

SHOW WORK TO RECEIVE CREDIT

$$E = h\nu \quad c = \lambda\nu \quad E_n = (-R_H)(1/n^2) \quad E = h\nu$$

$$R_H = 2.18 \times 10^{-18} \text{ J} \quad c = 3.0 \times 10^8 \text{ m/s} \quad h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$$

1. (3 Pts) What is the wavelength of radiation that has a frequency of $6.91 \times 10^{14} \text{ s}^{-1}$?

$$\lambda = \frac{c}{\nu} = \frac{3.0 \times 10^8 \text{ m/s}}{6.91 \times 10^{14} \text{ s}^{-1}} = 4.34 \times 10^{-7} \text{ m}$$

2. (3 Pts) Calculate the frequency of visible light having a wavelength of 656 nm.

$$c = \lambda\nu \quad \nu = \frac{c}{\lambda} = \frac{3.0 \times 10^8 \text{ m/s}}{656 \times 10^{-9} \text{ m}} = 4.57 \times 10^{14} \text{ s}^{-1}$$

3. (3 Pts) Calculate the energy, in joules, required to excite a hydrogen atom by causing an electronic transition from the $n = 1$ to the $n = 4$ principal energy level.

$$E_n = -R_H \left(\frac{1}{n^2} \right) \text{ for } n=1: E = -2.18 \times 10^{-18} \text{ J} \left(\frac{1}{1} \right) = -2.18 \times 10^{-18}$$

$$\text{for } n=4: E = -2.18 \times 10^{-18} \text{ J} \left(\frac{1}{4} \right) = -0.545 \times 10^{-18}$$

Taking difference gives $\Delta E = 2.04 \times 10^{-18} \text{ J}$
 assign a positive value because energy must be gained from $1 \rightarrow 4$.

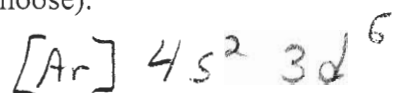
4. (3 Pts) How many unpaired electrons does an atom of silicon have?

2

5. (3 Pts) Which element has the electron configuration: $[\text{Kr}]5s^2 4d^{10} 5p^1$

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6. (3 Pts) Write out the electron configuration of a ground state Fe atom (you may use the shorthand method if you choose).



7. (3 Pts) Arrange the following ions in order of increasing ionic radius, Na^+ , P^{3-} , S^{2-} , Cl^- . (smallest to largest)



8. (4 Pts) Give the complete electron configuration for each of the following and state if the atom or ion would be paramagnetic or diamagnetic.

