

# First Semester Final Exam Review

Name: \_\_\_\_\_

Period: \_\_\_\_\_

Refer to your class notes, worksheets, and the textbook to complete this review sheet. Study early so that you will have time to ask questions about what you don't understand.

## Measurement

**Objective 1: Students will be able to gather, interpret, and analyze data to draw conclusions.**

- **Significant Figures**

How many significant figures are in the following measurements?

0.012 g = \_\_\_\_\_

1,003 mL = \_\_\_\_\_

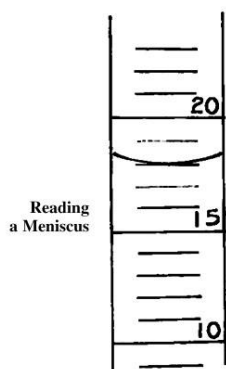
0.12300 g = \_\_\_\_\_

$7.54 \times 10^{-3}$  m = \_\_\_\_\_

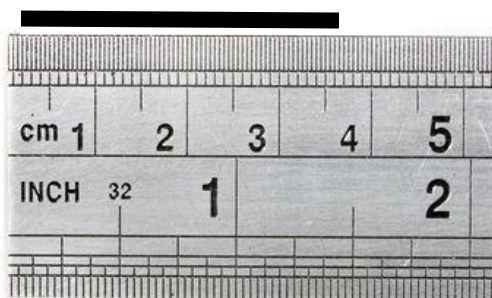
5,000 cm<sup>3</sup> = \_\_\_\_\_

5,000.00 nm = \_\_\_\_\_

- Read a measuring device (ruler, balance, graduated cylinder) to the correct number of significant figures.



\_\_\_\_\_



\_\_\_\_\_

- Common SI Units of Measurement

Measurement	Unit
Mass	
Volume	
Length	
Temperature	

- Convert from one metric unit to another metric unit. Show your work.

100 meters = \_\_\_\_\_ cm

230 mL = \_\_\_\_\_ Liters

0.062 kilograms = \_\_\_\_\_ mg

7 cm = \_\_\_\_\_ km

### **Matter: Anything that takes up space and has mass**

**Objective 2:** Students will be able to identify physical and chemical properties.

**Objective 3:** Students will be able to differentiate between physical and chemical changes.

➤ Physical Changes and Chemical Changes

Define each. How can you tell the difference between the two and give examples for each:

Physical change

Chemical change

Classify the following as physical or chemical changes:

a. spoiling of milk = \_\_\_\_\_

b. bending wire = \_\_\_\_\_

c. cutting paper = \_\_\_\_\_

d. rusting of a nail = \_\_\_\_\_

**Objective 1:** Students will be able to define matter, differentiate between its different states, and understand how it remains constant with a system.

➤ Define each:

- Matter =

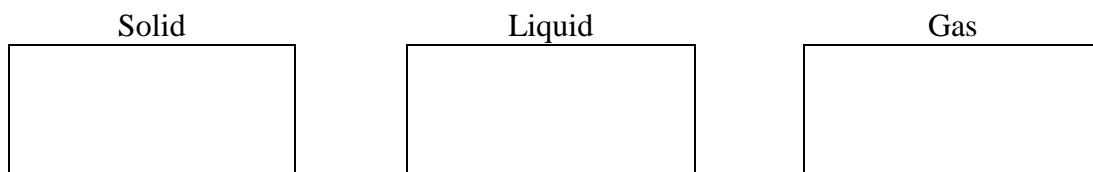
- Pure substances =

- Elements =
- Compound =
- Mixtures =
- Homogeneous (solutions) =
- Heterogeneous =

Identify the following as pure substances, homogeneous mixtures or heterogeneous mixtures:

- copper
- sweetened tea
- sand and water
- calcium carbonate ( $\text{CaCO}_3$ )

➤ Sketch particles in the three states of matter. How close are the particles and how much do they move?



Fill in the table:

State of Mater	Shape	Volume
Solid		
	No definite shape	Definite volume
		No definite volume

State the Law of Conservation of Mass and explain.

### Density

Define density.

Calculate density. If a given object has a mass 100.0 g and a volume of 25.0 mL. What is this object's density?

Given the following 3 rings:



Ring 1



Ring 2



Ring 3

And given that each ring is made out of pure gold, answer the following questions:

What can you say about the relationship between the mass and volume as you compare the 3 rings?

Which ring would have the greatest mass? \_\_\_\_\_

Which ring would have the greatest density? \_\_\_\_\_

## Atom

**Objective 3: Students will be able to describe isotopes.**

- Define the term *isotope*.
- Fill in the following for this Carbon-14 isotope,  $^{14}_6\text{C}$ 
  - Atomic number = \_\_\_\_\_, Mass number = \_\_\_\_\_
  - # of protons = \_\_\_\_\_ # of electrons = \_\_\_\_\_, # of neutrons = \_\_\_\_\_.
- Atomic Masses: What is the difference between the mass number for Carbon-14 and carbon's atomic mass of 12.011 amu?

**Objective 4: Students will be able to describe the history of our understanding of the atom.**

- Atomic Models: Write down their contribution to the discovery of the atomic models:
  - John Dalton

List the four postulates of Dalton's Atomic Theory:

- J.J. Thompson
- Ernest Rutherford

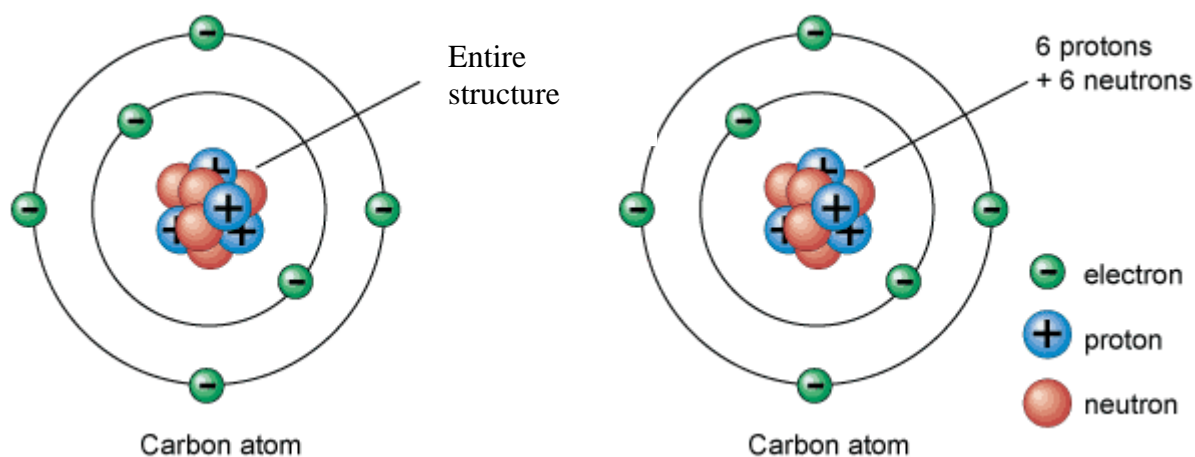
- Niels Bohr

**Objective 1: Students will be able to describe the basic structure of the atom.**

➤ Characteristics of subatomic particles

Particle	Mass	Charge	Location in atom
Proton			
Neutron			
Electron			

**Nucleus with:**



In the above atom of carbon, identify the proton, neutron, electron, and the nucleus.

How many electrons are there? \_\_\_\_\_ Given that this diagram is a carbon atom, how many protons are there? \_\_\_\_\_ Although you cannot see all of the neutrons, how would you determine how many neutrons there are in this atom of C-12?

**Objective 2: Students will be able to differentiate between ions and neutral atoms.**

- Atoms and Ions

How do atoms and ions differ?

Element	# of protons	# of neutrons	# of electrons	Atomic number	Mass number	Hyphen notation	Nuclear symbol	Atom or Ion?
							${}^{56}_{26}\text{Fe}^{+2}$	
Iodine					127			Atom
	16		18		32			

**Objective 5: Students will be able to describe the changes that occur in the nucleus of an atom undergoing radioactive decay.**

- Alpha, Beta, Gamma Decay**

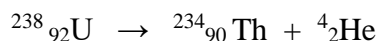
Type of Decay	Nuclear Symbol	Penetrating Ability	Stopped By
Alpha			
	${}^0_{-1}\text{e}$		
			Lead and Concrete

- If you have a focused beam of radioactive emission channeled through a positive and negatively charged field, what type of emission would be attracted to:

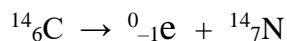
- The Positive Plate \_\_\_\_\_
- The Negative Plate \_\_\_\_\_
- Not Effective by Electrical Field \_\_\_\_\_

- Identify the type of decay below:

1. \_\_\_\_\_



2. \_\_\_\_\_



**Objective 1: Students will be able to describe the arrangement of electrons according to the quantum mechanical model of the atom.**

➤ **Electron Configurations**

- What element has the configuration  $[\text{Ne}]3s^23p^1$ ?
- What does the **3** mean in  $3s^2$ ?
- What does the **s** mean?
- What does the **2** mean?
- How many valence electrons will an atom of this element have?
- How many electrons will an atom of this element lose to form an ion? Why?

➤ Complete the following table:

SubLevel	Number of Electrons	Number of Orbitals
s		
p		
d		
f		

➤ Write out the electron distribution for the element Phosphorus according to Hund's rule. Use arrows to represent electrons.

$1s^2$  \_\_\_\_\_

$2s^2$  \_\_\_\_\_

$2p^6$  \_\_\_\_\_

$3s^2$  \_\_\_\_\_

$3p^6$  \_\_\_\_\_

➤ **Write the electron configuration for the following elements:**

Calcium

Iodine

Vandium

## Emission (or bright-line) Spectrums

- What is needed for an electron to “jump” to a higher energy level?
- What happens when an “excited” electron falls back to its ground state?
- What does an emission spectrum allow one to do?

**Objective 1:** Students should be able to summarize the periodic law and explain how it relates to physical and chemical properties.

**Objective 2:** Students will be able to use the periodic table as a reference tool.

## Periodic Table

➤ **Locate or define parts of the periodic table:**

- Groups
- Periods
- Transition metals (d blocks)
- Representative Elements (s & p blocks)
- Alkali metals
- Alkaline Earth metals
- Halogens Noble Gases

## Periodic Trends

➤ **Periodic Trends: Increasing or Decreasing from top to bottom or left to right?**

	<b>Top to Bottom in a Group</b>	<b>Left to Right across a Period</b>
<b>Electronegativity</b>		
<b>Ionization energy</b>		
<b>Atomic size</b>		



**Using the periodic table, answer the following questions:**

1. Which element stands alone in its family? \_\_\_\_\_
2. Which element has the largest atomic radius? \_\_\_\_\_
3. Which element has the smallest atomic radius? \_\_\_\_\_
4. Which element has the highest electronegativity? \_\_\_\_\_
5. Which element has the smallest ionization energy? \_\_\_\_\_

➤ Elements in the same \_\_\_\_\_ have similar physical and chemical characteristics because the  
(group or period)

they have the same number of \_\_\_\_\_.  
(atoms, protons, neutrons, electrons, valence electrons)

➤ Draw an electron dot diagram (or Lewis Dot structure) for Be and for N showing the correct number of valence electrons.

➤ From their positions on the periodic table, what charges would the ions of Be and N have?

	Gains or loses electrons?	Symbol for ion		Gains or loses electrons?	Symbol for ion
Be			N		

➤ **Properties of Metals vs. Nonmetals vs. Metalloids**

	Metals	Nonmetals	Metalloids
Luster			
Malleable vs. Brittle			
Conducts electricity & heat			
Typical state(s) at room temperature			

**Ionic vs. Molecular Compounds**

Objective 1: Students will be able to describe characteristics of a molecular compound and how a covalent bond forms at an atomic level.

Objective 2: Students will be able to describe characteristics of an ionic compound and how an ionic bond forms at an atomic level.

- Ionic bonds are formed when a \_\_\_\_\_ and a \_\_\_\_\_ combine.

- Metals lose electrons and form \_\_\_\_\_ while nonmetals gain and electrons form \_\_\_\_\_.
- Molecular compounds form when a \_\_\_\_\_ and a \_\_\_\_\_ combine as they share electrons.
- Identify the following pairs of atoms as potentially forming an ionic or molecular compound:

Mg and Cl \_\_\_\_\_ I and F \_\_\_\_\_ P and Cl \_\_\_\_\_

Ag and S \_\_\_\_\_ K and Br \_\_\_\_\_ Sn and O \_\_\_\_\_

## Covalent Bonding in Molecules

- Draw Lewis Structures (dot diagrams) for N<sub>2</sub>, HCl, H<sub>2</sub>S, CH<sub>2</sub>Cl<sub>2</sub>, and O<sub>3</sub>.
- Use Lewis Structures to predict molecular shapes and polarity of molecules.
- Identify shapes of the molecules as: Linear, Bent, Pyramidal, Trigonal Planar, or Tetrahedral.
- Use electronegativity values to determine if the individual bonds in the molecules above are polar.
- Look at the polarity of the bonds and the symmetry of the molecules above to determine if the molecules are polar (if one side of the molecule will be more negative than another).

H 2.1							He
Li 1.0	Be 1.5	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
Na 0.9	Mg 1.2	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar
K 0.8	Ca 1.0	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr

Electronegativity Difference (x)	Type of Bond
$0.0 \leq x \leq 0.4$	Non-polar covalent
$0.4 < x < 2.0$	Polar covalent
$2.0 \leq x$	Ionic

	N <sub>2</sub>	HCl	H <sub>2</sub> S	CH <sub>2</sub> Cl <sub>2</sub>	O <sub>3</sub>
<b>Lewis Structures &amp; Total # of Valence Electrons</b>					
<b>Structural Formula</b>					

Contains polar bonds?					
Is a polar molecule?					

➤ How do you know if a bond is polar or nonpolar?

➤ How do you know if a molecule is polar or nonpolar?

### Properties of Ionic and Molecular Compounds

	Molecular Compounds	Ionic Compounds
Combination of elements involved (metals? nonmetals?)		
How is bond formed?		
Typical state(s) at room temperature		
Melting and boiling points (relatively high or low?)		
Conduct electricity if dissolved in water?		

### Naming Molecular and Ionic Compounds

**Objective 3:** Students will be able to name and write formulas for compounds.

➤ **Naming molecular compounds**

Name:  $N_2O$ : \_\_\_\_\_  $NO_2$  \_\_\_\_\_

➤ **Naming Ionic Compounds**

Name:  $Li_2O$  \_\_\_\_\_  $(NH_4)_2SO_4$  \_\_\_\_\_

Name:  $FeO$  \_\_\_\_\_  $Sn_3(PO_4)_4$  \_\_\_\_\_

Name:  $NaHCO_3$  \_\_\_\_\_

$CuCl_2$  \_\_\_\_\_

## Formulas of Molecular and Ionic Compounds

Write formulas for the following compounds:

Water \_\_\_\_\_ silicon dioxide \_\_\_\_\_

Phosphorous trihydride \_\_\_\_\_ dioxygen difluoride \_\_\_\_\_

Lead (II) hydroxide \_\_\_\_\_ chromium (III) sulfate \_\_\_\_\_

Write formulas for the following ionic compounds:

$\text{Ba}^{2+}$  with  $\text{OH}^-$  \_\_\_\_\_ iron (III) sulfide \_\_\_\_\_

$\text{Na}^+$  with  $\text{OH}^-$  \_\_\_\_\_  $\text{NH}_4^+$  with  $\text{PO}_4^{3-}$  \_\_\_\_\_ magnesium oxide \_\_\_\_\_

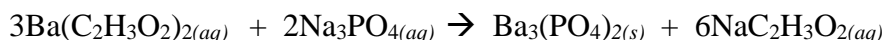
## Chemical Reactions

**Objective 1:** Students will be able to identify types of reactions.

**Objective 2:** Students will be able to apply the Law of Conservation of Matter to balance equations.

➤ Define what is meant by the term *chemical reaction*.

➤ In the following chemical equation, identify the *reactants* and the *products*.

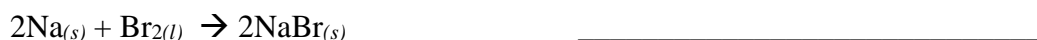


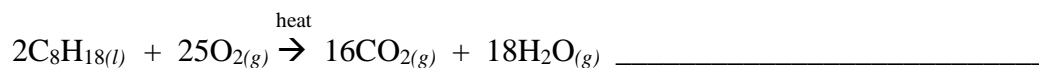
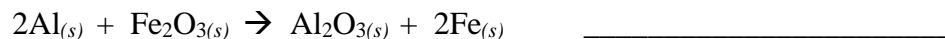
- In the above chemical equation, what do the symbols (*aq*) and (*s*) stand for? What would the symbols (*l*) and (*g*) stand for in a chemical equation?

➤ Chemical reactions can often be classified as one of five types. Write the general form for each type of reaction.

- Direct Combination (or synthesis):
- Decomposition
- Single-Replacement
- Double-Replacement
- Combustion

➤ Using the five types of reactions listed above, classify the following reactions:

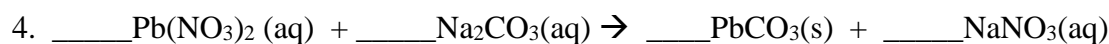
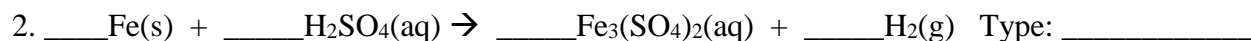




**Objective 2:** Students will be able to apply the Law of Conservation of Matter to balance equations.

➤ **When balancing equations it is necessary to have the same kind and number of \_\_\_\_\_ on each side of the equation.**

➤ **Balance the following chemical equations and indicate what type of reaction it represents:**



**Type:** \_\_\_\_\_

