

Chemistry
Utica Community Schools – Semester One Review

Directions:

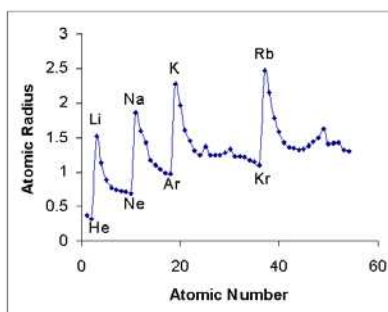
- You may prepare your own hand-written 3x5 note card which will be collected on your exam day. You must bring a pencil and calculator to the exam.
- You will be given a periodic table.
- If you complete the entire review sheet by the day of your exam you will be eligible for the curve should one be applied.
- The answers to this review must be on a separate sheet of lined paper. You will first see the objective of each question followed by the question itself. This is what you are providing the answer to.

Objectives and Questions:

- 1) Know how to write the names and formulas for ionic compounds, covalent compounds, acids and bases.
 - a. Write the names for the following compounds:
 - i. S_4O_6
 - ii. $Fe_3(PO_4)_2$
 - iii. $Mg(CN)_2$
 - iv. H_2S
 - v. HNO_3
 - vi. HNO_2
 - b. Write the formulas for the following compounds:
 - i. Silicon dioxide
 - ii. Phosphoric acid
 - iii. Lithium sulfite
 - iv. Cobalt (III) phosphate
 - v. potassium fluoride
 - vi. cesium hypochlorite
- 2) Know the location and properties of all three major subatomic particles (p^+ , n^0 , e^-) found on each atom.
 - a. What two subatomic particles are found in the nucleus? Describe the nucleus.
 - b. Where are electrons located?
 - c. Which two particles contribute to the atom's mass? What particle is the atomic number?
 - d. All atoms of the same type of element have the same number of which particle?
 - e. What must be true for an atom to be considered neutral in charge?
 - f. What particles are attracted to each other? What particles repel? What holds these particles together?
- 3) Know how to identify a compound as an ionic or covalent compound. Covalent compounds are also referred to as molecular compounds.
 - a. Circle the following formulas that represent ionic compounds. Put a box around those that are covalent/molecular.

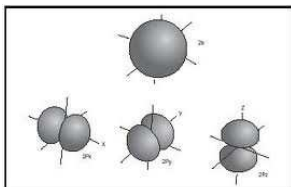
NO_2 $NaCl$ $BaCl_2$ CH_4 $PbSO_4$ H_2O_2 Fe_2O_3 $(NH_4)_2CO_3$ PH_3
- 4) Know how to properly classify an element and its reactivity based on its location on the periodic table.
 - a. Name and write the symbol of 2 Nonmetals, One semimetal, and 2 metals
 - b. Give the family name of Group 1, Group 2, Group 17, Group 18. Name one element from each of these families.
 - c. Why are elements that are placed in the same column called a family or a group? Who would have the same chemical properties as Krypton?
 - d. What type of compounds form between metals and nonmetals? Between a Group 1 and a Group 7?
 - e. What are the common ion charges of Groups 1,2,13,14,15,16,17,18 (AKA Groups 1A-8A)?

- 5) Know what mass defect is and how it affects the law of conservation of matter.
- Define mass defect? What type of reaction has a mass defect? How does this contradict the law of conservation of matter?
- 6) Know how to write electron configurations for elements of Periods 1-4.
- Write the electron configuration for the following elements: Iron, Magnesium, and Fluorine.
 - Write the abbreviated configuration for the elements in part b.
 - Identify the elements having the following electron configurations:
 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$
 - $[\text{Ne}] 3s^2 3p^5$
- 7) Know the trends of the periodic table such as atomic size, electronegativity, ionization energy and ionic size.
- Use the graph below to answer the following questions.
 - Identify the two groups shown on the table below.
 - Define atomic radius. Which group has the higher radius? Why do they have a higher radius?



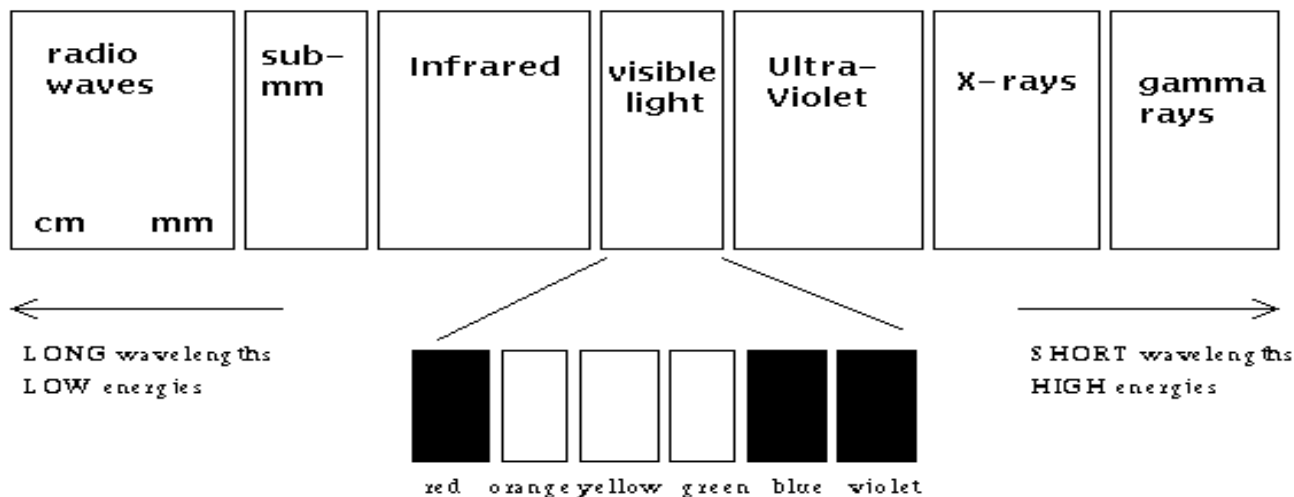
- Define electronegativity. What element has the highest electronegativity? What is the group trend for electronegativity and the period trend for electronegativity?
- 8) Be familiar with the terms mass number, atomic number, nuclei symbol and charge. Know how to determine the number of subatomic particles present on an atom based on these terms. Know various ways of representing isotopes of an atom.
- Determine the mass number, atomic number, the proton, neutron and electron count for:
 - $^{16}_8\text{O}$
 - $^{63}_{29}\text{Cu}^{+2}$
 - $^{35}_{17}\text{Cl}^{-1}$
 - Write a nuclei symbol, like the ones shown above, for an element with 10 protons, 12 neutrons and 10 electrons. Is this atom neutral?
 - Write a nuclei symbol for magnesium – 24. What does the number after the hyphen tell you?
 - How many protons, neutrons and electrons are present on the isotope aluminum – 27?
- 9) An atom has a mass number of 23 and an atomic number of 11. How many p^+ , n^0 , and e^- 's on this atom.
- 10) Be able to define and list examples of chemical change, physical change.
- Chemical or Physical Change – you be the judge! Write Chemical or Physical for your answer.
 - Melting Ice
 - Igniting a candle
 - Tearing Paper
 - A rusting car
 - Dissolving sugar
 - Reacting an acid with a base
 - What is happening at the molecular level during a chemical change. Draw a picture of the reaction of hydrogen gas plus oxygen gas to form water. Draw a picture of these molecules showing change. Describe how you know a chemical change has occurred.

- 11) Know the difference in how heat is transferred during the process of conduction, convection and radiation.
- What is a convection oven? How does it work?
 - Why does a metal spoon on the stove top get hot? How is this heat transferred? What is this called?
 - Conduction works best in solids because _____?
- 12) Know how to describe the most current model of atom. Be familiar with the shapes of the orbitals of s, p and d.
- Describe the Quantum Mechanical Model of the atom. Is it based on knowing the actual location of the electron or is based on probability?
 - Is it possible to know the exact location of an electron? Why or why not?
 - Identify the type of orbital shown in each row of the picture below. What is the shape of each type?



- 13) Be able to predict the products of an acid and base reaction. Know what pH is and how to classify a solution as acidic, basic or neutral. Be familiar with common indicators and how to interpret their colors.
- Based on the following pH's, classify the solutions as acidic, basic, or neutral:
 - pH = 2
 - pH = 9.8
 - pH = 7
 - pH = 11
 - pH = 3.5
 - List two properties of both acids and bases. Examples include taste, what ion they create, feel...
 - Indicators
 - What color is bromthymol blue in acid? In base?
 - What color is Litmus Paper in Acid? In base?
 - What color is phenolphthalein in acid? In base?
 - True or False: When an acid reacts with a base in a neutralization reaction, a salt and water form.
 - What are the products of a reaction between nitric acid and lithium hydroxide?
 - Why is calcium carbonate found in antacids? Why is a calcium carbonate lake bed helpful?
- 14) Know how to describe each of the states of matter in terms of the strength of their attractive forces, their range of motion, their shape, volume and capacity to flow.
- Which two states of matter can flow?
 - Which two states of matter have definite volume?
 - Which two states of matter have indefinite shape?
 - Which two states of matter are the condensed states of matter (Have particles that touch)?
 - List the three states of matter in order of increasing intermolecular (attractive) forces.
 - Characterize the motion allowed in the solid state? In the gas state? Why are they different?

- 15) Know how to perform mole conversions using moles, grams, and representative particles.
- What is a representative particle? What is the name of the representative particle for the ionic compound? The covalent compound? An element?
 - How many formula units are in a 53.79 gram sample of SrCO_3 ?
 - How many moles of AlF_3 are in a 10.0 gram sample of AlF_3 ?
 - How many grams of SO_2 are in a 0.65 mole sample of SO_2 ?
 - How many moles of copper atoms in 75g of Cu?
 - In a sample with 17.0 grams of water, how many molecules of water are present?
- 16) Understand flame tests and what they have taught us about the atom. Know, how the color emitted relates to the energy of the electron's jump.



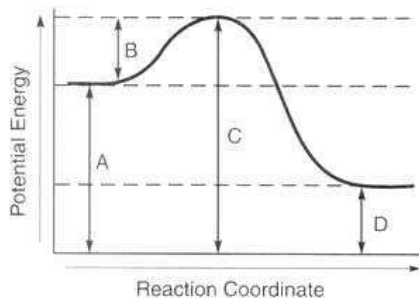
- A student does a flame test on three compounds A, B and C. Which flame represents the emission of an electron at the highest energy state? The following results were obtained:
 - Compound A creates a Red flame
 - Compound B creates a Yellow flame
 - Compound C creates a Blue flame
- 17) The labs you do help you process and analyze information. They also teach you how to design labs. Be aware of how lab design works.
- Why we do need multiple trials? Constants? Controls? Variables? Hypotheses?
- 18) Know how to calculate the Average atomic mass of an element given information about the percent abundance and the masses of the individual isotopes. Know how the average atomic mass can be used to predict the most abundant isotope
- Calculate the average atomic mass of magnesium in AMU units given the following information:

Isotope	Mass of the Isotope (AMU)	Percent Abundance
Magnesium-24	23.985041700	0.7899
Magnesium-25	24.98583692	0.1000
Magnesium-26	25.982592929	0.1101

- Chlorine has two naturally occurring isotopes, Chlorine-35 and Chlorine-37. It's average atomic mass is 35.453 amu. Which isotope is more abundant in nature? How can you tell?

19) Use kinetic theory and collision theory to explain the energy changes that accompany a chemical reaction.

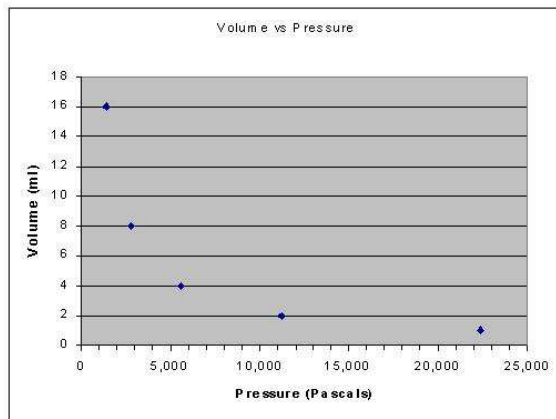
a. Use the curve below to answer the questions that follow:



- i. What letter shows the initial energy of the reactants?
- ii. What letter shows the Activation energy?
- iii. What letter shows the energy of the activated complex?
- iv. What letter shows the final energy of the products?

20) Use kinetic theory to describe gases, liquids and solids and use the Gas Laws to solve gas related problems.

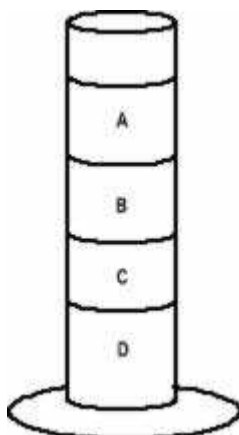
- a. Which state of matter is best described as having closely packed particles in fixed positions?
- b. Which state of matter is best described as having particles that are completely separated with random motion?
- c. What is temperature and what does it measure? Describe how the kinetic energy is different for a cup of water at 0°C and for a cup of water at 25°C? Describe how the kinetic energy is different for a cup of water at 25°C and a piece of plastic at 25°C.
- d. Write the equations for the relationships listed below:
 - i. Pressure and Volume
 - ii. Pressure and Temperature
 - iii. Volume and Temperature
- e. What happens to the pressure of a gas if the temperature is increased in a constant volume container? What could happen if you left a bottle of hairspray in the trunk of a car on the hottest of days? Explain why this would happen on the particle level.
- f. What happens to the volume of a gas if it is heated? How are volume and temperature related? If one goes up the other _____?
- g. Use the graph below to answer the following questions:



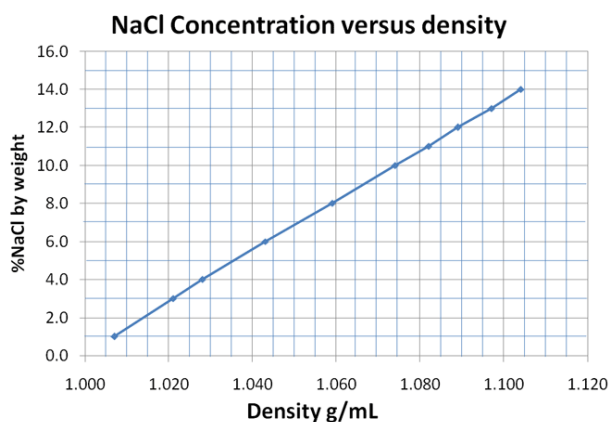
- i. What does this graph show about the relationship between volume and pressure?
- ii. Finish this statement: What the volume of a gas decreases, the pressure _____?

21) Understand Density and know what causes a substance to float in another substance.

- a. Put the following substances in order from LEAST dense to MOST dense. How did you determine this?

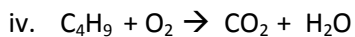
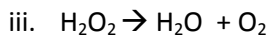
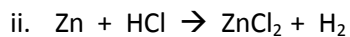
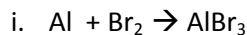


- b. A lab tests the density of different salt solutions based on the %NaCl by mass in the water. The data for the lab is graphed and shown below. You need to get the %NaCl in an unknown solution. The unknown solution has a mass of 26 grams and a volume of 25 mL. What is the approximate %NaCl for that solution?



22) Know how to balance equations with coefficients, how to translate the word equation to balanced equation with proper formulas.

- a. Balance the following equations:



- b. Translate the words into a balanced chemical equation

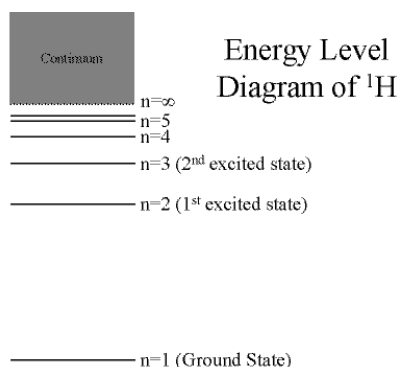
i. Carbon dioxide, water and sodium carbonate are produced when sodium bicarbonate is strongly heated.

ii. Zinc reacts with hydrochloric acid to produce hydrogen gas and zinc chloride.

iii. Calcium nitrate reacts with sodium phosphate to form calcium phosphate and sodium chloride.

23) Describe the Bohr model of the atom. Be able to describe how this model explains the results we see in flame tests.

- Where does Bohr describe the location of the electrons on an atom?
- The energy levels that Bohr describes are similar to ladders. Look at the diagram below, how are similar to a ladder and how are they different.
- Why is Bohr's model no longer considered the best model of the atom?



- In the diagram above, when an electron goes from the $n=1$ (Ground State) to $n=2$ (excited state) it requires energy to do this. WHEN it falls back down it will release that energy. Often that is in the form of light. When atoms get bigger they have bigger electron orbitals and larger nucleus'. This makes energy levels different for different atoms ☺
 - Which electron transition, on the diagram above, would result in the largest release of energy, $n=1$ to $n=5$ OR $n=5$ to $n=1$? The smallest, $n=4$ to $n=5$ OR $n=5$ to $n=4$?
 - Copper produces a green flame test. When is the green light emitted, when the electron moves UP to the excited state or when it moves DOWN to the ground state?