INSTRUCTIONS:
PRINT YOUR NAME ————> NAME ________________.

QUIZ 8 Work 3 of 1-4
FINAL Work all of 5-12
SHOW YOUR WORK FOR PARTIAL CREDIT
USE THE CORRECT NUMBER OF SIGNIFICANT FIGURES
THE LAST TWO PAGES ARE A PERIODIC TABLE AND A SCRATCH SHEET

1 _____
2 ____.

h = 6.626 X 10^-34 J-s
3 ____
c = 2.9979 X 10^8 m/s
4 ____
J = (kg·m^2)/s^2

TOTAL(75) ____.

5 ____ 10
6 __ 20.
7 __ 20.
8 __ 20.
9 __ 20.
10 __ 20.
11 __ 20.
12 __ 20.

TOTAL(150) ____.
1. (a) Se is not in the above table. How does its electronegativity compare to S? (greater, less, or the same)

(b) B is not in the above table. How does its electronegativity compare to carbon? (greater, less, or the same)

(c) Which is the more polar bond? C-H or C-O?

(d) What type of bonding would you expect between the following elements (covalent, polar covalent, or ionic):
Si and F? ______________ N and Cl? ______________ Na and F? ______________

2. Arrange the three species in increasing order of size (radii) for each of (a) – (e)
(a) Co Co^{2+} Co^{3+} _______ < _______ < _______
(b) Na^{+} K^{+} Rb^{+} _______ < _______ < _______
(c) Ca^{2+} K^{+} Cl^{-} _______ < _______ < _______
(d) S S^{-} S^{2-} _______ < _______ < _______
(e) O^{-} O O^{+} _______ < _______ < _______
3. Draw a valid Lewis structure for the following molecules or ions.

(a) HCN  (b) NF₃  (c) SO₄²⁻  
(C atom central)

(d) H₂O  (e) ONF  
(O atom central) (N atom central)

4. Using the following bond energies, estimate the ΔH of the reaction below.

Bond energies in kJ/mol

C-H  413  O=O  495
Cl-Cl  239  C=O  745
H-Cl  427

\[
2 \text{H} = \text{C} = \text{H} + 4 \text{Cl} = \text{Cl} + \text{O} = \text{O} \rightarrow 2 \text{C} = \text{O} + 8 \text{H} = \text{Cl}
\]
5. (a) A super tanker has a capacity to carry \(6.74 \times 10^5 \text{ m}^3\) of oil. How many barrels of oil can the super tanker carry? (1000 L = 1 m\(^3\), 3.785 L = 1 gallon, and 42 gallons = 1 barrel)

(b) An empty bottle has a mass of 100 g. When filled with water (density = 1.00 g/mL), the mass of the bottle and the water is 250 g. The bottle is emptied and then filled with an unknown liquid. The mass of the bottle and unknown liquid is 320 g. What is the density of the unknown liquid?

6. Answer the following questions concerning elementary atomic theory.

(a) An atom has 42 protons and 54 neutrons. What is the element? ________________

(b) What is the symbol (including Z and A) for an atom that has

40 protons and 54 neutrons ______________________

(c) What is the name of the following compounds? (Li = lithium)

\(\text{Li}_3\text{N}\) ________________________________ \(\text{AlF}_3\) ________________________________

\(\text{Ca(NO}_3\text{)}_2\) ________________________________

(d) Write the correct formula for the following compounds.

Ionic compound formed between sodium and phosphate __________________________

Molecular compound chlorine trifluoride __________________________
7. Malonic acid contains only carbon, oxygen, and hydrogen. It has a percent by mass composition of 34.62% carbon, 3.87% hydrogen, and the remaining is oxygen. What is the empirical formula of malonic acid?

8. Iron (III) chloride reacts with hydrosulfuric acid to form iron (III)sulfide and hydrochloric acid. How many g of hydrochloric acid are formed when 23.8 g of iron(III)chloride completely reacts with excess hydrosulfuric acid?

\[ 2 \text{FeCl}_3 + 3\text{H}_2\text{S} \rightarrow \text{Fe}_2\text{S}_3 + 6\text{HCl} \]
9. If 37.12 mL of 0.1151 M NaOH are required to neutralize 20.00 mL of citric acid, H$_3$C$_6$H$_5$O$_7$, what is the molarity of the citric acid?

\[
\begin{align*}
\text{H}_3\text{C}_6\text{H}_5\text{O}_7 + 3\text{NaOH} & \rightarrow \text{Na}_3\text{C}_6\text{H}_5\text{O}_7 + 3\text{H}_2\text{O} \\
\end{align*}
\]

10. Calculate the enthalpy of the following reaction:

\[
\begin{align*}
\text{POCl}_3(\text{liq}) + 3\text{H}_2\text{O}(\text{liq}) & \rightarrow \text{H}_3\text{PO}_4(\text{aq}) + 3\text{HCl}(\text{aq}) \\
\end{align*}
\]

\[
\begin{array}{|c|c|}
\hline
\text{Compound} & \Delta H^\circ (\text{kJ}) \\
\hline
\text{POCl}_3(\text{liq}) & -597 \\
\text{H}_2\text{O}(\text{liq}) & -286 \\
\text{H}_3\text{PO}_4(\text{aq}) & -1288 \\
\text{HCl}(\text{aq}) & -167 \\
\hline
\end{array}
\]
11. Answer the following questions concerning atoms and modern atomic theory. What are the electron configurations of the following atoms?

(a) Al

(b) Rb

(c) P

Arrange the three species in increasing order for the property given in the left column in (d)-(d).

(d) 1st ionization energy  C  Si  Sn  _______ < _______ < _______

(e) 1st ionization energy  F  N  O  _______ < _______ < _______

(f) atomic radii  Mg  Al  S  _______ < _______ < _______

(g) Atomic radii  Li  Na  K  _______ < _______ < _______

12. A transition in a hydrogen atom from n = 1 to n = 2 has an energy of $+1.633 \times 10^{-18}$ J. What is the wavelength of light associated with this transition?