

PHY 102 HW #3 SOLUTIONS

1. (a) $\lambda = c/f = 3 \times 10^8 / 60 = \boxed{5 \times 10^6 \text{ m}}$

(b) EARTH'S RADIUS, $R = 6.37 \times 10^6 \text{ m}$

$\therefore \boxed{\lambda < R}$

(c) **RADIO WAVES**

2. (a) $\lambda = 0.2 \text{ nm} \rightarrow f = c/\lambda = 3 \times 10^8 / 0.2 \times 10^{-9} = \boxed{1.5 \times 10^{18} \text{ Hz}}$

(b) **X-rays**

3. $\lambda_{\text{max}} T = 2.898 \times 10^{-3} \text{ Km}$

$\lambda_{\text{max}} = \frac{2.898 \times 10^{-3}}{1650} = \boxed{1.756 \times 10^{-6} \text{ m}}$

4. $\lambda_{\text{max}} = 2.65 \mu\text{m}$

$T = \frac{2.898 \times 10^{-3}}{2.65 \times 10^{-6}} = 1.0936 \times 10^3 = \boxed{1093.6 \text{ K}}$

5. $A = 1.2 \text{ m}^2$

$T_{\text{STOVE}} = 175^\circ\text{C} = 448 \text{ K}$

$T_{\text{ROOM}} = 20^\circ\text{C} = 293 \text{ K}$

$E = \sigma A (T_{\text{STOVE}}^4 - T_{\text{ROOM}}^4)$

$= 5.67 \times 10^{-8} \times 1.2 \times (448^4 - 293^4)$

$= \boxed{2239 \text{ W}}$