$$\text{Para la estrella 2 ,} \quad m_2 = -1 + 5\log 1 - 5 = -7.0 \quad (13)$$

Podemos observar que m_2 es menor en magnitud aparente.

3

$d = \frac{1}{0.0001} = 10000\text{pcs}$ por lo tanto sí se puede diferenciar una distancia de 10000pcs.

4

Estrella a 690kpc con $M = 5$, al explotar su brillo se incrementa 10^{10} veces la original.

$$m = M + 5\log d - 5 \quad \rightarrow \quad m = 5\log 690000 = 29.2 \quad (14)$$

$$\text{La nueva magnitud aparente cuando el brillo incremente } 10^{10} \text{ veces la original} \quad (15)$$

$$m_{\text{supernova}} = m - 2.5\log 10^{10} = 29.2 - 25 = 4.2 \quad (16)$$

5

- **a)**

$$f = \frac{c}{\lambda} = \frac{3 \times 10^8}{4.25 \times 10^{-7}} = 0.706 \times 10^{15} Hz \quad (17)$$

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{4.25 \times 10^{-7}} = 148 \times 10^7 1/m \quad (18)$$

Pertenece al espectro visible (entre 400nm y 700nm).

- **b)** su velocidad de propagacion se reduce a $\frac{4c}{5}$

$$n = \frac{c}{v} = \frac{c}{4/5c} = \frac{5}{4} = 1.25 \quad (19)$$

- **c)**

$$\text{Si } f = 7.06 \times 10^{14} Hz \quad , \quad v = \frac{5}{4}c \quad (20)$$

$$\lambda = \frac{v}{f} = \frac{\frac{4}{5}(3 \times 10^8)}{7.06} = 3.4 \times 10^{-7} m = 340nm \quad (21)$$

6

$$E = \frac{hc}{\lambda}, \qquad c = 3 \times 10^8 m/s, \qquad h = 6.626 \times 10^{-34} Js \quad (22)$$

- Para el sol $\lambda = 500 \times 10^{-9} m$

$$E_{sol} = \frac{(6.626 \times 10^{-34} Js)(4 \times 10^8 m/s)}{500 \times 10^{-9}} = 3.98 \times 10^{-19} J \quad (23)$$

$$E_{sol} = \frac{3.98 \times 10^{-19} J\ eV}{1.60 \times 10^{-19} J} = 2.48 eV \quad (24)$$

- Para Sirio $\lambda = 300 \times 10^{-9}$

$$E_{sirio} = \frac{(6.626 \times 10^{-34} Js)(3 \times 10^8 m/s)}{300 \times 10^{-9} m} = 6.62 \times 10^{-19} J = 4.14 eV \quad (25)$$

- Para Betelgeuse $\lambda = 900 \times 10^{-9}$

$$E_{Be} = \frac{(6.626 \times 10^{-34} Js)(3 \times 10^8 m/s)}{900 \times 10^{-9} m} = 1.38 eV \quad (26)$$

7

De la expresion en parsecs tenemos que $m - M = 5(\log r - 1)$, aplicando que $r = R \times 10^6$ tenemos $m - M = 5(\log R \times 10^6 - 1) = 5(\log R + \log 10^6 - 1) \rightarrow m - M = 5(\log R + 5)$