

Formulas: $e = mc^2$ $E = h\nu$ $c = \lambda\nu$ $\Delta E = -R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$ $R_H = 2.178 \times 10^{-18}$

SHOW ALL WORK TO RECEIVE CREDIT

- 1.(5) What is the energy of a photon of electromagnetic radiation with a frequency of 3.51×10^{14} Hz? ($c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J · s)

$$E = h\nu = (6.63 \times 10^{-34} \text{ J} \cdot \text{s}) (3.51 \times 10^{14} \text{ s}^{-1})$$

$$2.327 \times 10^{-19} \text{ J}$$

- 2.(3) Which of the following electron configurations represents an excited state of the indicated atom?

- A) He: $1s^2$
 B) Ne: $1s^2 2s^2 2p^6$
 C) Na: $1s^2 2s^2 2p^6 3s^2 3p^2 4s^1$
 D) P: $1s^2 2s^2 2p^6 3s^2 3p^2 4s^1$
 E) N: $1s^2 2s^2 2p^3$

- 3.(5) What is the wavelength in nm of a photon having a frequency of 26.8 THz? ($n = 10^{-9}$, 1 THz = 10^{15} Hz, $c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J · s)

$$c = \lambda\nu$$

$$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m/s}}{26.8 \times 10^{15} \text{ s}^{-1}} = 11.2 \text{ nm}$$

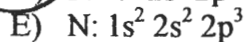
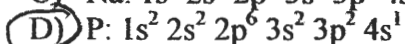
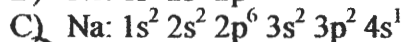
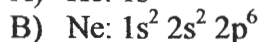
4. (12 Pts) Write out the complete (i.e. start with $1s^2$ ground state electron configuration for each of the following.

- a. Se: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$
- b. Nb: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^3$
- c. Fe^{2+} : $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ (Lost the $4s^2$ electrons)

Formulas: $e = mc^2$ $E = h\nu$ $c = \lambda\nu$ $\Delta E = -R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$ $R_H = 2.178 \times 10^{-18}$

SHOW ALL WORK TO RECEIVE CREDIT

1.(3) Which of the following electron configurations represents an excited state of the indicated atom?



2.(5) What is the wavelength in nm of a photon having a frequency of 20.1 THz? ($n = 10^{-9}$)

1 THz = 10^{15} Hz, $c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J · s

$c = \lambda\nu$

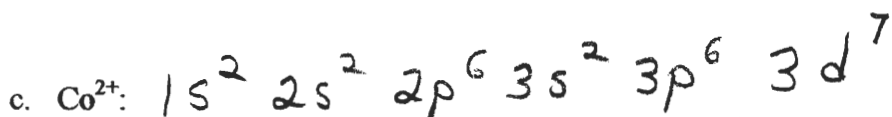
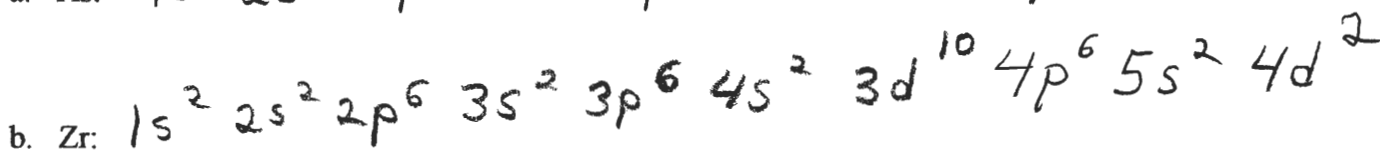
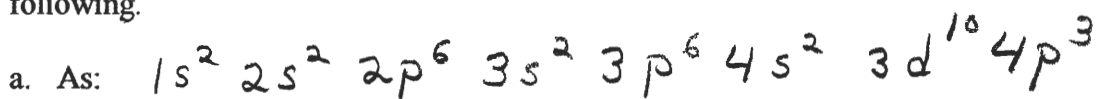
$\lambda = \frac{c}{\nu} = \frac{3.00 \times 10^8 \text{ m}}{20.1 \times 10^{15} \text{ s}^{-1}} = 14.9 \text{ nm}$

3.(5) What is the energy of a photon of electromagnetic radiation with a frequency of 4.64×10^{14} Hz? ($c = 3.00 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J · s)

$E = h\nu = 6.63 \times 10^{-34} \text{ J} \cdot \text{s} \times 4.64 \times 10^{14} \text{ s}^{-1} = 3.08 \times 10^{-19} \text{ J}$

$E = h\nu = \frac{6.63 \times 10^{-34} \text{ J} \cdot \text{s} \times 4.64 \times 10^{14}}{\text{s}} = 3.08 \times 10^{-19} \text{ J}$

4. (12 Pts) Write out the complete (i.e. start with $1s^2$ ground state electron configuration for each of the following.



↑ Lost the $4s^2$ electrons