

## PH 102 Quiz 7: Have you done your homework yet?

$$\begin{array}{ll}
 E = hf = \frac{hc}{\lambda} & \Delta E \Delta t \geq \frac{h}{4\pi} \\
 e\Delta V = KE_{\max} = hf - \phi & h = 6.624 \times 10^{-34} \text{ J} \cdot \text{s} \\
 \lambda_{\text{out}} - \lambda_{\text{in}} = \frac{h}{m_e c} (1 - \cos \theta) & e = 1.602 \times 10^{-19} \text{ C} \\
 h = \lambda |\vec{p}| & c = 3.00 \times 10^8 \text{ m/s} \\
 & m_e = 9.11 \times 10^{-31} \text{ kg}
 \end{array}$$

1. An FM radio transmitter has a power output of 130 kW and operates at a frequency of 98.3 MHz. How many photons per second does the transmitter emit?

- $2 \times 10^{30}$   
  $5 \times 10^{-29}$   
  $1 \times 10^{15}$   
  $7 \times 10^{18}$

2. Light of wavelength 220 nm falls on a carbon surface, and electrons with 0.64 eV kinetic energy are emitted. What is the work function of carbon?

- 4 eV  
 3 eV  
 5 eV  
 0.2 eV

3. What is the minimum accelerating voltage required to produce a photon with  $\lambda = 1 \text{ mm}$ ?

- 1.2 mV  
 1.2 V  
 1.2 kV  
 0.12 V

4. X-rays with an energy of 320 keV undergo Compton scattering, and are deflected by  $42^\circ$ . What is the energy of the scattered X-ray?

- 302 keV  
 161 keV  
 275 keV  
 381 keV

5. A molecule is known to exist in an unstable higher energy configuration for  $\Delta t = 10 \text{ nsec}$ , after which it relaxes to its lower energy stable state by emitting a photon. What uncertainty in the frequency of the emitted photon is implied?

- 6 kHz  
 7 GHz  
 8 MHz  
 9 Hz