1) The percentage composition of an organic compound is found to be 39.9% C, 6.7% H, and 53.4% O. Determine the empirical formula of the compound.

2) The molar mass was determined by experiment to be 60.0 g/mol. What is the molecular formula?

Use the following recipe to complete the associated calculations. Given 1 cup flour is 45 g, 1 stick butter is 113 g, 1 egg is 52 g, 1 cup sugar is 180 g, and 1 cup milk is 242 g.

3.0 cups flour + 2.0 sticks butter + 4.0 eggs + 1.0 cup sugar + 1.0 cup milk → 1.0 cake

3) If you had 24 cups of flour and excess all other ingredients, how many cakes could you make?

4) If you had 247 g of sugar and excess all other ingredients, how many cakes could you make?

Ethanol (C_2H_6O) can be used as an alternative fuel. Answer the following questions given the reaction outlined below for the combustion of ethanol:

$$C_2H_6O \ (l) + 3 \ O_2 \ (g) \rightarrow 3 \ H_2O \ (g) + 2 \ CO_2 \ (g)$$
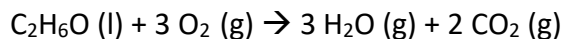
5) How many moles of O_2 would you need to make 15.2 moles of CO_2?

6) If 453 grams of ethanol are burned in the presence of excess oxygen, how many grams of H_2O would be produced?

7) One method to absorb CO_2 from the air involves a reaction with LiOH. Following the reaction below, how many grams of CO_2 can be absorbed in the reaction with 45 grams of lithium hydroxide.

$$2 \text{ LiOH (s)} + CO_2 \text{ (g)} \rightarrow Li_2CO_3 \text{ (s)} + H_2O \text{ (l)}$$
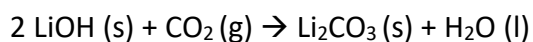
8) Using the reaction outlined in question 7, how many grams of lithium carbonate could theoretically be formed from the reaction between 26 grams LiOH and 18 grams of CO_2?

9) What is the percent yield from the reaction outlined in question 8, if 27.2 grams of Li_2CO_3 are collected?
$$percent\ yield = \frac{actual\ yeild}{theoretical\ yeild}\ x\ 100$$

1) The atomic radius of main-group elements generally decreases across a row because _____.
A) effective nuclear charge increases across a row
B) effective nuclear charge decreases across a row
C) effective nuclear charge zigzags across a row
D) the principal quantum number of the valence orbitals increases
E) none of the above

2) Which group in the periodic table contains elements with the valence electron configuration of ns^2np^2?
A) 1A
B) 2A
C) 3A
D) 4A
E) 6A

3) In which orbital does an electron in a copper atom experience the greatest effective nuclear charge?
A) 3s
B) 4d
C) 4p
D) 2p
E) 3d

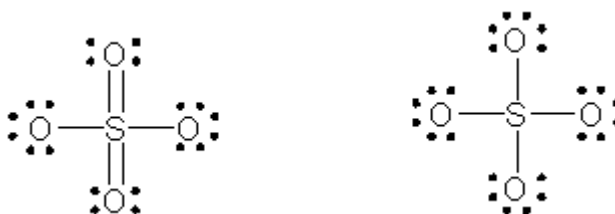4) In which orbital does an electron in a copper atom experience the least effective nuclear charge?
A) 3s
B) 4d
C) 4p
D) 2p
E) 3d

5) What would be the electron configuration of In^{3+} ?
A) $[Kr]5d^{10}$
B) $[Kr]4d^{10}$
C) $[Kr]5s^24d^8$
D) $[Xe]5s^24d^8$
E) $[Kr]5s^25d^{10}5p^1$

6) Determine the formal charge on sulfur in SO_4^{2-} in both Lewis structures of the ion.

A) -2, 0
B) -2, -2
C) +2, 0
D) 0, +2
E) 0, 0

7) Please complete each step of the following problem:
- Please draw the **BEST** Lewis dot structures for the following molecules or ions
- assign charges to atoms that carry charge where appropriate
- answer the following questions listed below:

$[N_3]^-$ ClO_4^{1-}

7b)How many bonding electron **PAIRS** are assigned to the central atom? (2 pts)
N   Cl

7c)How many nonbonding electron **PAIRS** are assigned to the central atom? (2 pts)
N   Cl

7d) Which, if any, of Lewis structures above, violate the octet rule? (2 pts)

1.) If Duke Blue devil blue has a wavelenght of exatly 484 nm. What is the frequency of that
    wavelength? Given c = 3.0 x 10^8 m/s

Frequency =

2.) What is the energy of that wavelength of light? Given h = 6.626 x 10^{-34} J·s

ΔE =

3.) Wi-Fi signal broadcasts at a frequency of 2.4 GHz, what is the wavelength and energy of this
    signal?

λ =
E =

4.) Exposure to UVA and UVB light causes skin damage. If UVA light has a wavelength of 395
    nm and UVB has a wavelength of 315 nm. What is the energy of one photon of UVA and
    UVB light?

UVA =
UVB =

5.) Using your answer from question 4, what is the energy contained in one mole of UVA and one mole of UVB photons?

UVA =	
UVB =	

6.) If the average energy required to break a chemical bond is 374 kJ/mol, which light (UVA or UVB) is more likely to be able to break a chemical bond, causing damage to our skin? Why?

7.) What is the wavelength (in nm) of light released when an electron in a hydrogen atom transitions from n = 6 to n = 2 quantum level? Given (hcR_H) = 2.18 x 10⁻¹⁸ J

$$\Delta E = -hcR_H \left[\left(\frac{1}{n_f^2} \right) - \left(\frac{1}{n_i^2} \right) \right]$$

Given:

$$c = v\lambda \qquad\qquad E = hv \qquad E = \frac{h \cdot c}{\lambda}$$