

Name: _____ Period: _____ Date: _____

Unit Topic: Structure of Matter

Grade Level: 9

Key Learning: There are patterns that exist because of the physical components of matter. These patterns allow us to predict properties and draw conclusions about interactions.

Unit Essential Question: How do the patterns formed by the physical components of matter allow us to predict properties and draw conclusions about interactions?

Concept: Atoms and Subatomic Particles

Concept: Arrangement of the Periodic Table

Concept: Sources of Properties of Compounds

Lesson Essential Questions:

17.3-17.4

How is the number of each subatomic particle determined?

How did the model of the atom evolve over time?

Lesson Essential Questions:

17.5

How are elements grouped on the periodic table?

18.1 & 18.4

How can the periodic table help us draw models for atoms?

Lesson Essential Questions:

23.3 & 23.4

How can we determine the types of bonds present in a compound?

Which properties can we predict based on the types of bonds in a compound?

Vocabulary:

element
atom
subatomic particle
proton
neutron
electron
nucleus
atomic number
mass number
isotope
energy levels

Vocabulary:

metals
nonmetals
metalloids
group
period
valence electron
ion

Vocabulary:

compound
chemical bonds
octet of electrons
covalent bond
ionic bond
metallic bond
molecule
ionic crystal

Objectives:

In order to demonstrate one's competence in this area, the student will be able to:

Section 1: Atoms and Subatomic Particles

1. Define all vocabulary terms listed on the student learning map.
2. State the location, relative mass, charge, and importance of an electron, proton, and neutron.
3. Determine the number of protons, neutrons, and electrons in an atom, ion, or isotope.
4. Determine how the addition of certain subatomic particles would change an atom.
5. Write nuclear symbols and hyphenated notations for any atom, ion, or isotope.
6. Discuss the experimental evidence that led to each atomic model.

Section 2: Arrangement of the Periodic Table

1. Define all vocabulary terms listed on the student learning map.
2. Draw a Bohr model of any of the first 18 elements.
3. Identify the number of valence electrons based on a Bohr model or location on the periodic table.
4. Draw a Lewis dot structure for any main group element.
5. Predict the common charge of an ion based on a Bohr model, Lewis dot structure or location on the periodic table.
6. Predict the properties of main group elements based on their location on the periodic table.

Section 3: Sources of Properties of Compounds

1. Define all vocabulary terms listed on the student learning map.
2. Determine the type of bond formed between 2 elements based on the location of elements on the periodic table.
3. Use Lewis dot structures to represent ionic and covalent compounds.
4. Predict general properties of compounds based on the type of bond.

Subatomic particle	Charge (+, -, 0)	Location (in nucleus or outside nucleus)	Relative mass (0, 1)	Significance
proton				
neutron				
electron				

1. What do isotopes have in common?

_____ & _____ & _____

2. What 2 things are different between isotopes? _____ & _____

3. If you know the atomic number, what, if anything, could you correctly predict? _____ & _____

4. If you know the number of protons, what, if anything, could you correctly predict? _____ & _____

5. The number of _____ + _____ equals the mass number of an atom

Complete each statement by circling the correct choice.

6. In the nuclear symbol, the mass number is the (top / bottom) number

7. In the nuclear symbol, the atomic number is the (top / bottom) number.

8. The number of protons is equal to the (mass / atomic) number.

9. The number of (neutrons / electrons) is equal to the mass number minus the protons.

10. In a neutral atom, the number of electrons is equal to the number of (protons / neutrons).

11. The hyphenated notation is the element's name followed by a dash and the (mass / atomic) number.

Complete the table for the **neutral atoms**

hyphenated notation	Complete nuclear symbol	atomic number	mass number	# of protons	# of neutrons	# of electrons
12	$^{162}_{76}\text{Os}$					
13				34	33	
14	indium – 122					
15		38	78			

1. Identify the atomic model by name and describe the scientific **evidence** that was used to develop it.



- Lightly **shade** the 8 metalloids
- Circle the symbols of the 16 nonmetals
- Place an x in the box of the 11 gases
- Write the **common charges** of ions on the line **above** each main group (1,2,13,14,15,16,17,18)
- Write the number of **valence electrons** on the line **below** each main group (1,2,13,14,15,16,17,18)

																		18
1	2											13	14	15	16	17	He	
H	Li	Be											B	C	N	O	F	Ne
Na	Mg	3	4	5	6	7	8	9	10	11	12	Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac																

Answer the questions related to the periodic table:

- A horizontal row on the periodic table is called a _____
- A vertical column on the periodic table is called a _____
- On the modern periodic table elements are listed by _____ and grouped by _____.
- Circle the correct word: Most elements are (metals / nonmetals / metalloids)
- Circle the correct word: Most are most elements (solids / liquids / gases)
- Circle the correct word: Most nonmetals are (solids / liquids / gases)

1. Identify 2 general properties for each group listed:

a. Group 1 _____

b. Group 2 _____

c. Group 17 _____

d. Group 18 _____

For 2-4 Draw a Bohr model for each element and write the number of valence electrons (ve-) it has next to its name

2. silicon ve- = _____

3. magnesium ve- = _____

4. sulfur ve- = _____

For 5-7 Draw Lewis dot structures for the following elements and write the number of valence electrons (ve-) it has next to its name

5. potassium(K) ve- = _____

6. bromine(Br) ve- = _____

7. bismuth(Bi) ve- = _____

For 8-13 Write the charge the ion of each element would have:

8. Ga

11. Cs

9. Cl

12. P

10. I

13. Ba

1. Complete the table. There may be ions

hyphenated notation	Complete nuclear symbol	atomic number	mass number	# of protons	# of neutrons	# of electrons
	${}_{8}^{15}\text{O}^{-2}$					
				32	33	28
sodium – 23 ion						
ion		35	78			

2. Write the nuclear symbol for an atom of fluorine – 19 if a proton were added to it. _____

3. Write the nuclear symbol for an atom of fluorine – 19 if an electron were added to it. _____

4. Write the nuclear symbol for an atom of fluorine – 19 if a neutron were added to it. _____

5. Complete the table

Elements in bond	Location on periodic table	Type of bond
metal		
metal		
nonmetal		
metal		
nonmetal		
nonmetal		

6. Determine the type of bond that would form between the elements

magnesium and fluorine _____

S and N _____

oxygen and sodium _____

P and K _____

carbon and sulfur _____

Cl and Na _____

copper and nickel _____

Zn and Sn _____

1. Determine whether the compound formed between the 2 elements would be soluble in water or and whether it would have a high or low boiling point

Elements in bond	Soluble in water? (Y or N)	High or low melting point?
Cu & Zn		
Br & Rb		
O & P		

Draw Lewis dot structures to show the bond between the elements.

2. Mg & S

3. F & Cl

4. Ba & I

5. N & F

Define the terms in your own words

element

atom

subatomic particle

proton

neutron

electron

nucleus

atomic number

mass number

isotope

energy levels

metals

nonmetals

metalloids

group

period

valence electron

compound

chemical bond

octet of electrons

covalent bond

ionic bond

metallic bond

molecule

ionic crystal