

Quiz 5; Phys 100

Name _____

Photon energy: $E = hf$. Wavelength of a particle: $\lambda = h/(ms)$.

1. (4 points) The photoelectric threshold frequency of a certain metal lies in the yellow region of the spectrum. Will red, green, violet, and infrared light cause electrons to be ejected from the surface? (From low to high frequency: infrared, red, green, violet, ultraviolet.)

(a) Red yes, Green yes, violet no, infrared yes

(b) Red no, Green yes, violet yes, infrared no

(c) Red yes, Green yes, violet no, infrared yes

(d) Red no, Green yes, violet yes, infrared yes

(e) Red yes, Green no, violet no, infrared no

2. (3 points) Which of the following is *not* true when you compare a radio photon and an blue photon, given that the frequency of blue light waves is higher than that of radio waves?

(a) The blue photon is more energetic

(b) Both photons have zero rest mass

(c) The blue photon moves faster

(d) Only the blue photon is visible to our eyes

(e) Both are detectable by instruments

3. (4 points) An electron and a proton are moving at the same speed. Which has the longer wavelength? How much longer? (Protons are about 1800 times more massive than electrons.)

Answer: Since $\lambda = h/(ms)$, the wavelength is inversely related to the mass. h is a constant, and s is given to be the same. Therefore the electron wavelength will be longer; 1800 times the proton wavelength.

4. (3 points) Which of the following does *not* play a role in an explanation of why, according to classical physics, a Hydrogen atom should not exist?

- (a) **The electron and the proton are both completely stationary**
- (b) Energy is conserved
- (c) The electron has a nonzero electric charge
- (d) Accelerating charges radiate electromagnetic waves
- (e) Waves transmit energy

5. (4 points) Which element was discovered not on Earth, but by examining the spectrum of light from the Sun?

- (a) Epithelium
- (b) Oxygen
- (c) Euphonium
- (d) Pathogen
- (e) **Helium**

6. (4 points) What is the Copernican principle?

- (a) The speed of light is constant everywhere
- (b) Atomic elements have a characteristic set of lines in their spectra
- (c) Life must be based on carbon, rather than silicon chemistry
- (d) Science fiction movies always have unrealistic conceptions of possible aliens
- (e) **Earth does not occupy a special location in the universe**