1. Visible wavelengths of electromagnetic radiation have a range of wavelengths of
   A) 90 to 130 nm.
   B) 1 to 100 nm.
   C) 800 to 1900 nm.
   D) 400 to 700 nm.

2. Suppose an astronomical satellite observes the Crab Nebula at a wavelength of 100 nm. In what wavelength range is this satellite observing?
   A) ultraviolet
   B) infrared
   C) gamma rays
   D) X-rays

3. X-rays and light are
   A) different because X-rays are made up of particles, whereas light is made up of waves.
   B) the same thing except that X-rays have a shorter wavelength than light.
   C) the same thing except that X-rays have a longer wavelength than light.
   D) different because X-rays are made up of waves, whereas light is made up of particles.

4. What is the wavelength of electromagnetic radiation whose frequency is $10^6$ cycles per second ($10^6$ Hz or 1000 kHz, the frequency of ordinary AM radio)?
   A) 3 mm
   B) 3 cm
   C) 3 m
   D) 300 m

5. The human eye is most sensitive to light with a wavelength near 550 nm. To what photon energy is the human eye most sensitive?
   A) 2.49 eV
   B) $3.61 \times 10^{-19}$ eV
   C) 2.25 eV
   D) 1.83 eV
6. What is the energy in electron volts of a photon whose wavelength is the diameter of a typical atom, about 1 nm?
   A) 12.4 keV, or 12,400 eV
   B) $1.24 \times 10^{-7}$ eV
   C) 1.24 keV, or 1,240 eV
   D) 8.061 MeV, or 8,061,000 eV

7. The parameter of an atom that defines its unique position in the periodic table is
   A) the total number of protons and neutrons in the nucleus.
   B) its temperature.
   C) the number of protons in the nucleus.
   D) its size.

8. The Lyman series of spectral lines at UV wavelengths are emitted by a hot hydrogen gas when the electrons fall from all higher atomic energy levels to the
   A) ionization level, or $n = \infty$.
   B) first excited level, $n = 2$.
   C) next level down for each level (e.g., $n = 4$ to $n = 3$).
   D) ground state, $n = 1$.

9. The strong visible spectral line emitted by hot hydrogen gas is known as the
   A) 21-cm line.
   B) Balmer $\alpha$ line.
   C) Paschen $\alpha$ line.
   D) Lyman $\alpha$ line.

10. What happens in general when ultraviolet radiation passes through a tube of cool hydrogen gas?
    A) Radiation at all wavelengths is absorbed, reducing the intensity at all wavelengths uniformly.
    B) It is unhindered except at the specific wavelengths of the Lyman series, L$\alpha$, L$\beta$, etc, which are absorbed by the atoms.
    C) It is unhindered except the Lyman L$\alpha$ wavelength, which is absorbed by the atoms.
    D) It is unhindered since the hydrogen gas is cool and cannot absorb energy.