

ASTRO 130, Homework 1

Name: _____ Date: _____

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) 3.61×10^{-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) 1.24×10^{-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 $n = \text{infinity}$.
 - 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 α line.
 - C) Paschen α line.
 - D) Lyman α 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.