

3.18) CALCULATE THE TEMPERATURE OF A BLACKBODY IF THE SPECTRUM PEAKS AT

- a) γ -RAYS, $\lambda = 1.50 \times 10^{-44}$ m
- b) X -RAYS, $\lambda = 1.50$ nm
- c) RED, $\lambda = 640$ nm
- d) TV, $\lambda = 1.00$ m
- e) AM, $\lambda = 204$ m

WIEN'S LAW STATES $\lambda_{\text{MAX}} T = 2.898 \times 10^{-3} \text{ mK}$

$$\Rightarrow T = \frac{2.898 \times 10^{-3}}{\lambda}$$

$$a) T_{\gamma} = \frac{2.898 \times 10^{-3}}{1.50 \times 10^{-44} \text{ m}} = \boxed{1.93 \times 10^{42} \text{ K} = T_{\gamma}} \quad \text{Wow! Hot!}$$

$$b) T_X = \frac{2.898 \times 10^{-3}}{1.50 \times 10^{-9}} = \boxed{1.93 \times 10^6 \text{ K} = T_X} \quad \text{THE SUN'S CORONA}$$

$$c) T_{\text{RED}} = \frac{2.898 \times 10^{-3}}{640 \times 10^{-9}} = \boxed{4,528 \text{ K} = T_{\text{RED}}} \quad \text{COOL STARS!}$$

$$d) T_{\text{TV}} = \frac{2.898 \times 10^{-3}}{1.0} = \boxed{2.898 \times 10^{-3} \text{ K} = T_{\text{TV}}} \quad \mu\text{K! COLD!}$$

$$e) T_{\text{AM}} = \frac{2.898 \times 10^{-3}}{204} = \boxed{1.42 \times 10^{-5} \text{ K} = T_{\text{AM}}} \quad 14 \mu\text{K! VERY COLD!}$$

→ ONLY COLD OBJECTS EMIT THERMAL RADIATION IN RADIO BANDS!