NAME: **Class:**

Science 9 Unit 2: Chemistry
Reading Logs – SCIENCE FOCUS

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Topic 1 – Exploring Matter

A good laboratory is a safe laboratory. Your knowledge and actions in this unit will help keep you and your peers safe. Do you know where the safety equipment is stored in our lab?

Fire extinguisher	Aprons	WHIMIS chart	Telephone
Fire blanket	Broken glass bin	Fire exit	Dustpan and brush
Safety goggles	First-aid kit	Eyewash station	Sink(s)

Chemistry is the study of _____

Canadian scientists have won the Nobel Prize in science more than 10 times! (Go CANADA). List 3 Canadian Nobel Laureates who were **chemists**:

1.

2.

3.

Before we begin any experiments in this unit we must ALL be familiar with WHMIS. What does WHMIS stand for?

W H M I S

List all 5 components of the **Particle Model of Matter**

You DO NOT need to do this chart if we do the flip chart assignment for WHMIS in class.

Description	**Symbol** (DRAW it)	**Example**
Flame		
Flame over circle		
Gas Cylinder		
Corrosion		
Exploding Bomb		
Skull and Crossbones		
Health Hazard		
Exclamation Mark		
Biohazardous Infectious Materials		

The particle model of matter is one example of a scientific model. Scientific models help us to visualize processes that cannot be seen directly.

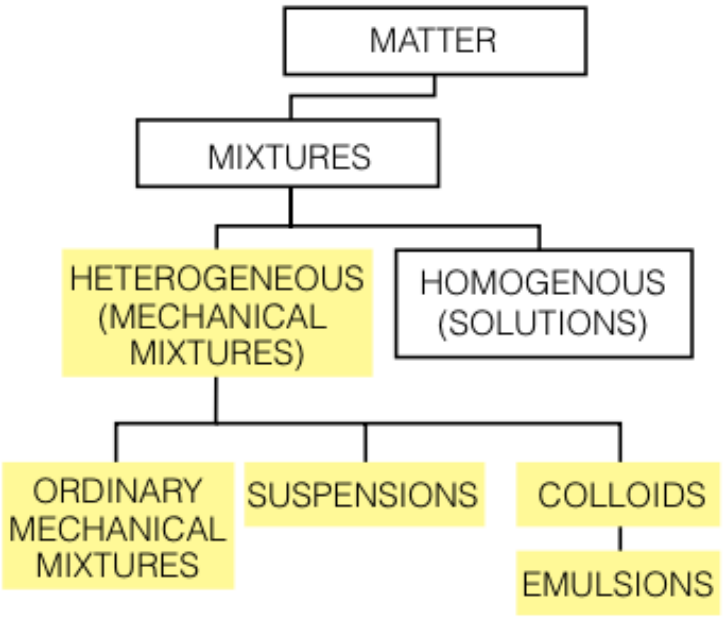
You already know that matter can be classified according to its state. In the boxes below, draw what the particles in each matter would look like.

Gas	Liquid	Solid

Matter can be further classified according to its composition as a mixture or a pure substance. Each _____ substance contains its own unique kind of particle. Whereas _____ contain at least two kinds of particles.

Mixtures can be classified by their properties. Using the information from your textbook and the chart below, write a definition for each of the mixture types.

Homogeneous
Heterogeneous
Suspension
Colloids
Emulsions



How can you tell the difference between a solution and a colloid?

Topic 2 – Changes in Matter

Give 2 distinct characteristics and 2 examples of **PHYSICAL** change:

Characteristics:	Examples:
1.	1.
2.	2.

Give 2 distinct characteristics and 2 examples of **CHEMICAL** change:

Characteristics:	Examples:
1.	1.
2.	2.

It can be difficult to decide if a change is physical or chemical. Here is a rule that can help you: if you make two or more of the following observations, then a chemical change has *probably* taken place:

--

--

--

--

--

Why does the rule say *probably?*

Any property that can be observed or measured without forming a new substance is a:

_____ property. Here is an example: _____

Any property that describes how a substance reacts with another substance when forming a

new substance is a _____ property. Here is an example: _____
Physical properties can be further classified as either Qualitative or Quantitative.

Give an example of how you would record your results if they were qualitative:

Give an example of how you would record your results if they were quantitative:

Physical Properties	
Qualitative	**Quantitative**
colour	melting temperature
texture	boiling temperature
taste	density
smell	viscosity
state	solubility
crystal shape	electrical conductivity
malleability	heat conductivity
ductility	

Water and gasoline are both clear liquids at room temperature. Describe one physical property and one chemical property that might be used to distinguish between them:

Physical ->

Chemical ->

The transformation of water from a solid to liquid to gas is a physical change. Diagram the transformation and clearly label the **THREE** states and the **SIX** changes that occur between them.

Define the following (in your own words):

Ductility Malleability Viscosity

Topic 3 – What are Elements?

From very early times, people have wondered why matter behaves as it does. Ancient Greek philosophers thought that all matter was made out of fire, water, earth and air. They called these four substances “elements”.

Hands-on investigations of matter were carried out for many centuries by people known as alchemists. These scientists searched for elements by taking apart matter by ordinary chemical means until it would not break down any further. In this way they were able to determine if a substance was a pure substance or a mixture.

Lavoisier defined elements as _____.

The Law of Conservation of Mass:

The Law of Definite Composition:

Give 2 examples of matter that follow the law of definite composition – include percentages.

Example 1	Example 2

Pure substances have constant composition, and therefore they also tend to have constant, unvarying properties. An unknown substance can be identified by measuring a property and comparing it to known values.

ELEMENTS VS. COMPOUNDS

An _____ is a pure substance made up of only one type of particle, or atom.

Each element has its own unique set of distinguishing properties and cannot be broken down into simpler substances by means of a chemical change.

A _____ is a pure substance made up of 2 or more elements chemically combined together.

Compounds can be broken down into the elements that they are composed of.

ELECTROLYSIS

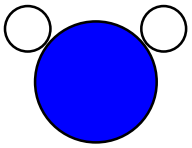
Using a "voltaic pile" scientists could separate compounds.

Draw a labeled diagram of the device that uses a voltaic pile to decompose water. Show the difference in amounts (composition) of oxygen versus hydrogen. Explain how Lavoisier used it to discover the "definite composition" of oxygen.

CHEMISTRY'S MOST WANTED

#1 - _____

Dalton thought of atoms as _____.
He drew pictures of water with equal numbers of smaller hydrogen and larger oxygen atoms.



DALTONS ATOMIC THEORY

List all 4 Points:

1.

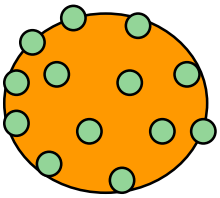
2.

3.

4.

#2 - _____

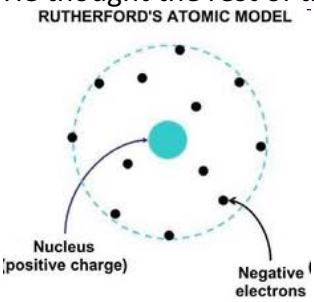
Thought of atoms as negatively charged electrons stuck to a positively charged mass
"Raisin Buns" "_____"



#3 - _____

Thought the entire mass of an atom was in the center of the atom (called the atomic nucleus)

He thought the rest of the atom was just empty space



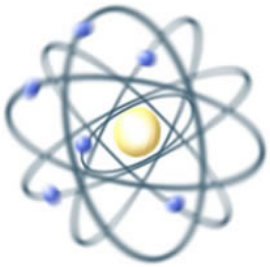
He called the positively charged particles in the center of the atom _____.

He called the negatively charged particles floating around the atomic nucleus, _____.

#4 -_____

Pictured the atom like a mini solar system.

Electrons rotated around the nucleus like the planets around the sun in things called _____



Later on, _____ discovered _____

He said these particles didn't have a charge but helped make up the mass of the atom.

Neutrons are in the atomic nucleus with the protons.

Review Topics 1-3

1. Write the difference between each of the following terms.
   (a) a heterogeneous mixture and a homogeneous mixture (1)

   (b) a physical change and a chemical change (2)

   (c) the law of conservation of mass and the law of definite composition (3)

   (d) an element and a compound (3)

   (e) an observation and a theory (3)

2. Fill in the blanks:

   (a) If a substance has the ability to burn in oxygen, it has the property of _____ (2).

   (b) A homogeneous mixture can also be called a _____. (1)

   (c) A heterogeneous mixture can also be called a _____. (1)

   (d) A substance that cannot be broken down into simpler substances is an _____. (3)

(e) The physical property of matter known as mass per unit volume is called _____. (2)

3. Make a sketch of the electron cloud model. Label the locations of the electrons, protons, neutrons, and atomic nucleus. (3)

Topic 4 – Classifying Elements

List three different ways elements have been named.

1.

2.

3.

Draw the ancient symbol for two different elements and give their letter symbol.

Copy table 2.3, found on page 118 below

	State at room temp.	Appearance	Conductivity	Malleability and Ductility
Metals				
Nonmetals				
Metalloids				

Explain the physical properties malleability and ductility.

What are the two most common elements in the Earth's crust (name and symbols)

What is the term **chemical family** used to describe**?**

Describe the properties of the Alkali Metal family.

Describe the properties of the Alkaline Earth Metal family.

Describe the properties of the Noble Gases family and list the noble gases.

Describe the properties of the Halogen family.

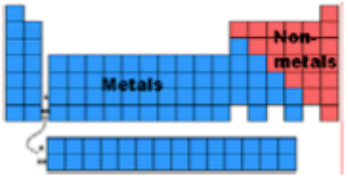
Topic 5 – The Periodic Table

What is atomic number? Give an example using an element.

If the atomic number is 6 and its mass is 19.3 how many neutrons does it have? Show your work.

Why are atomic number and atomic mass not always the same?

What does this illustration tell you about the History of the Periodic Table



_____

_____

Describe how it has changed to what is illustrated here.

_____

_____

_____

A column in the periodic table is a _____ or _____.

A row is called a _____.

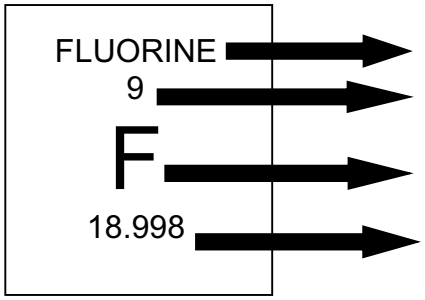
The number of _____ is equal to the number of protons in an uncombined atom.

The number of neutrons is found by subtracting the atomic _____ from the atomic

_____.

Fill in the missing information on the chart about each element using your periodic table.

2 protons: ___neutrons Element? _____ ____electrons	Mass # 18.998 Element? _____ Atomic #? _____ Symbol? _____	Iron Symbol?_____ Atomic #? _____ Atomic mass? _____	Zn Element? _____ Atomic #?_____ Atomic mass? _____	11 protons _____neutrons _____electrons Element? _____
Mercury Symbol?____ Atomic #? _____ ____neutrons	82 protons ____neutrons ____electrons Element? _____	Gas with seven protons Element? _____ ____neutrons	18 protons ___neutrons Element?_____ _____ Symbol? _____	Potassium Symbol?_____ Atomic #? _____ Atomic mass? _____
Ba Element?_____ _____ Period? _____ Family?_____ Atomic #? _____	Synthetic; Am Element? _____ Atomic #? _____ Mass? _____	Three protons Element? _____ Mass? _____ Period?_____ Family?_____	29 protons Symbol? ____ Period? _____ Family? _____ Atomic #? _____	



- The mass of an atom is ENTIRELY in the nucleus
- So for Fluorine, the atomic mass is 18.998.
    - We use math rules and either round up or round down.
        - So Fluorine would have an atomic mass of _____
- Fluorine will have 9 protons and 9 electrons
- Fluorine will have 19 (rounded up) – 9 = neutrons.
    - So Flourine will have _____ neutrons

Topic 6 – Chemical Compounds

- _____ are what hold elements together and they are formed when elements gain, lose or share electrons.

- A _____ is when two DIFFERENT types of atoms come together to form a molecule.

Complete the following table:

Properties of Ionic Compounds	Properties of Molecular Compounds

Most Molecular compounds do not form large structures. Although the bonding between atoms is _____, the attraction between molecules is _____.

There are several rules you can learn to help you communicate using the language of chemistry. For example, a compound made from two elements is called a **binary compound**. The names of ***molecular*** binary compounds follow these rules:

1.

2.

3.

Name the following Molecular compounds

Chemical Formula	**Name**
BCl_3	
CO	
SO_2	
As_4O_{10}	
N_2O_3	

Give a definition for the following:

Conductivity

Molecular Compound

Ionic Compound

Diatomic Molecule

The rules for **naming binary ionic compounds** are similar to those for binary molecular compounds. However, the name of the compound does not indicate the number of ions of each element. Follow these rules:

1.

2.

3.

Name the following Ionic compounds

Chemical Formula	Name
KCl	
Ca_3N_2	
$MgCl_2$	
Ag_3N	
BeO	

In terms of electrons, what is the difference between a molecular compound and an ionic compound?

Identify if each compound is ionic or molecular by placing an I (ionic) or M(molecular) next to the compound. Name each compound according to the IUPAC naming rules for each type.

Chemical Formula	**Ionic or Molecular**	**Name**
NaCl		
CO_2		
SF_2		
MgF		
CaO		
$SiCl_4$		
Ag_2O		
BN		
OF_2		

Can you make the following molecular compounds from the name?

Chemical formula	**Name**
	Diboron tribromine
	Tetraselenium pentaiodide
	Nitrogen monoxide

Metal ion	Non-Metal ion	Ionic Compound	Name
		BeF_2	
Na^{1+}	P^{3-}		
Mg^{2+}			Magnesium Oxide
Al^{3+}	O^{2-}		
		Al_2S_3	
K^{1+}	F^{1-}		
Na^{1+}			Sodium Phosphide
		Ca_3N_2	
	P^{3-}		Potassium Phosphide
Na^{1+}			Sodium Nitride
Al^{3+}	Cl^{1-}		

Topic 7 – Chemical Reactions

Reminder - Indicators of Chemical Change

1. Gas bubbles are formed
2. Change of color
3. Precipitate is formed
4. It is hard to reverse the change
5. A new substance with new properties are formed
6. Heat is produced or absorbed
7. Starting material is used up

Chemical Reactions

- In a _____, two or more substances undergo a re-organization of atoms to form other substances.
  - The substances that go into a chemical reaction are called _____
  - The substances produced by a chemical reaction are called _____

Describing Reactions

1. Word Equations
   - Silver + Bromine → Silver Bromide

2. Chemical Equations (How would you balance this equation, given that bromine is a diatomic element?)
   - Ag + Br → AgBr

Equations, Products and Reactants

- 1. Magnesium reacts with Oxygen to produce magnesium oxide.
  $Mg + O_2 \rightarrow 2MgO$
  Reactants → Mg and O_2
  Products → MgO

- 2. $2Ca + O_2 \rightarrow 2CaO$
  - Calcium reacts with Oxygen to produce Calcium Oxide
    - Reactant: Ca and O_2
    - Produce: CaO

Reaction Types

- All chemical reactions involve changes in energy
- Energy is either _____ or _____ in a chemical reaction

- _____ are reactions that GIVE OFF or RELEASE HEAT
- Examples:
  - Nitroglycerine is used in explosives
  - Combining Oxygen and Hydrogen to get water
    - $2H_2 + O_2$ + A little energy = $_{2H2O}$ + A lot of energy
  - Heat packs (usually use calcium chloride)

- _____ are reactions that ABSORB energy

- Examples:
  - Photosynthesis in plants
  - Cold packs (usually use ammonium nitrate)
  - Cooking foods with baking soda.
    - Baking soda absorbs energy and releases it as carbon dioxide and steam

PRACTICE

A. FOR EACH OF THE STATEMENTS BELOW WRITE A WORD EQUATION.

1. Acid rain, sulfurous acid, is formed when sulfur dioxide reacts with water in the air.

2. The heat and pressure inside an automobile engine cause nitrogen and oxygen to react; the resulting substance is a pollutant, nitrogen monoxide.

3. Rust on cars, usually iron(III) oxide trihydrate (3 water molecules attached to it), is formed when iron is exposed to oxygen and water in the air.

4. Potassium mixed with chlorine produces potassium chloride

5. Silicon dioxide changes to silicon and carbon dioxide when in contact with carbon

B. MATCH THE CHEMICAL FORMULA WITH THE COMMON NAME OF THE SUBSTANCE.

___ baking soda (sodium hydrogen carbonate)	a. $NaCl_{(s)}$)
___ water	b. $NaOCl_{(aq)}$
___ carbon dioxide	c. $O_{2(g)}$
___ carbon monoxide	d. $C_2H_4O_{2(aq)}$
___ table salt (sodium chloride)	e. $NaHCO_{3(s)}$
___ bleach (sodium hypochlorate)	f. $H_2O_{2(l)}$
___ chalk or limestone(calcium carbonate)	g. $C_6H_{12}O_{6(s)}$
___ oxygen gas	h. $CO_{2(g)}$
___ hydrogen peroxide	i. $H_2O_{(l)}$
___ vinegar (acetic acid)	j. $CaCO_{3(s)}$
___ glucose (sugar)	k. $CO_{(g)}$
___sodium hydroxide	l. NaOH

1. Find 3 examples of chemical reactions (can be from your text book or one of our labs). For each, write out the word equation and the chemical equation. The more familiar you are with common reactions (photosynthesis, respiration, corrosion) the better!

Topic 8 – Reaction Rate

Reaction rate is _____

Complete the following table

Method to change reaction rate	How it works? (general)	Increase or decrease reaction rate?	Give an example
Increase temperature			
Decrease temperature			
Stirring			
Catalyst			
Inhibitor			
Grinding solids			

When metals are exposed to air what happens - _____

This is the oxidation of metals or rocks in the presence of air and moisture.

Write a **word equation** to represent the corrosion of iron to iron oxide (you need oxygen)

Write a **chemical equation** to represent the corrosion of iron to iron oxide (you need oxygen). You must adhere to the Law of Conservation of Mass.

List 3 ways to protect our friends the metals from corrosion:

1.

2.

3.

Write out the chemical reaction for photosynthesis.

Using the above equation, explain whether photosynthesis is endothermic or exothermic and how you know.

A tree uses photosynthesis to grow. Using the above equation, can you explain what makes up the mass of a tree?