

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 = _____

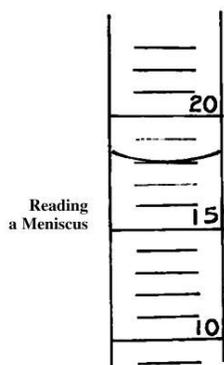
0.12300 g = _____

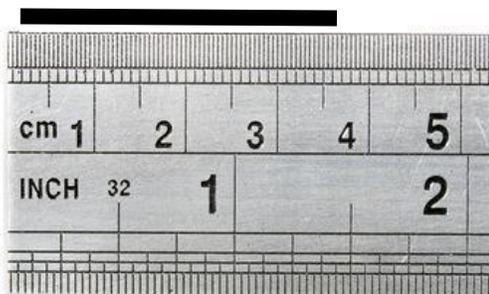
7.54×10^{-3} m = _____

5,000 cm³ = _____

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

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:

- spoiling of milk = _____
- bending wire = _____
- cutting paper = _____
- 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 =

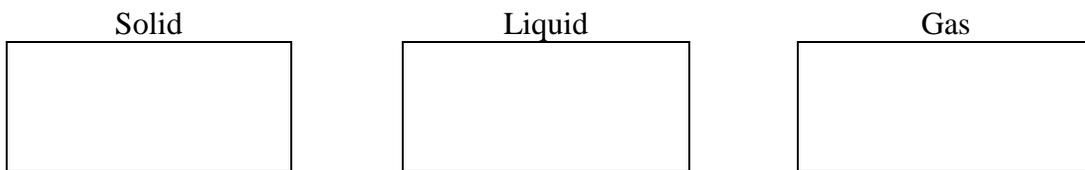
- Pure substances—elements and compound =

- Mixtures – homogeneous (solutions) =

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

- copper
- sweetened tea
- sand and water
- calcium carbonate (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.

Calculate the number of grams of oxygen needed based upon the Law of Conservation of Mass.



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

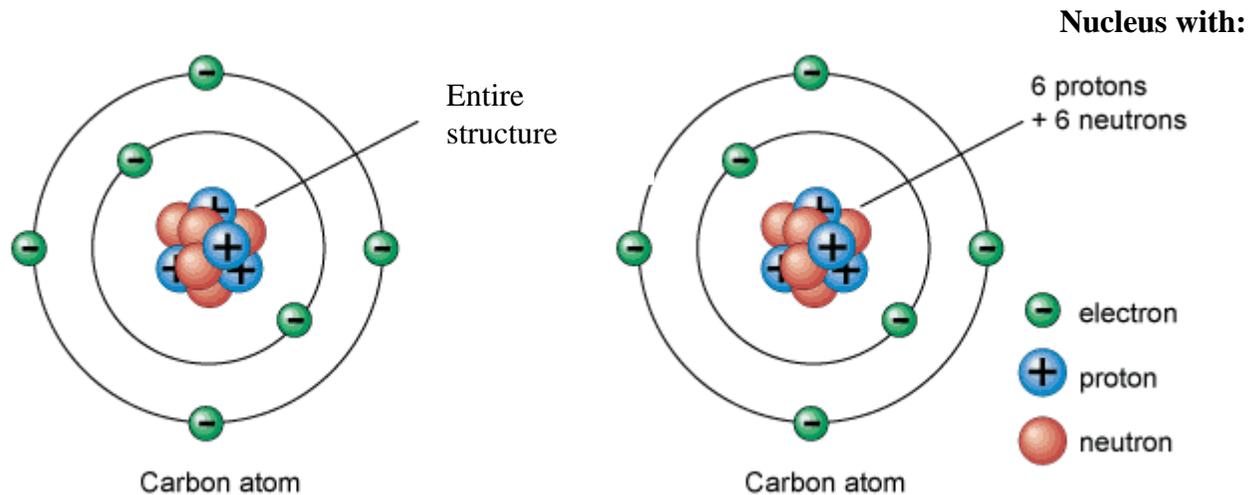
List the four postulates of Dalton's Atomic Theory:

- 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			



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**

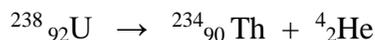
Type of Decay	Nuclear Symbol	Penetrating Ability	Stopped By
Alpha			
	${}^0_{-1}e$		
			Lead and Concrete

• 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:

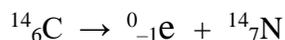
- The Positive Plate _____
- The Negative Plate _____
- Not Effective by Electrical Field _____

• 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.

1s² _____

2s² _____

2p⁶ _____

3s² _____

3p⁶ _____

- 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 & f blocks) vs. 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?**

	Top to Bottom in a Group	Left to Right across a Period
Electronegativity		
Ionization energy		
Atomic size		

Using the periodic table, answer the following questions:

1. Which element stands alone in its family? _____
2. Which element has a larger atomic radius A or C? _____
3. Which element has a larger atomic radius C or D? _____
4. Which element has a higher electronegativity? A or B? _____
5. Which element has a higher ionization energy? C or D? _____

➤ 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 N₂, HCl, H₂S, CH₂Cl₂, and O₃.
- 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 ₂	HCl	H ₂ S	CH ₂ Cl ₂	O ₃
Lewis Structures & Total # of Valence Electrons					
Structural Formula					
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:

Ba^{2+} with OH^- _____ iron (III) sulfide _____

Na⁺ with OH⁻ _____ NH₄⁺ with PO₄³⁻ _____ magnesium oxide _____

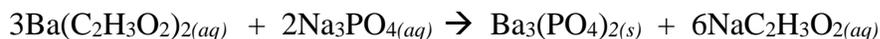
Chemical Reactions

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

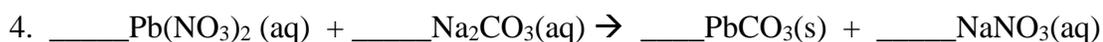
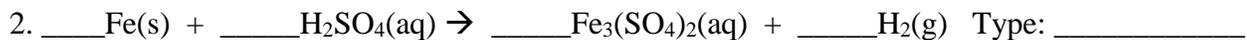
➤ Using the five types of reactions listed above, classify the following reactions:



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: _____

