**Mr. Perez – Chemistry Semester One Review Packet Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_\_\_**

**Terminology/Concepts *(You should be able to DEFINE these and give EXAMPLES)***

**\_\_\_\_\_Write Definitions on a separate sheet of paper. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Lab Safety Rules/Techniques
* Lab Equipment
* 50 element symbols and names
* Chemistry
* Matter
* Analytical Chemistry
* Inorganic Chemistry
* Organic Chemistry
* Biochemistry
* Physical Chemistry
* Pure Chemistry
* Applied Chemistry
* Alchemy
* Lavoisier
* Scientific Method
* Observation
* Hypothesis
* Quantitative
* Qualitative
* Experiment
* Independent Variable
* Dependent Variable
* Theory
* Scientific Law (model)
* Scientific Notation
* Accuracy
* Precision
* Accepted Value
* Experimental Value
* Error
* Percent Error
* ~~Significant Figures~~
* SI base units
* Mass
* Weight
* Volume
* Celsius Scale
* Kelvin Scale
* Energy
* Density
* Extensive Property
* Intensive Property
* Physical Property
* Chemical Property
* Solid
* Liquid
* Gas
* Vapor
* Plasma
* Phase Changes
* Physical Change
* Chemical Change
* Mixture
* Homogenous Mixture
* Heterogeneous Mixture
* Phase
* Filtration
* Distillation
* Element
* Compound
* Reactants
* Products
* Precipitate
* Law of Conservation of Mass
* Bohr Model of the Atom
* Nucleus
* Proton
* Neutron
* Electron
* Atomic Number
* Mass Number
* Isotopes
* Chemical symbol notation
* Octet Rule
* Average Atomic Mass
* Mendeleev
* ~~Moseley~~
* Periods/Series
* Groups/Families
* Alkaline Metals
* Alkaline Earth Metals
* Halogens
* Noble Gases
* Periodic Law
* Transition Metals
* Lanthanides
* Actinides
* Metals, Non-metals, Metalloids
* Atomic Radius
* Ionization Energy
* Orbital Notation
* Hund’s Rule
* Pauli Exclusion Principle
* Aufbau Principle
* ~~Quantum Numbers~~
* ~~Principle Quantum Number~~
* ~~Orbital Quantum Number~~
* ~~Magnetic Quantum Number~~
* ~~Spin Quantum Number~~
* Electron Dot Notation
* Noble Gas Notation
* Electron Configuration Notation

**Calculations/Types of Problems**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Percent Error
* ~~Determining the number of Significant Figures~~
* ~~Rounding~~
* ~~Sig Figs (addition, subtraction, multiplication, division)~~
* Scientific and Standard Notation
* Unit and Metric Conversions
* ~~Dimensional Analysis~~
* Volume
* Density
* Temperature Conversions
* Law of Conservation of Mass
* Mass Number to find # of neutrons
* Identify the atomic number, # of protons, neutrons, and electrons for an element
* Average Atomic Mass

**You will receive the following equations on your exam:**

**You NEED to have be familiar with the following SI units. Know the SI metric prefixes, their symbols, and the conversions.**

|  |  |  |  |
| --- | --- | --- | --- |
| **SI Prefix** | **Symbol** | **Conversions** | |
| **giga** | **G** | **1Gm =** | **1 x 109 m** |
| **mega** | **M** | **1 Mm =** | **1 x 106 m** |
| **kilo** | **k** | **1 km =** | **1000 m** |
| **deci** | **d** | **10 dm =** | **1 m** |
| **centi** | **c** | **100 cm =** | **1 m** |
| **milli** | **m** | **1000 mm =** | **1 m** |
| **micro** | **μ** | **1 x 106 μm =** | **1 m** |
| **nano** | **n** | **1 x 109 nm =** | **1 m** |
| **pico** | **p** | **1 x 1012 pm =** | **1 m** |

**Review Questions (Separated by Unit)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Unit 1 – Safety and Introduction to Chemistry**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***Complete the following true and false statements. Write “T” for true and “F” for false.***

1. \_\_\_\_\_When diluting an acid, you always add the water to the acid.
2. \_\_\_\_\_When massing a powder on the balance, you place it directly on the balance pan.
3. \_\_\_\_\_When heating a test tube, you should point the open end of the test tube towards yourself.
4. \_\_\_\_\_When evaporating a filtrate, you should use a low flame or occasionally remove the flame from beneath the evaporating dish in order to prevent spattering.
5. \_\_\_\_\_If you are absent, it is your responsibility to pick up any assignments you missed from Mrs. Gelhausen.
6. \_\_\_\_\_Books and purses should be left on the lab tables while performing a lab.
7. \_\_\_\_\_Hot glassware and cold glassware look different in appearance.
8. \_\_\_\_\_Open-toed shoes are not allowed in lab.
9. \_\_\_\_\_If a fire alarm goes off during lab, leave all Bunsen burners lit and exit the room as quickly as possible.
10. \_\_\_\_\_Regular glasses or contacts may be worn in the lab as a substitute for goggles.

***Answer the following questions.***

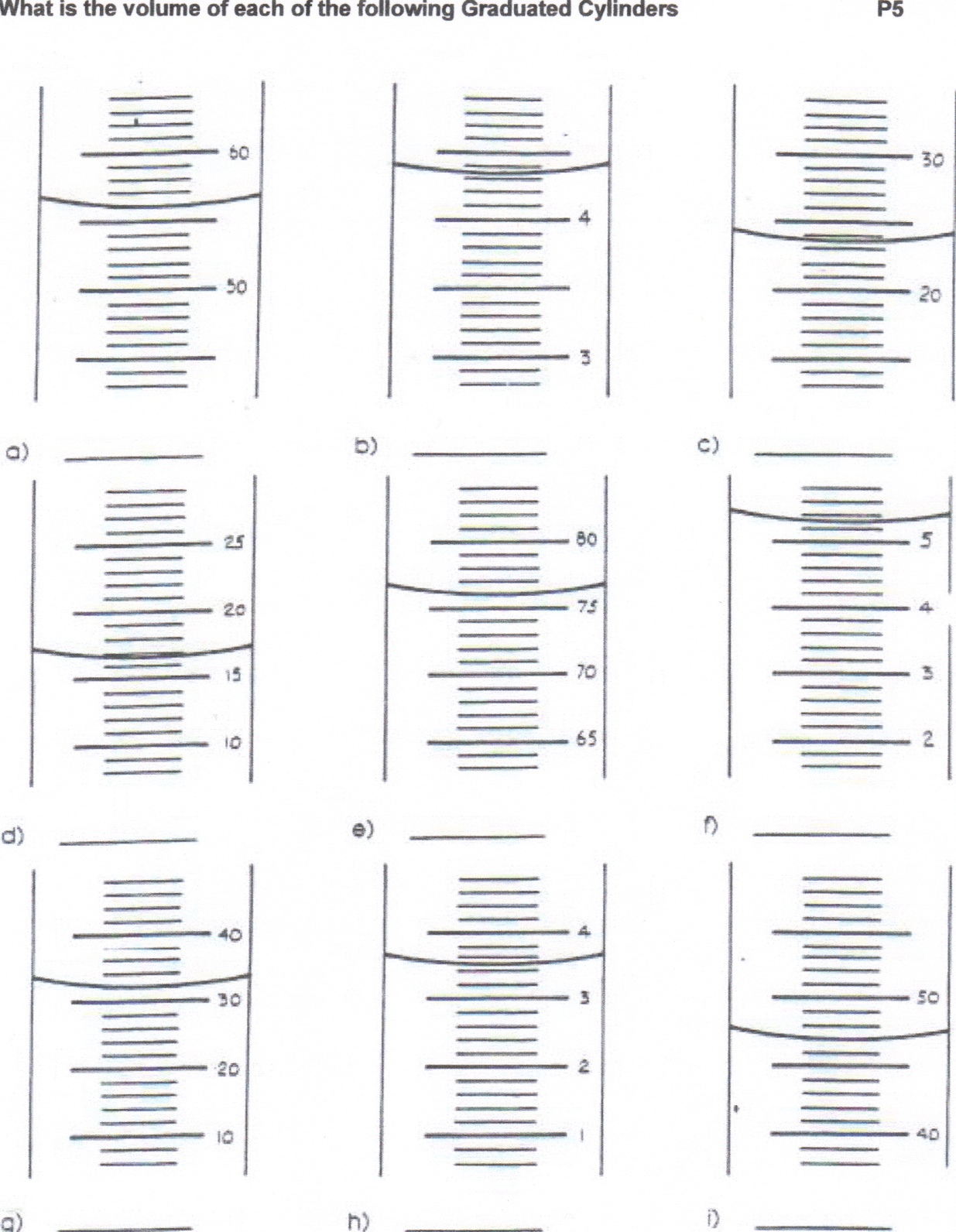
1. What are the five steps of the scientific method?
2. What is the difference between and Erlenmeyer and a Florence flask?
3. Describe the correct way to use an electronic scale. Be sure to mention the “tare” function.

1. Where are the fire extinguisher and safety eyewash station located in the classroom?
2. What is the difference between an independent variable and a dependent variable?
3. A scientist wants to find out if warm or cooled hydrochloric acid reacts faster with magnesium solid. He determines that when 10mL of acid is at 5 degrees Celsius, 1.0 grams of magnesium takes 8 minutes to completely react. He also determines that when 10mL of acid is at 55 degrees Celsius, 1.0 grams of magnesium takes 1.5 minutes to completely react.
   1. What is the independent variable?
   2. What is the dependent variable?

**Write in scientific notation.**

* 1. 520060000
  2. .0000003258
  3. 78
  4. 92500.
  5. 643.002
  6. 2006.2
  7. 56885.2
  8. 0.00356
  9. 0.025

1. **Write the following in standard form.**
   1. 852 x 106
   2. .00023 x 10-9
   3. .0076 x 1017
   4. 5.42 x 10-3
   5. 7.1 x 103
   6. 6.04 x 10-5
   7. 9.1482 x 104
   8. 679 x 10-1
   9. .0504 x 1010
2. **Complete the following percent error problems.**
   1. If a student determines the experimental density of a material to be 2.46 g/cm3 and the actual density is 2.65 g/cm3.
   2. The actual density of water is 3.01 g/mL. In an experiment, you found the density to be 3.11 g/mL.
   3. If a student calculates the density of a substance to be 1.8g/mL and the actual density is 2.0g/mL, what is the percent error?
   4. A student measure the volume of an object to be 2.38 L for a container that should be 2.50 L. What is the percent error?
3. **Complete the following density problems.**
   1. What is the density of 34 g of water?
   2. Find the density of the following: Mass = 30 g, Volume of water = 30 mL, Volume of water and material = 56 mL
   3. Find the density for this solid: Length = 4 cm, Height = 5 cm, Width = 1 cm, Mass = 422 g
4. **Read the following graduated cylinders measurements. Write your answer in the blank using the CORRECT number of significant digits and units.**

****

**\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_**

1. **Complete the following density problems.**
   1. A graduated cylinder contains 20.0mL of water. Upon adding a solid, the water level rises to 22.5mL.
      1. What is the volume of the solid?
      2. If the mass of the solid is 4.0g, what is the density of the solid?
   2. The density of a substance is 8.7g/mL. If the volume of the substance is 2.5mL, what is the mass of the substance?
   3. A liquid has a mass of 3.2g and a density of 1.2g/cm3. What is the volume of the liquid?
2. **Describe each of the following as intensive or extensive**:
   1. Volume
   2. Weight
   3. Mass
   4. Density
   5. Color
   6. Length
   7. Luster
3. **Classify each as a chemical or physical change:**
   1. Melting
   2. Burning
   3. Breaking
   4. Ripping
   5. Mixing
   6. Digesting
   7. Decomposing
   8. Tearing
   9. Dissolving
   10. Boiling water
4. **Classify each as a chemical or physical property:**
   1. Colorless
   2. Remains unchanged in the presence of air
   3. Melting point
   4. Conducts electricity
   5. Density is 6 g/mL
   6. Boiling point
   7. Rusts in the presence of oxygen
   8. Al will not react with N
   9. Mass is 5 g
   10. Glass is clear
   11. Mercury is silver
5. **Classify the following as homogenous or heterogeneous:**
   1. Cat
   2. Apple
   3. Salt and Pepper
   4. Cooking oil
   5. Raisin muffin
   6. Kool-aid
   7. Honey
   8. Sand and water
6. **Classify the following as a element, compound, or mixture:**
   1. Air
   2. Krypton
   3. Water
   4. Wood
   5. Sugar
   6. Salt
   7. Aluminum
   8. Popcorn
   9. Iron
   10. Milk
7. **A student combines 6.00g of aluminum and 4.65g of sodium chloride in a test tube producing sodium and aluminum chloride. The student finds that 5.10g of sodium is produced. What is the mass of aluminum produced?**

**Unit 2 – The Periodic Table and Atomic Structure**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Complete the following problems, solving for atomic mass:**
   1. What is the atomic mass of element X which has 4 isotopes and the mass numbers and % compositions? (47-X abundance 43.2%. 53-X abundance 1.04%, 54-X abundance .23%, and 61-X abundance 55.53%)
   2. What is the atomic mass of zinc which has 5 isotopes and the mass numbers and % compositions? (64-Zn abundance 85.2%, 66-Zn abundance 11.6%, 68-Zn abundance 1.7%, 67- Zn abundance 1.3%, and 70-Zn abundance .2%)
   3. Calculate the atomic mass of element Rx if when a sample was analyzed it was found to contain 4 isotopes. The following data was determined: 11 atoms had a mass of 85, 23 atoms a mass of 90, 34 atoms with a mass of 96, and 52 atoms have a mass of 98.

For Questions 14-16: All answers must be on a separate sheet of paper.

1. **Write out orbital diagrams for the following elements:**
   1. Si
   2. N
   3. Mg
   4. Ca
   5. H
   6. Ne
2. **Write out electron notation for the following elements:**
   1. Al
   2. B
   3. Ar
   4. Na
   5. He
   6. Li
3. **Write out the noble gas notation for the following elements:**
   1. Ag
   2. Cu
   3. K
   4. Ge
   5. Sn
   6. I
4. **Fill in the missing information in the charts below:**

Atomic Particles Chart – Fill in the missing information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Isotope/Nuclide | protons | neutrons | electrons | Mass number |
| Nitrogen – 15 |  |  |  |  |
|  | 104 |  |  | 261 |
| Dysprosium – 180 |  |  |  |  |
|  |  | 120 | 101 |  |
| Polonium - 201 |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | protons | neutrons | electrons | Mass number |
| Au |  |  |  |  |
| Os |  |  |  |  |
|  | 78 |  | 74 |  |
|  | 34 |  | 36 |  |
| P |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Atom/Isotope/**  **Ion** | **Atomic #** | **# of Protons** | **# of Neutrons** | **#of Electrons** |
|  |  | 25 | 30 |  |
| Fe+2 |  |  |  | 28 |
| 63-Cr |  |  |  |  |
| S2- |  |  |  | 18 |
| 48-Ti |  |  |  | 22 |

1. Use the table below to calculate the average atomic mass of chromium.

|  |  |  |
| --- | --- | --- |
| **Isotope** | **% abundance** | **Mass (amu)** |
| 50-Cr | 4.35% | 49.946 |
| 52-Cr | 83.79% | 51.941 |
| 53-Cr | 9.50% | 52.941 |
| 54-Cr | 2.36% | 53.939 |

**Unit 3 – Ionic and Covalent Bonding**

**Write the letter of the statement that best fits the term listed to the right.**

|  |  |
| --- | --- |
| \_\_\_\_\_ 1. halogen  \_\_\_\_\_ 2. period  \_\_\_\_\_ 3. inner transition metal  \_\_\_\_\_ 4. alkali metals  \_\_\_\_\_ 5. ionization energy  \_\_\_\_\_ 6. electronegativity  \_\_\_\_\_ 7. transition metal  \_\_\_\_\_ 8. noble gas  \_\_\_\_\_ 9. alkaline earth metals | a. elements in group 1  b. an element which has electrons in the *f* subshell  c. a horizontal row on the periodic table  d. the energy required to remove an electron from an atom  e. an element in group 17  f. an element in group 2  g. an element with the outermost *s* and *p* orbitals filled  h. an element which has electron orbitals ending in the *d* subshell  i. the ability of an atom to attract electrons in a chemical bond |

1. Tell whether each of the following elements is a metal, nonmetal, or metalloid and whether it normally exists as a solid, liquid, or gas.

|  |  |  |
| --- | --- | --- |
| a. aluminum  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | b. silicon  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | c. oxygen  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. For the elements that have the outer electron configurations, tell the period and group number they belong.

|  |  |  |
| --- | --- | --- |
| a. 5s2  period\_\_\_\_\_\_\_\_\_\_  group\_\_\_\_\_\_\_\_\_\_\_ | b. 3s23p4  period\_\_\_\_\_\_\_\_\_\_  group\_\_\_\_\_\_\_\_\_\_\_ | c. 4s24p2  period\_\_\_\_\_\_\_\_\_\_  group\_\_\_\_\_\_\_\_\_\_\_ |

1. Tell which element in the following pairs has the biggest electronegativity.

|  |  |
| --- | --- |
| a. K, Br  \_\_\_\_\_\_\_\_\_\_ | b. I, Br  \_\_\_\_\_\_\_\_\_\_ |

\_\_\_\_\_ 14. The vertical columns on the periodic table are called:

|  |  |  |  |
| --- | --- | --- | --- |
| a. groups | b. rows | c. periods | d. transitions |

\_\_\_\_\_ 15. Which orbital block corresponds to group 13-18 on the periodic table?

|  |  |  |  |
| --- | --- | --- | --- |
| a. s | b. p | c. d | d. f |

\_\_\_\_\_ 16. Circle the element that has the highest electronegativity.

|  |  |  |  |
| --- | --- | --- | --- |
| a. oxygen | b. zinc | c. cobalt | d. lead |

\_\_\_\_\_ 17. The alkali metals do not include:

|  |  |  |  |
| --- | --- | --- | --- |
| a. K | b. Ca | c. Na | d. C |

**Name the following compounds. Do not forget your LAAMBTICC’s!!!**

1. Fe2O3
2. K2Cr2O7
3. Na2SO3 ∙ 5H2O
4. KMnO4
5. Pb(NO3)2

**Write formulas for the following compounds:**

1. tin(IV) oxide
2. mercury(I) sulfide
3. aluminum iodide
4. aluminum hydroxide
5. ammonium sulfate
6. copper(II) hydroxide
7. hydrogen cyanide
8. Write the electron dot structures for the atoms of each of the following elements

a. Mg

b. S

c. Al

1. \_\_\_\_\_ A cation is any atom or group of atoms with:

|  |
| --- |
| a. a positive charge |
| b. no charge |
| c. a negative charge |
| d. more electrons than the corresponding atom |

1. \_\_\_\_\_ How many valence electrons does an atom of any halogen have?

|  |  |  |  |
| --- | --- | --- | --- |
| a. 7 | b. 4 | c. 6 | d. 8 |

1. \_\_\_\_\_ To attain a noble gas configuration, a sulfur atom must:

|  |  |
| --- | --- |
| a. gain 2 electrons | c. lose 2 electrons |
| b. lose 1 electron | d gain 3 electrons |

1. \_\_\_\_\_ Which element, when combined with fluoride, would most likely form an ionic compound?

|  |  |
| --- | --- |
| a. lithium | c. phosphorous |
| b. carbon | d. chlorine |

1. ~~List the 5 characteristics of ionic compounds that we tested in lab.~~

1a. Define the term molecule:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. How many valence electrons should each element in a molecule have to be most stable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. How does a covalent bond differ from an ionic bond?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Explain the difference in shared pairs for single, double, and triple bonds.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What are the two characteristics of covalent compounds that we tested in lab?
2. Name the following compounds:
3. HCl
4. P5O10
5. NO
6. SO3
7. CO2
8. Write the formula for the following compounds:
9. sulfur hexafluoride
10. carbon monoxide
11. disulfur tetraoxide
12. fluorine
13. dihydrogen monoxide

**Answer the following items in the space provided.**

1. Draw the Lewis structure for each of the following molecules using NASB, predict the shape, and indicate if the molecule is polar or nonpolar. Include partial charges as well.

|  |  |  |
| --- | --- | --- |
| a. SiH4 | b. NCl3 | c. H2O |
| d. I2 | e. N2 | f. H2SO4 |

1. \_\_\_\_\_ Which of these compounds do not have a covalent bond?

|  |  |  |  |
| --- | --- | --- | --- |
| a. NO2 | b. Cs2O | c. N2O | d. H2O2 |

1. \_\_\_\_\_ Which of the following compounds is not ionic?

|  |  |  |  |
| --- | --- | --- | --- |
| a. NaI | b. CaS | c. CO | d. Na2O |

1. \_\_\_\_\_ If a bonding pair of electrons is unequally shared between two atoms, the bond is,

|  |  |
| --- | --- |
| a. ionic | c. electrocovalent |
| b. nonpolar covalent | d. polar covalent |

1. \_\_\_\_\_ Which of the following molecules has *one* lone pair of electrons (not taking part in bonding)?

|  |  |  |  |
| --- | --- | --- | --- |
| a. CH4 | b. HCl | c. H2O | d. NH3 |

1. \_\_\_\_\_ In naming a binary molecular compound, the number of atoms of each element present in the molecule is indicated by:

|  |  |
| --- | --- |
| a. roman numerals | c. prefixes |
| b. superscripts | d. suffixes |