**First Semester Final Exam Review – 2020**

This review is to give you an idea of some areas you may need to study and to give you a little practice with the concepts. It is **NOT** a complete list. If you discover sections that you've struggled with during the school year, you should return to your NOTES and ALL HOMEWORK and CLASSWORK HANDOUTS for that topic.

# Introduction to Chemistry

Vocabulary Words and/or Topics: chemistry, mass, matter, qualitative data, quantitative data

1. Define matter.
2. Contrast mass and weight.

# Data Analysis

Vocabulary Words and/or Topics:

Accuracy, precision, conversion factor, density, dimensional or unit analysis, graph, scientific notation, significant figures

1. Write the following numbers in scientific notation and indicate the number of significant figures in each..

|  |  |  |
| --- | --- | --- |
| Convert to scientific notation  ↓ |  | # of Significant Figures?  ↓ |
|  | 751 meters |  |
|  | 781000 meters |  |
|  | 781000.0 meters |  |
|  | 0.0050 grams |  |
|  | 0.00000745 grams |  |
|  | 3 Kelvin |  |
|  | 3.0 billion atoms |  |

2. Perform the following operations and report the answer to the proper number of significant figures with

the proper units

* + 1. 10.2 m x 178.9 m =
    2. 10.1 cm + 0.672 cm =
    3. 5.70 cm x 6.40 cm x 7.320 cm =
    4. 5.73 g / 7.64 cm3 =
    5. 14.72 g + 735.0 kg =

3. Convert each of the following quantities and answer with the correct number of significant figures and

units.

* + 1. 0.143 hours to seconds (show your work)
    2. 1.098 km to m
    3. 1.70 mL to L
    4. 5.7 mm to cm
    5. 0.924 kg to grams
    6. 16 ft3 to in3 (look up conversion and show your work)
    7. 35.72 mL to cm3

4. What is the density of a substance that has a volume of 3.07 cm3 and a mass of 8.76 g?

5. Calcium chloride is used as a de-icer on roads in winter. It has a density of 2.50 g/cm3. What is the volume

of 7.91 g of this substance?

**Matter: Properties and Changes**

Vocabulary Words and/or Topics: allotropes, atom, chemical change, chemical properties, compounds, element, extensive properties, gas, heterogeneous mixture, homogeneous mixture, intensive properties, law of conservation of mass, liquid, mixture, periodic table, physical change, physical properties, sold, solution, states of matter, substance, vapor

1. Classify the following materials as heterogeneous mixtures (HE), solutions (HO), compounds (C), or elements (E):

A. air

* 1. paper
  2. table salt
  3. granite
  4. whole milk
  5. plutonium
  6. distilled water

1. How many phases are present in a glass of soda on ice?

1. Classify the following properties as intensive or extensive:
   1. mass
   2. color
   3. ductility
   4. length
   5. melting point

1. Classify the following as chemical or physical properties:

|  |  |  |  |
| --- | --- | --- | --- |
| color | stability | stiffness | reactivity |
| flammability | ductility | melting point | reacts with air |
| solubility | electrical conductivity | corrosive | blue |

1. Differentiate between homogenous mixtures and heterogeneous mixtures. Give examples of each.
2. What are chemical properties?
3. Why is a change of phase considered to be a physical change?
4. What is a compound?
5. What is the difference between qualitative and quantitative data?
6. What is an alloy? Is it a homogeneous mixture, heterogeneous mixture, or a compound? Give an example.
7. Which of the following is a pair of isotopes? Why?
   1. ~~14~~~~N and~~ ~~14~~~~O~~
   2. 35Cl and 34Cl
   3. ~~Si that has 12 neutrons and sulfur that has 12 neutrons~~

D. two bromine atoms with 54 neutrons each

4

2

0

-1

# Development of the Modern Periodic Table and the Elements

Vocabulary Words and/or Topics: alkali metals, alkaline earth metals, groups, halogen, transition metal, ion, ionization energy, electronegativity, metal, metalloid, noble gas, nonmetal, octet rule, period, periodic law

1. How do chemists use the periodic law to classify elements?

1. What is the name of a vertical column on the periodic table? What is the name for a horizontal row?

1. Why is beryllium in group 2? What do all atoms in Group 2 have in common?
2. Who developed the modern periodic table? How was it later modified?

1. Sketch a simplified version of the periodic table and indicate the location of groups, periods, metals, nonmetals, and metalloids.

1. How does the shielding effect affect atomic size?

1. Which has a larger radius?
   1. Mg or Si
   2. Ti or Cr
   3. Li or Cs
   4. Ni or Zn
2. Which has the higher ionization energy?
   1. Ba or Bi
   2. Al or Ti
   3. C or O
   4. Br or Kr
   5. P or O

1. Which has the larger electronegativity?
   1. B or F
   2. Cl or S

1. For the element aluminum, the number 26.98 represents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

# Atomic Structure

Vocabulary Words and/or Topics: proton, neutron, electron, atomic number, mass number, orbital, sublevel, energy level, group, period, ground state, excited state, electromagnetic radiation

1. Describe what each of these scientists discovered about the atom. What was the name of each of their theories?
   1. Dalton
   2. Thomson
   3. Rutherford
   4. Bohr

1. What are the symbols for the 4 orbital shapes? How many sublevels are in the 1st energy level? 2nd? 3rd? 4th?

1. What is the symbol for one electron in an orbital diagram? What is the maximum number of electrons that can occupy the 2s sublevel? The 4f sublevel? The 5d sublevel? The 3p sublevel?

1. Explain what the energy levels of an atom correspond to on the periodic table.

1. Explain how an electron configuration describes an atom.

1. Explain what its orbital diagram describes about an atom.
2. If an atom has 14 protons and a mass number of 38, tell the following:
   1. number of electrons
   2. number of neutrons
   3. atomic number

1. If an atom has an atomic number of 7 and 8 neutrons, tell the following:
   1. number of protons
   2. number of electrons
   3. mass number

9. Write out the complete electron configuration for the following atoms (NO SHORT CUT)

A. sodium

* 1. zinc
  2. sulfur
  3. neon

10. Write the noble gas notation for the electron configuration for the atoms above (9A through 9D)

11. Write the noble gas notation for the orbital diagram for each atom above (9A through 9D)

12. Draw Lewis diagram for ONE ATOM of each of the following

a) sodium, b) carbon, c) fluorine, d) calcium, e) phosphorus

# Ionic Compounds

Vocabulary Words and/or Topics: ion, cation, anion, oxidation number, transition metal, roman numerals, polyatomic ions, superscript, subscript, valence electrons, chemical bond, ionic bond

1. What type of bond will be formed between:
   1. carbon and fluorine
   2. magnesium and chlorine
   3. zinc and copper
   4. hydrogen and oxygen

2. How many valence electrons are in the following atoms: lithium, nitrogen, aluminum, fluorine, neon, bromine, sulfur, calcium

3. Using the octet rule, when the atoms in Problem #2 above turn into ions, what is the charge of each? *Hint: one of them doesn’t form an ion at all*

**Naming and Formulas for Compounds**

* Naming and Formulas for Ionic Compounds
* Naming and Formulas for Covalent Compounds

*Write the chemical formula: Write the chemical name:*

* 1. sodium fluoride 8. NaI
  2. hydrogen monofluoride 9. AlBr3
  3. aluminum sulfide 10. H2SO4
  4. barium sulfide 11. Cl2O7
  5. phosphorus pentachloride 12. HBr
  6. dinitrogen tetroxide 13. N2O5
  7. hydrogen nitrate 14. ICl3

*Write the chemical formula:* *Write the chemical name:*

* 1. sodium sulfite 22. HCl
  2. magnesium ion 23. Na2SO4
  3. ammonium fluoride 24. KNO3
  4. oxygen 25. NH4+
  5. oxide 26. Mg(OH)2
  6. hydrogen chlorate 27. H2CO3
  7. barium cyanide

*Write the chemical formula:* *Write the chemical name:*

* 1. iron(II) chloride 33. NiF2
  2. iron(III) chloride 34. F2
  3. chromium(III) oxide 35. F-
  4. iron(III) perchlorate 36. Fe2S3

32. nickel(III) acetate 37. CrO

38. Ca3(PO4)2

# BONDING and IMFs

* Determining type of bond between 2 elements: ionic, metallic, polar covalent, or nonpolar covalent
* Drawing Lewis diagrams for covalent compounds
* Determine the shape of a covalent molecule and whether the molecule is polar or nonpolar

# Type of Bond

Indicate the type of bond formed between the following elements.

1. N and Cl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. K and Br \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. N and N \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7. Mg and Mg \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Ca and O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8. Al and Cl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. C and F \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 9. Si and Cl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. H and O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 10. Cu and Sn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Lewis Diagrams

For the following compounds: a) draw a Lewis diagram, b) determine the shape of the molecule, and c) determine if the molecule is polar or nonpolar

H2, O2, N2, CCl4, NH3, C2H6 *(don’t do shape for this one)*, SF2, CO2