

## AP Chemistry – Quantum Nature of Matter – 5

Name \_\_\_\_\_ Per \_\_\_\_

1. What is the frequency of radiation whose wavelength is 589 nm?
2. What is the wavelength of radiation that has a frequency of  $1.2 \times 10^{13}$  Hz?
3. Would the radiations in questions 1 or 2 be visible to the human eye?
4. What distance does electromagnetic radiation travel in 7.50 ms?
5. What is the energy of a photon of frequency 80.5 MHz?
6. What frequency of radiation has photons of energy  $1.77 \times 10^{-19}$  J? In what region of the electromagnetic spectrum would this radiation be found?

7. Calculate the wavelengths of the first three lines in the Lyman series – those for which  $n_i = 2, 3,$  and  $4$ .
8. Use the de Broglie relationship to determine the wavelength of an 85 kg person skiing at 50. km/h.
9. How many possible values for  $l$  and  $m_l$  are there when (a)  $n = 3$  and (b)  $n = 5$ ?
10. What is the maximum number of electrons in an atom that can have the following quantum numbers:
- (a)  $n = 2, m_s = -1/2$
  - (b)  $n = 5, l = 3$
  - (c)  $n = 4, l = 3, m_l = -3$
  - (d)  $n = 4, l = 1, m_l = 1$
11. Using only a periodic table as a guide, write the condensed electron configurations for the following atoms:
- (a) Se
  - (b) Rh
  - (c) Hg
  - (d) Hf

12. Write the chemical formulas for each of the following compounds:

- |    |                            |          |
|----|----------------------------|----------|
| a. | Potassium dichromate       | a. _____ |
| b. | Cobalt(II) nitrate         | b. _____ |
| c. | Chromium(III) acetate      | c. _____ |
| d. | Sodium hydride             | d. _____ |
| e. | Calcium hydrogen carbonate | e. _____ |
| f. | Barium bromate             | f. _____ |
| g. | Copper(II) perchlorate     | g. _____ |

13. A compound has the following mass% composition: 61.2% Carbon, 6.16% Hydrogen and 32.6% Oxygen. Determine the empirical formula.

14. If the compound represented by the empirical formula above, has the molar mass 196.22 g, what is the molecular formula.

15. Selenium has six naturally occurring isotopes: 0.89% is Se 74, 9.37% is Se 76, 7.63% is Se 77, 23.77% is Se 78, 49.61% is Se 80 and 8.73% is Se 82. What is the average atomic mass of Selenium?