Name _____

#3 Atomic Structure
Quantitative Chemistry

Student Learning Map

Unit EQ: What are atoms, and why is their structure significant?

Key Learning: Knowing the parts of the atom and how it is assembled is critical to understanding the structure of matter.

UNIT CONCEPT:

1. Models of the Atom	2. Isotopes	3. Ions
LESSON ESSENTIAL QUESTIONS:		
a. What do we know about atoms and atomic theory? b. What events led up to the development of modern atomic theory?	Which subatomic particle is responsible for isotopes, and how are isotopes connected to the real world?	Which subatomic particle is responsible for the formation of ions, and how do ions bond in a specific ratio?
LESSON ESSENTIAL VOCABULARY:		
Proton Neutron Electron Nucleus Atomic Number Mass Number Laws: Conservation of Mass Constant Composition Multiple Proportions	Isotopes Carbon-14 Dating	Ion Cation Anion

Date:

1a. Introduction to Elements & Atoms

EQ: What do we know about atoms and atomic theory?

I. What is Matter Composed Of?

A. _____ (400 BC)

4 elements: _____ _____

_____ _____

B. _____ (Middle Ages)

- _____
- _____
- _____

C. _____ (1627-1691)

- Science should be firmly grounded in _____.
- An _____ is something that cannot be broken down into simpler substances.
- There are probably _____.

Date:

1a. Introduction to Elements & Atoms (cont.)

II. Elements

A. Abundant Pure Elements in the Atmosphere

_____ _____ _____

B. Abundant Elements By Mass

Human Body	Earth's Atmosphere	Earth's Oceans	Earth's Crust

C. Trace Elements

_____

_____

III. Laws of Matter

A. Law of Conservation of Mass

_____ can be neither _____ nor _____.

B. Law of Definite Proportion (Constant Composition)

A given compound always contains exactly the same proportion of elements by mass. Examples:

C. Law of Multiple Proportions

When two elements form a series of compounds, the ratios of the masses of the second element that combine with one gram of the first element can always be reduced to small whole numbers.

Example:

Date:

1b. Models of the Atom

EQ: What events led up to the development of modern atomic theory?

Scientists	*Illustration*
1. John Dalton – 1800s *Atomic Theory (5 points)* *1.* *2.* *3.* *4.* *5.*	
2. JJ Thomson – 1890s *Discovered the _____ from the use of Cathode Ray Tubes.* *Along with _____, he believed that the negative electrons were stuck in a positive sphere. [Plum Pudding Model]*	
3. Ernest Rutherford – 1911 *Discovered the _____ from the Gold Foil Experiment.* *He determined that the atom was mostly _____ with a dense, positive center.*	
4. Niels Bohr – 1913 *Believed that _____ moved around the _____ like planets around the sun.* *[Planetary / Solar System Model]*	

Date:

1b. Models of the Atom (cont.)

5. James Chadwick – 1932 *Discovered the _____ (neutral particle in the nucleus, along with the proton).*	
The Current Model: Quantum Mechanical Model *Electrons exist in _____ (3D probability regions) around the nucleus.*	

Parts of the Atom

	Proton	***Neutron***	***Electron***
1. Location			
2. Charge			
3. Mass			
4. Other Info			

Date:

1b. Models of the Atom (cont.)

Bohr Models

Although the Bohr model is not the current model, it provides a foundation for our understanding of the quantum mechanical model.

Examples:

Li	B
F	Na

Date:

2. Isotopes

EQ: Which subatomic particle is responsible for isotopes, and how are isotopes connected to the real world?

Terms:

Isotopes –

Atomic Number (Z) –

Mass Number (A) –

Atomic Symbol: Hyphen Name:

Example:

Isotopes of Hydrogen

	Hyphen	Atomic #	Mass #	Protons	Neutrons	Electrons	Symbol
Protium							
Deuterium							
Tritium							

How many protons, neutrons, and electrons are in each the following?

1. 2. 3.

Draw symbols for the following atoms:

1. 2. 3.

Date:

2. Isotopes (cont.)

What is the difference between mass number and atomic mass?

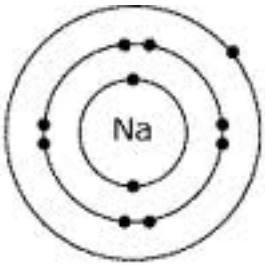
What is special about C-14?

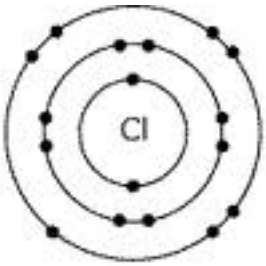
3. Ions

EQ: Which subatomic particle is responsible for the formation of ions, and how do ions bond in a specific ratio?

Conductivity Demo:

Illustration:





Terms:

Ion –

Cation –

Anion –

Date:

3. Ions (cont.)

Formation of Ions

Lithium (Li)

Protons = _____

Electrons = _____

Bohr Model:

What happens? _____

Protons = _____

Electrons = _____

Overall Charge = _____

Symbol = _____

Name = _____

Fluorine (F)

Protons = _____

Electrons = _____

Bohr Model:

What happens? _____

Protons = _____

Electrons = _____

Overall Charge = _____

Symbol = _____

Name = _____

Oxygen (O)

Protons = _____

Electrons = _____

Bohr Model:

What happens? _____

Protons = _____

Electrons = _____

Overall Charge = _____

Symbol = _____

Name = _____

Date:

3. Ions (cont.)

Ion & Isotope Chart

Symbol	Atomic #	Mass #	Protons	Neutrons	Electrons
$^{16}_{8}O^{2-}$					
$^{23}_{11}Na^{1+}$					
	13	27			10
$^{29}_{18}Ar$					
$^{35}_{17}Cl^{1-}$					
	9	19			10
$^{9}_{4}Be^{2+}$					
		207	82		78
			20	20	18
$^{31}_{15}P^{3-}$					
	29	63			27

Date:

3. Ions (cont.)

Writing Formulas for Simple Ionic Compounds:

Write the formulas for the binary compounds that would be produced from the following:

a. K^{+} and Cl^{-}

b. Mg^{2+} and F^{-}

c. Li^{+} and N^{3-}

d. Si^{4+} and O^{2-}

e. Be^{2+} and O^{2-}

f. Al^{3+} and O^{2-}

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REVIEW