

Atoms and Elements

Unit A – Atoms and Elements

A1 – ESSENTIAL OUTCOMES (40% + exam)

Outcome Questions	Vocabulary & Concepts	Textbook	Activities	Assessment																						
<p><i>S1-2-03:</i></p> <ul style="list-style-type: none"> What are the symbols of the first 20 elements and other common ones? <p style="text-align: right;"><input type="checkbox"/></p>	Element Atom Periodic Table	p.38-40	Periodic Table Search	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Date</th> <th style="width: 50%;">%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%																				
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<p><i>S1-0-04:</i></p> <ul style="list-style-type: none"> What symbols and systems help people use chemicals safely at home, work and for the environment? <p style="text-align: right;"><input type="checkbox"/></p>	WHMIS HHPS MSDS	p.8-13	Safety First	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Date</th> <th style="width: 50%;">%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%																				
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<p><i>S1-2-09:</i></p> <ul style="list-style-type: none"> How do you classify matter using the words: element, compound, atom, molecule, mixture and pure? <p style="text-align: right;"><input type="checkbox"/></p>	<table style="width: 100%;"> <tr> <td style="width: 50%;">Pure</td> <td style="width: 50%;">Diatomic</td> </tr> <tr> <td>Mixture</td> <td>Homogeneous</td> </tr> <tr> <td>Compound</td> <td>Heterogeneous</td> </tr> <tr> <td>Molecule</td> <td>Metalloid</td> </tr> </table>	Pure	Diatomic	Mixture	Homogeneous	Compound	Heterogeneous	Molecule	Metalloid	p.72-73	States of Matter	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Date</th> <th style="width: 50%;">%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%												
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<p><i>S1-2-12:</i></p> <ul style="list-style-type: none"> How do you identify physical or chemical change and if a chemical reaction has taken place? <p style="text-align: right;"><input type="checkbox"/></p>	Precipitate <table style="width: 100%;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%; text-align: center;"><i>Law of Conservation of Matter</i></td> </tr> </table>		<i>Law of Conservation of Matter</i>	p.86-90	Physical and Chemical Change	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Date</th> <th style="width: 50%;">%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%																		
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A2 – EXTENSION OUTCOMES (70% + exam)													
<p>S1-2-02:</p> <ul style="list-style-type: none"> What is the basic subatomic structure of an atom? <input type="checkbox"/>	Subatomic Electron Proton Neutron Nucleus	Neutral	p.28-29		<table border="1"> <thead> <tr> <th>Date</th> <th>%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%						
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<p>S1-2-04:</p> <ul style="list-style-type: none"> How do you use atomic mass and atomic number to identify parts of the atom? <input type="checkbox"/>	Amu (μ)	Atomic Mass Atomic Number	p.49	Atomic Structure	<table border="1"> <thead> <tr> <th>Date</th> <th>%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%						
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<p>S1-2-05:</p> <ul style="list-style-type: none"> How do you draw an atom using a Bohr Diagram? <input type="checkbox"/>	Orbit Bohr Diagram Valence		p.60-61	Bohr and the Table	<table border="1"> <thead> <tr> <th>Date</th> <th>%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%						
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<p>S1-2-06:</p> <ul style="list-style-type: none"> How is the Periodic Table organized for the elements and what patterns exist? <input type="checkbox"/>	Mendeleev Period Group Family Alkali Metals Earth Metals Transition Metals Chalcogens Halogens Noble Gases		p.48, 52-53	Bohr and Periodic Trends	<table border="1"> <thead> <tr> <th>Date</th> <th>%</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Date	%						
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A3 – EXPLORATION OUTCOMES (80% + exam)													
<p>S1-2-08:</p> <ul style="list-style-type: none"> Why do families react differently during chemical reactions? <input type="checkbox"/>													
<p>S1-2-10:</p> <ul style="list-style-type: none"> How do you use a formula to find elements in the molecule and the number of atoms of each element? Subscript Coefficient	<input type="checkbox"/>												
<p>S1-2-01:</p> <ul style="list-style-type: none"> How did each person contribute to our understanding of matter? Democritus Dalton Thomson Rutherford	<input type="checkbox"/>												

PERIODIC TABLE SEARCH

SI-2-03: What are the symbols of the first 20 elements and other common ones?

1. What is the Periodic Table of Elements?
2. Define an <i>element</i> :
3. Define an <i>atom</i>

Over the next few years you will be expected to memorize the symbols for the following elements.
(Most you will remember without trying just because you will use them so often)

Fill in the missing information:

Element	Symbol	Element	Symbol	Element	Symbol
Hydrogen			Mg	Copper	
	He	Calcium			Zn
Chlorine			W	Sodium	
	Ni	Potassium			B
Tin			S	Iodine	
	U	Lithium			Si
Nitrogen			Ar	Oxygen	
	Au	Mercury			P
Fluorine			Al	Silver	
	Ne	Iron			C
Lead			Be	Uranium	

OK detectives, grab your periodic tables and proceed to solve the mystery of the missing elements.

1. Find and write down 4 elements that are named after countries, states, or other places on Earth.
2. Find 3 elements that are named after planets or outer-space objects (write element and object).

3. Find 3 elements that are named after scientists (write element and scientist names).

4. How many elements have only one letter for their symbol?

5. What is the symbol for:

a. An important mineral in your body that is found in milk, cheese, bones and teeth?

b. The gas element used in good party balloons –

c. The gas element found in fancy restaurant lights –

d. The element used to purify swimming pool water –

e. A liquid element used in old thermometers –

f. The element used to shield your body during x-rays –

g. The element used most in electrical wiring –

h. The solid elements used in most common pencils (not lead) –

i. The radioactive element used as a fuel in nuclear reactors –

j. This element is the lightest of the halogens –

k. The atomic mass of this metal is about 56 –

l. Period 6 contains this group 2 metal –

m. Group 16 contains this reactive non-metal gas –

n. There is no heavier member of group 2 –

o. This inert gas is in period 3 –

p. This is the lightest element in period 2 –

q. The element found in Period 3, Group 16 –

r. The element found in Period 2, Group 13 –

6. Guess the element from the *Greek and Latin* names used to create the symbols:

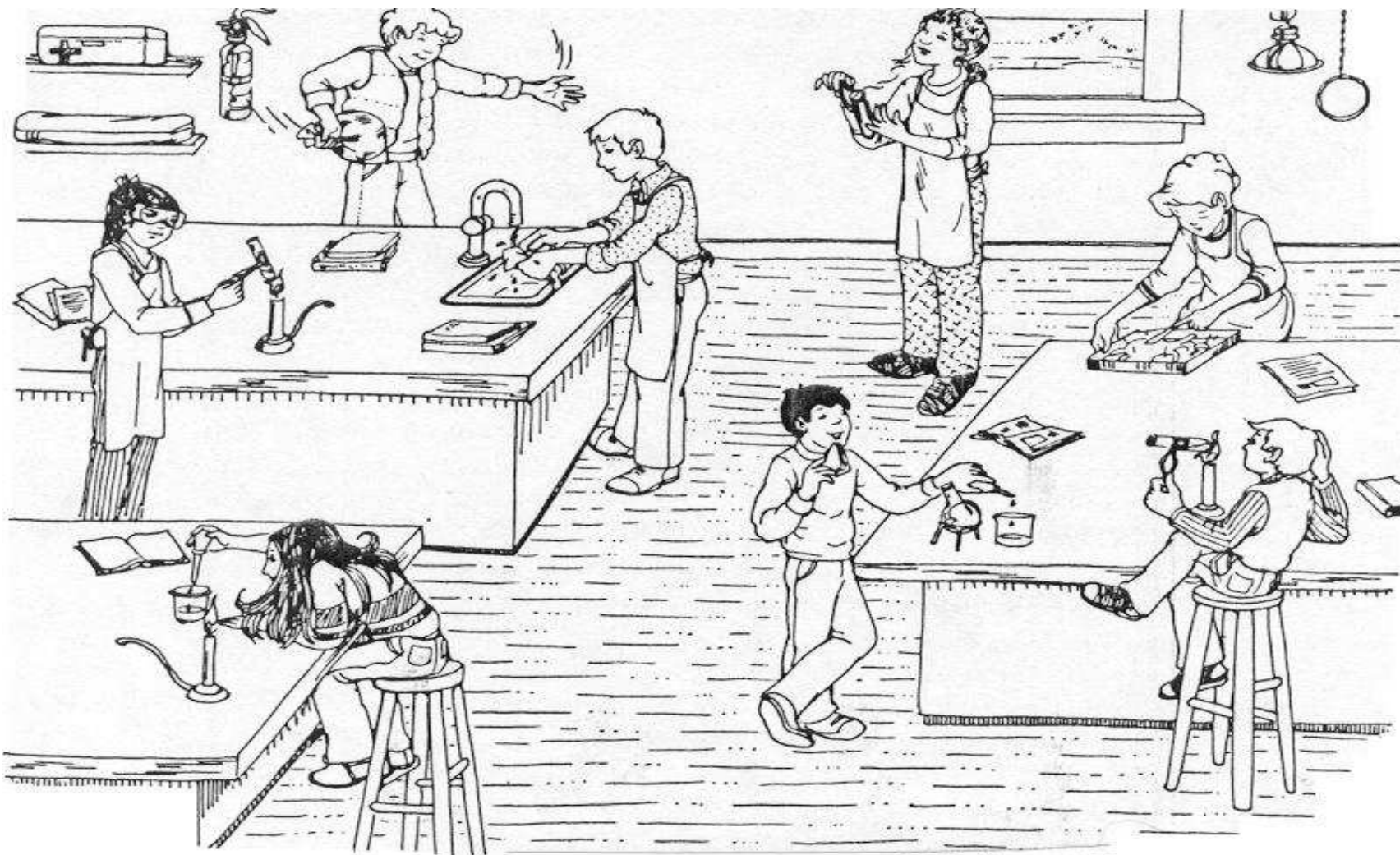
Element	Symbol	Latin Name
		Stibium
		Cuprum
		Aurum
		Ferrum
		Plumbum
		Kalium
		Argentum
		Natrium
		Stannum
		Wolfram

SAFETY FIRST

SI-0-04: Demonstrate work habits that ensure personal safety, safety of others, and consideration for the environment.

Being safe and smart during a lab activity requires that you use common sense.

1. CIRCLE **four** behaviours/situations that are **UNSAFE**.
2. SQUARE **four** behaviours/situations that are **SAFE**.



Created or selected by Chris Heumann

1. WHMIS

WHMIS stands for **W** _____ **H** _____ **M** _____ **I** _____ **S** _____.

It was established to inform users of hazardous materials of the risks and precautions involved. It is used across Canada. Anyone who uses materials controlled by WHMIS *must be trained* in the system.

WHMIS is a program that requires all dangerous substances to have:

- Labels on all containers and bottles
- Safety data sheet (SDS) delivered with all materials

A. PRODUCT IDENTIFIER LABEL

Products must have a label that contains 8 things:

1. Product Identifier
2. Supplier Identifier
3. Pictograms / Hazard symbols
4. Signal Words
5. Hazard statement(s)
6. Precautionary statement(s)
7. Supplemental information



B. SDS stands for **S** _____ **D** _____ **S** _____.

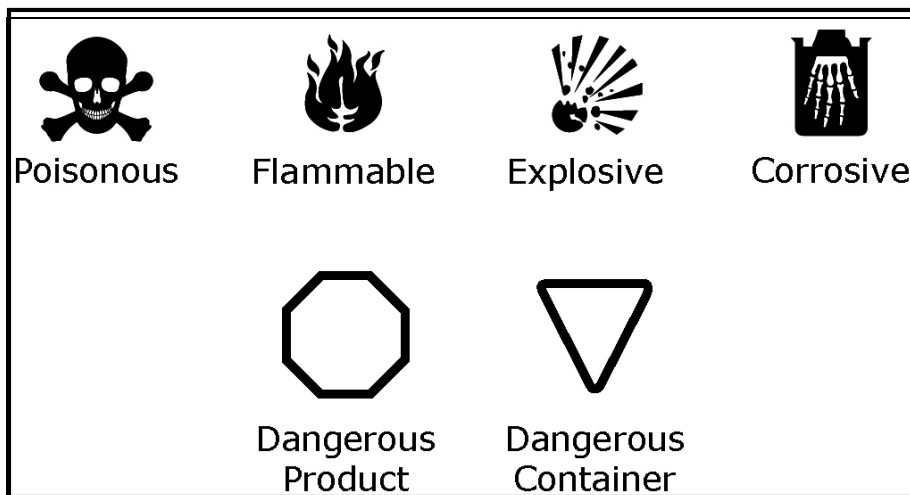
Gives *detailed* information on the product. An SDS looks something like this:



2. Safety Symbols (Pictograms)

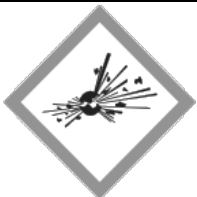


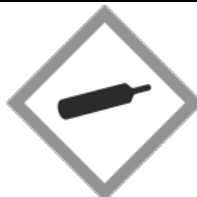
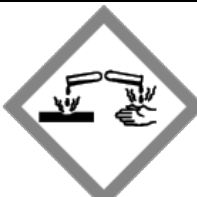





1. HAZARDOUS HOUSEHOLD PRODUCT SYMBOLS (HHPS)

Purpose:



2. WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Purpose:

PHYSICAL HAZARDS				
				
Explosive	Flammable	Oxidizing	Compressed Gas	Corrosive
HEALTH HAZARDS				ENVIRONMENTAL HAZARD
				
Acute Toxicity	Biohazard	Irritation	Health Hazard	Aquatic Hazard

SI-2-09: How do you classify matter using the words: element, compound, atom, molecule, mixture, pure?

<i>Pure</i>	<i>Mixture</i>	<i>Compound</i>	<i>Molecule</i>	<i>Diatomic</i>	<i>Heterogeneous</i>	<i>Homogeneous</i>

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STATES OF MATTER

SI-2-09: How do you classify matter using the words: element, compound, atom, molecule, mixture and pure?

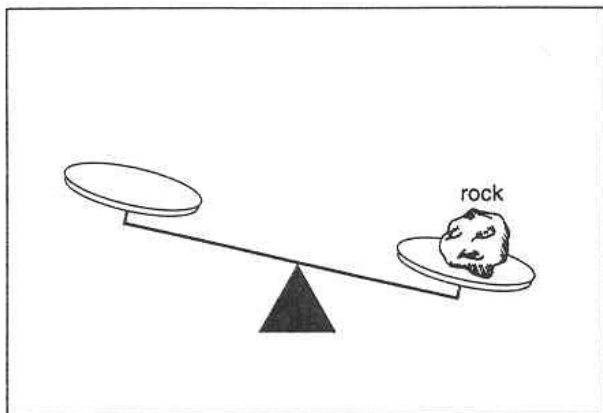


Figure A

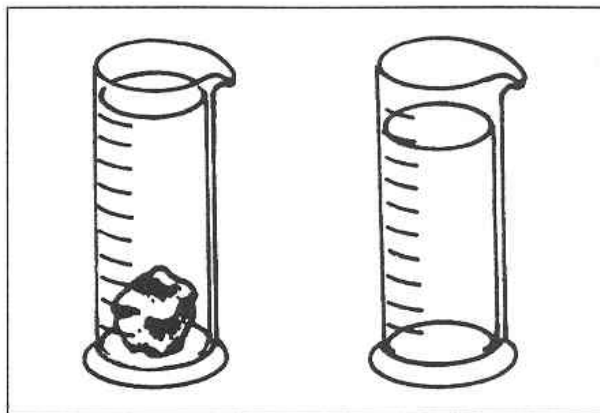


Figure B

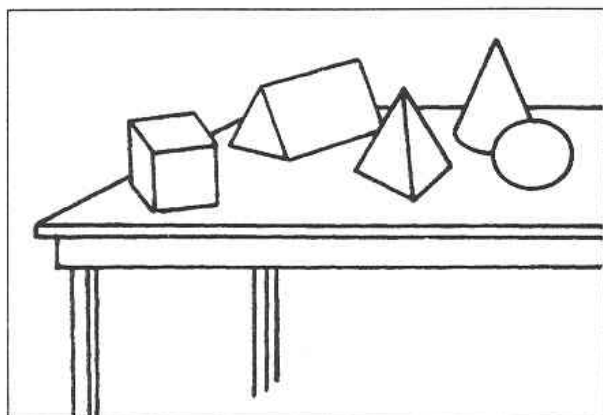


Figure C

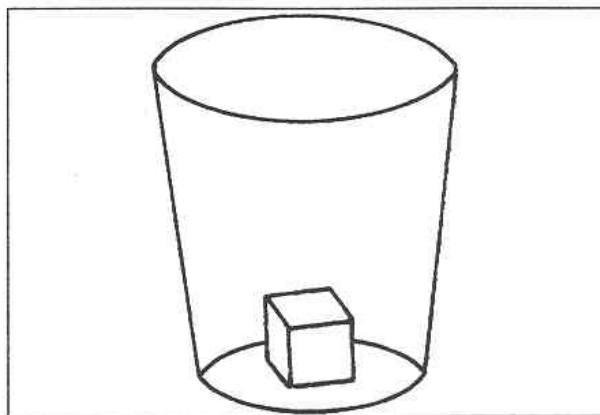


Figure D

Which figure shows that a solid . . .

1. . . . takes up space? A B C D
2. . . . does not take the shape of its container? A B C D
3. . . . does not fill its container? A B C D
4. . . . has mass? A B C D
5. . . . has a definite shape? A B C D

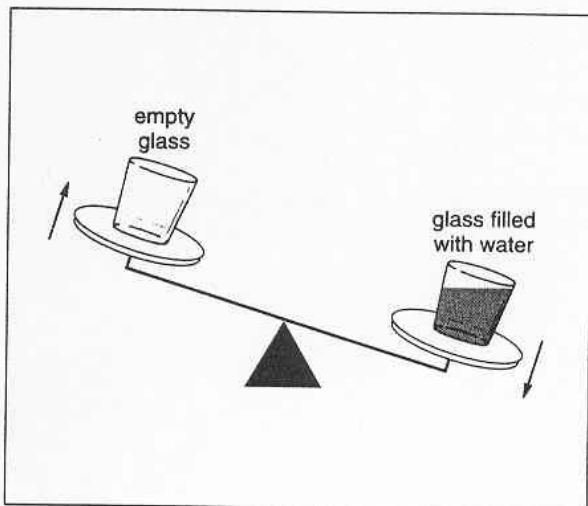


Figure A

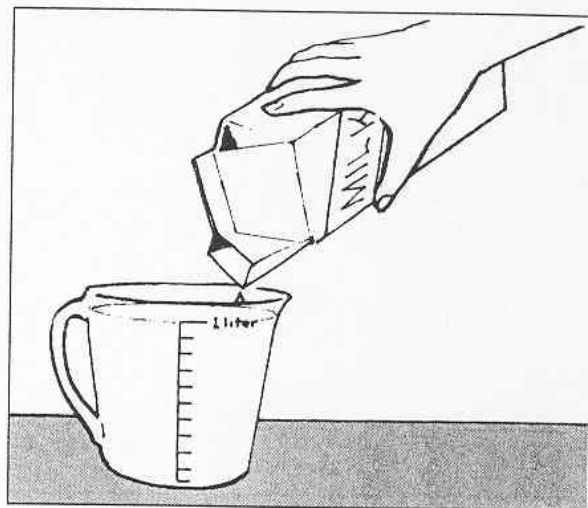


Figure B

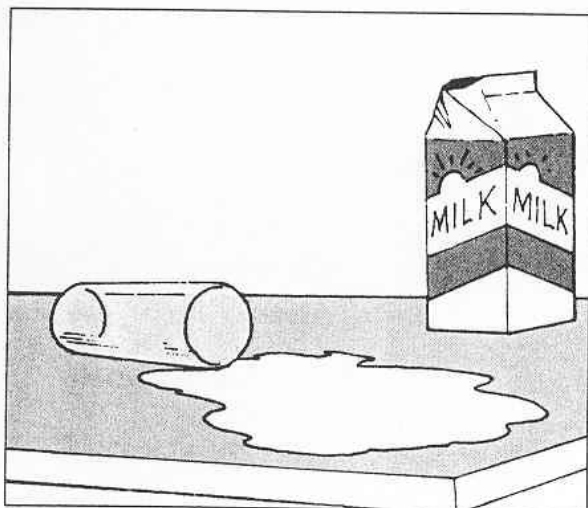


Figure C

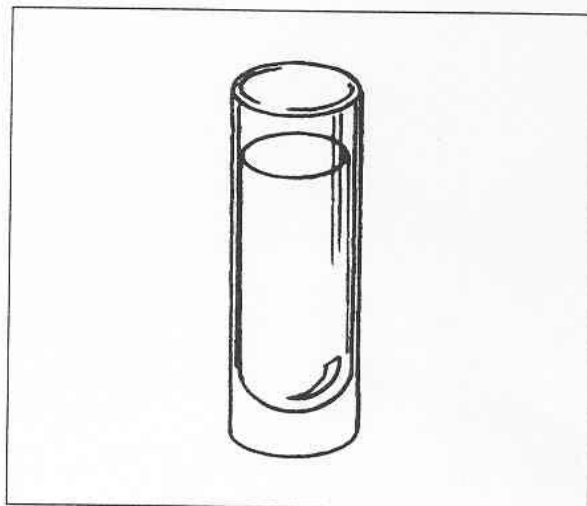


Figure D

Which figure shows that a liquid . . .

1. . . takes up a definite amount of space? A B C D
2. . . has mass? A B C D
3. . . takes on the shape of its container? A B C D
4. . . does not fill a container larger than itself? A B C D
5. . . has no definite shape? A B C D

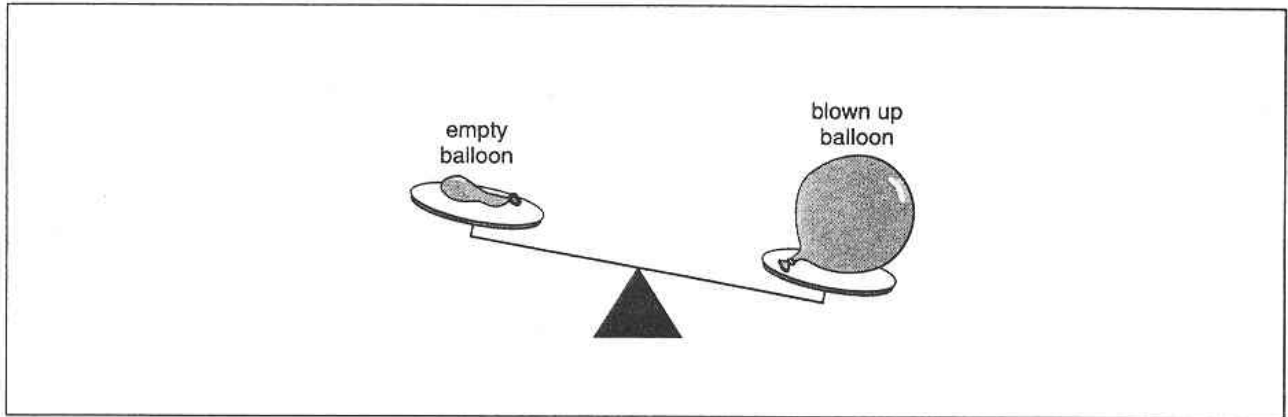


Figure A

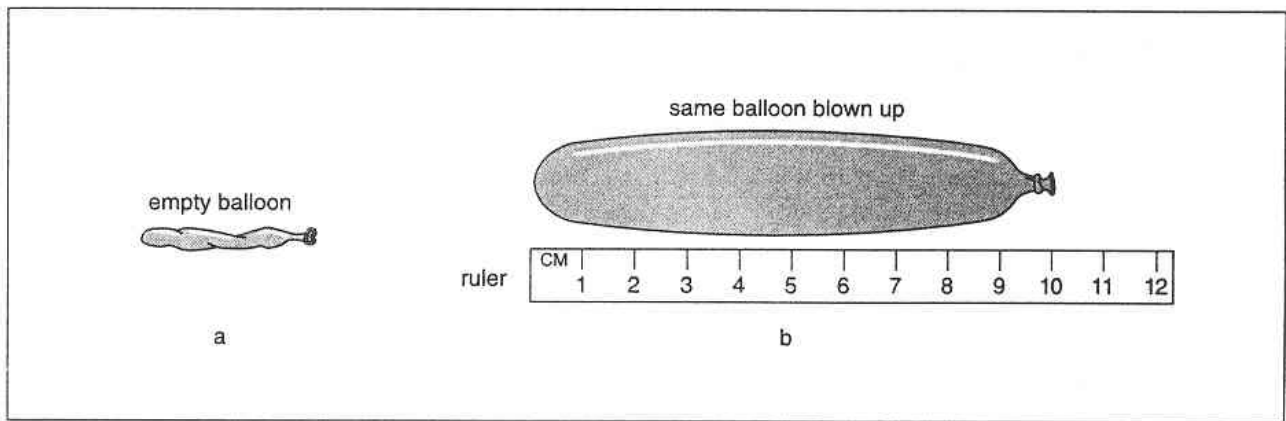


Figure B

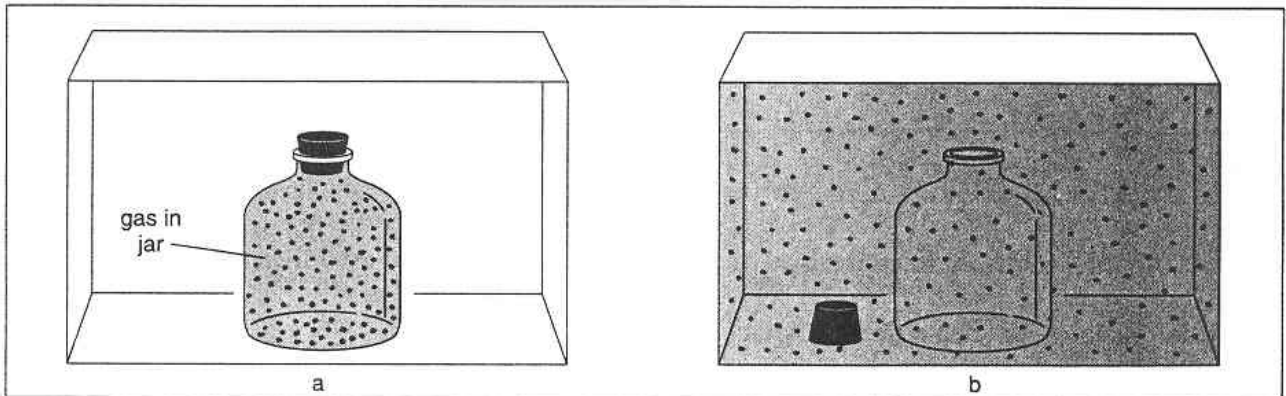


Figure C

Which figure shows that a gas . . .

1. . . . has mass? A B C
2. . . . spreads out to fill its container? A B C
3. . . . takes up space? A B C

1. What is matter?
2. Name the three states of matter?
3. What is the special temperature at which a liquid becomes a solid called?
4. What is the special temperature at which a liquid becomes a gas called?
5. What is *evaporation*?
6. Complete this table:

<u>STATE</u>	Has Mass	Takes up Space	Has a Definite Shape	Has a Definite Volume	Takes shape of Container
<i>solids</i>	YES				
<i>liquids</i>					
<i>gases</i>			NO		

PHYSICAL AND CHEMICAL PROPERTIES

SI-2-07: What properties classify elements as metals, non-metals or metalloids?

1. Complete the missing information in the table below:

<u>Physical Properties</u>		
Definition:		
<i>Qualitative</i>		<i>Example</i>
State/Phase	Solid, liquid, gas or plasma	
Malleability		Gold is malleable Glass is <i>brittle</i>
Ductility		Copper is ductile Coal is not ductile
Texture	Appearance and feel of the surface	
Lustre	Degree to which a material reflects light	
Magnetism		Iron is magnetic Carbon is not magnetic
<i>Quantitative</i>		
Solubility		Salt is soluble in water Pepper is not soluble in water
Hardness	A measure of resistance to being scratched	
Conductivity	Ability to conduct heat or electricity	
Viscosity	A measure of resistance to flow	
Density		Lead has high density Water has a density of 1g/mL
Melting Point		
Boiling Point	Temperature of boiling/condensing	Water boiling at 100°C

2. Looking at the table of physical properties, what do you think the words “qualitative” and “quantitative” mean for physical properties?

<u>Chemical Properties</u>		
Definition:		
Reactivity	Degree to which a material chemically interacts (in water or acid etc.)	
Combustibility		Gasoline is combustible Water is not combustible
Toxicity	Degree to which a material causes bodily harm	

3. What property(s) of the following substances make them important for the stated uses?

a) Diamond is used in drill bits that travel through rock.

b) Antifreeze is used as a car coolant.

c) Helium is used to fill the Good Year blimp.

d) Hydrogen is not used to fill the Good Year blimp.

e) Copper is used in house wiring.

f) Aluminum is used on the cooling fins of a lawn mower engine.

g) Mercury is used as an electrical switch when movement is needed.

h) Tires are made of rubber.

i) Some cooking pots have a copper bottom.

j) Fiberglass insulation is used in walls.

4. State whether a *physical* (P) or *chemical* (C) property is being described, and list the property described:

- a) Aspirin tablets can be pulverized with a hammer. (P) / (C) : HARDNESS
- b) Lithium metal burns in oxygen with a bright red flame. (P) / (C) : _____
- c) Mercury is a liquid at room temperature. (P) / (C) : _____
- d) Gold metal does not react with hydrochloric acid or nitric acid. (P) / (C) : _____
- e) Hemoglobin molecules have a red colour. (P) / (C) : _____
- f) An iron nail is attracted to a magnet. (P) / (C) : _____
- g) Diamonds are hard substances. (P) / (C) : _____
- h) Chlorine gas has a yellowish green colour. (P) / (C) : _____
- i) Beryllium metal vapour is extremely toxic to humans. (P) / (C) : _____
- j) Ski goggles become fogged. (P) / (C) : _____
- k) A rubber band can be stretched. (P) / (C) : _____
- l) A firecracker explodes when lit. (P) / (C) : _____
- m) A dry leaf can be crushed. (P) / (C) : _____

5. What is the definition of a metal, a non-metal and a metalloid?

6. What are some defining properties of each type of matter?

SI-2-12: How do you identify physical or chemical change and if a chemical reaction has taken place?

Precipitate Combustion Corrosion Oxidation *Physical Change* *Chemical Change*
Law of Conservation of Matter

PHYSICAL VS. CHEMICAL CHANGE

SI-2-12: How do you identify physical or chemical change and if a chemical reaction has taken place?

In a physical change, the original substance still exists, it has only changed form. In a chemical change, a new substance is produced. *Energy changes always accompany chemical changes (although it may be subtle).*

1. List signs that a chemical reaction and therefore a chemical change has taken place:

a)	b)	c)
d)	e)	f)

2. Classify each of the following changes as either physical or chemical. Provide an explanation for your choice using the “signs” of a chemical reaction you listed above.

Situation	Type of Change	Explanation
a) A piece of dry ice (solid carbon dioxide) is dropped in hot water. Large amounts of white vapour bubbles out of the water.	<input type="checkbox"/> PHYSICAL <input type="checkbox"/> CHEMICAL	
b) When George makes wine from crab-apples, bubbles form on the surface of the yeast and fruit mixture.	<input type="checkbox"/> PHYSICAL <input type="checkbox"/> CHEMICAL	
c) When milk is left out on the counter for a long period of time goes sour.	<input type="checkbox"/> PHYSICAL <input type="checkbox"/> CHEMICAL	
d) Jane opens up a container of air freshener and the room quickly smells of flowers.	<input type="checkbox"/> PHYSICAL <input type="checkbox"/> CHEMICAL	
e) To reduce swelling in Jane’s sprained ankle her basketball coach squeezes a room temperature bag that quickly becomes very cold.	<input type="checkbox"/> PHYSICAL <input type="checkbox"/> CHEMICAL	

3. Classify the following as being a physical or chemical change by placing a “P” or a “C” next to the statement. *Include at least one “sign” or explanation to your choice:*

a) Sodium hydroxide dissolves in water. (P) / (C) : _____

b) Hydrochloric acid reacts with potassium hydroxide to produce a salt, water and heat.

(P) / (C) : _____

c) A pellet of sodium is sliced in two. (P) / (C) : _____

d) Water is heated and changed to steam. (P) / (C) : _____

e) Potassium chlorate decomposes to potassium chloride and oxygen gas.

(P) / (C) : _____

f) Iron rusts. (P) / (C) : _____

g) When placed in water, sodium pellet catches on fire as hydrogen gas is liberated and sodium hydroxide forms.

(P) / (C) : _____

h) Evaporation. (P) / (C) : _____

i) Ice melting. (P) / (C) : _____

j) Sugar dissolves in water. (P) / (C) : _____

k) Wood rotting. (P) / (C) : _____

l) Pancakes cooking on a griddle. (P) / (C) : _____

m) A tire is inflated with air. (P) / (C) : _____

n) Food is digested in the stomach. (P) / (C) : _____

o) Water is absorbed by a paper towel. (P) / (C) : _____

SI-2-02: What is the basic subatomic structure of an atom?

SI-2-04: How do you use atomic mass and atomic number to identify parts of the atom?

Subatomic	Electron	Proton	Neutron	Neutral	Amu (μ)
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<i>Atomic Mass</i>	<i>Atomic Number</i>
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ATOMIC STRUCTURE

*SI-2-02: What is the basic subatomic structure of an atom?**SI-2-04: How do you use atomic mass and atomic number to identify parts of the atom?*

1. Fill in the blanks for the elements in this chart.

For the purposes of this chart, round all atomic masses to the nearest whole number.

Element	Symbol	Number of Protons	Number of Neutrons	Number of Electrons	Atomic Mass	Atomic Number
Lithium						
Carbon						
Chlorine						
silver						
lead						
Calcium						
radium						
uranium						

2. Fill in the table below.

	Symbol	Charge	Location	Mass
Protons				
Electrons				
Neutrons				

3. Use the Periodic Table to fill in the missing information in the table below:

	Atomic Number	Element Symbol	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
a.	11					
b.			40		20	
c.	17					19
d.					18	
e.			52	24		
f.		Li	7			
g.			197	79		
h.	82					125

These last three are called “isotopes.” Workout there numbers and see if you can come up with a definition for this new term:

i.		Fe				31
j.			2		1	
k.					6	7

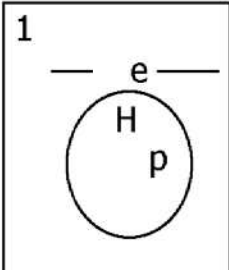
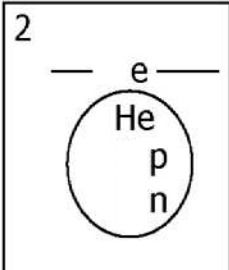
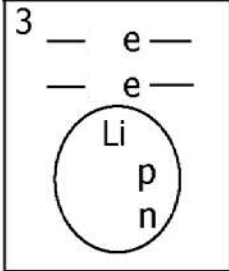
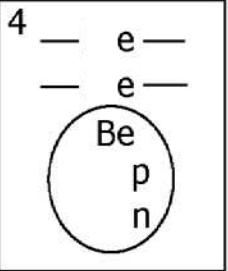
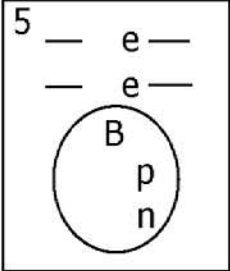
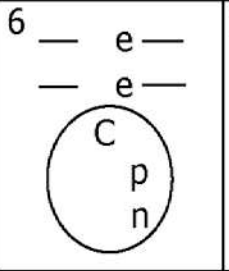
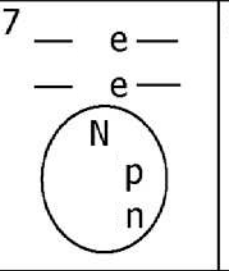
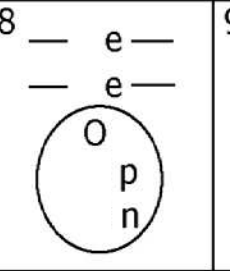
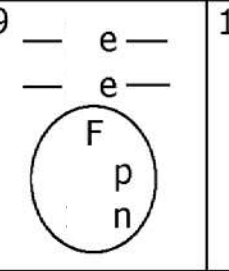
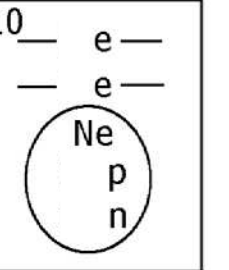
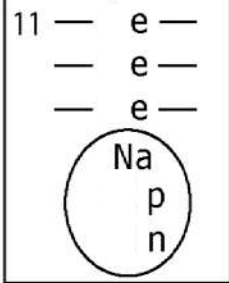
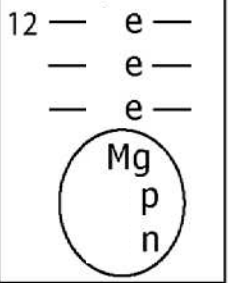
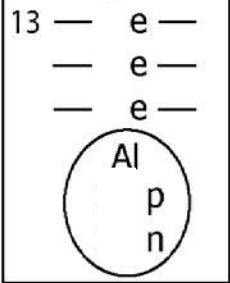
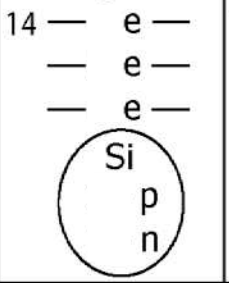
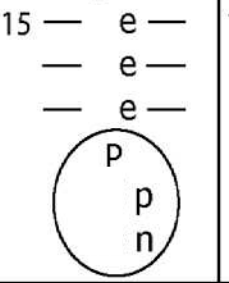
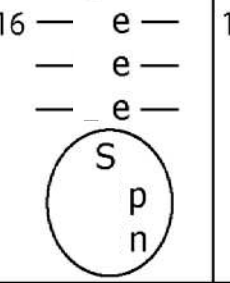
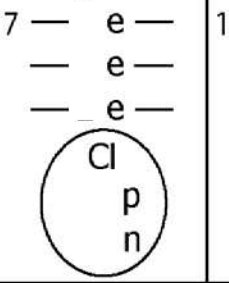
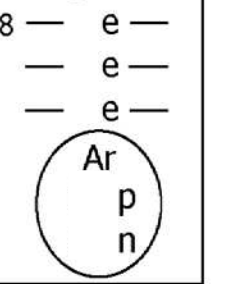
SI-2-05: How do you draw an atom using a Bohr Diagram?

Orbit	Valence	<i>Bohr Diagram</i>

BOHR DIAGRAMS

SI-2-05: How do you draw an atom using a Bohr Diagram?

Complete the Bohr diagrams for the following 18 elements:

1												18		
1														
		2												
2			5	6	7	8	9	10	13	14	15	16	17	18
														
3														

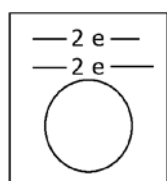
S1-2-06: How is the Periodic Table organized for the elements and what patterns exist?

Period	Group	Family	Mendeleev	Periodic Law	Transition Metals

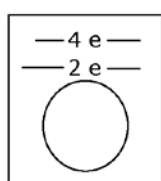
BOHR AND PERIODIC TRENDS

SI-2-06: How is the Periodic Table organized for the elements and what patterns exist?

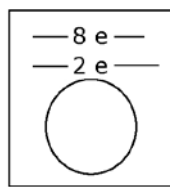
- Examine the periodic table to help answer the following questions:
 - What do the drawings for Hydrogen, Lithium, and Sodium have in common?
 - Based on your diagrams for Beryllium and Magnesium and what you can see in the Periodic Table, predict the number of electrons in the outer ring of Calcium.
 - Predict the number of electrons in the outer ring of Gallium.
 - Why is Helium in the same column as Neon and Argon?
- Examine the rows of the periodic table. As the rows increase, what happens to the number of electron shells?
- How many electrons are there in the outer shell of a Selenium (Se) atom? _____
- How many electron shells would you expect to find in a Selenium atom? _____
- What similarities exist in the Bohr diagrams for elements of *ANY* family?
- How do the diagrams differ among elements in the same family?
- Without checking your work above*, use the Periodic Table to identify the elements from the Bohr-Rutherford diagrams below.



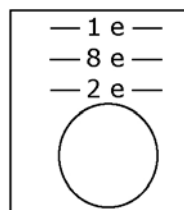
a) _____



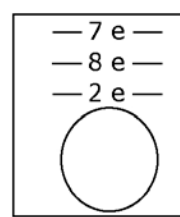
b) _____



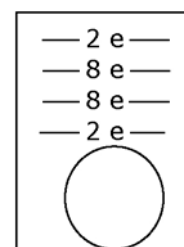
c) _____



d) _____

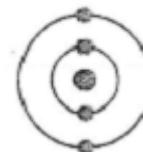
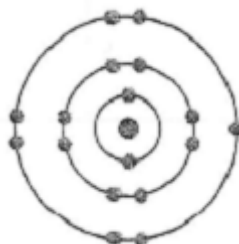
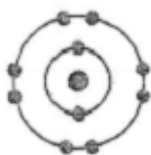


e) _____



f) _____

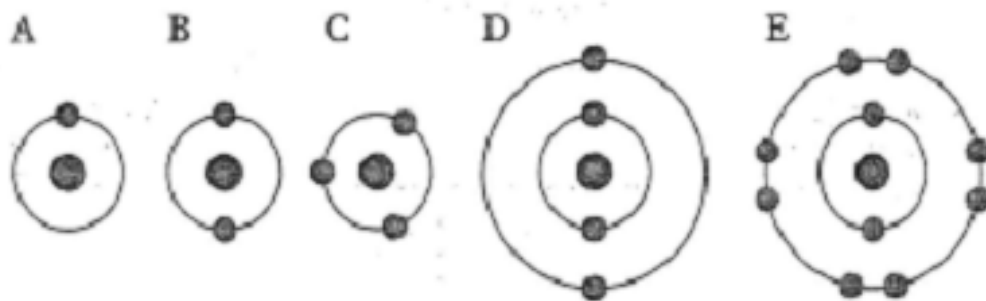
- Match these “shell diagrams” below to the elements you identified above:



9. Approximately how many elements have been discovered?
- a) 3
 - b) 35
 - c) 100
 - d) 300
10. Name two metals.
- a) copper and chlorine
 - b) copper and gold
 - c) sulphur and chlorine
 - d) sulphur and gold
11. Which of the following is a metalloid?
- a) silicon
 - b) sulphur
 - c) sodium
 - d) strontium
12. What is a period in the Periodic Table?
- a) a family of elements with similar properties
 - b) a horizontal row
 - c) group of elements with the same valence number
 - d) a vertical column
13. What do the noble gases He and Kr have in common?
- a) both gases will make a balloon tend to float
 - b) filled valence energy levels
 - c) the same number of electrons
 - d) the same number of protons
14. How is the periodic table arranged?
- a) by atomic mass and chemical properties
 - b) by atomic number and chemical properties
 - c) by ion charge and atomic mass
 - d) by ion charge and atomic number
15. Which phrase is correct for a Bohr model of a noble gas?
- a) empty outer electron shell
 - b) full outer electron shell
 - c) more electrons than protons
 - d) more protons than electrons
16. Which best describes the alkaline earth metal family?
- a) family of metals that is magnetic
 - b) the most reactive family of metals
 - c) family of metals used to make coins
 - d) family whose elements have 2 valence electrons
17. Which best describes an element?
- a) family with different by similar properties
 - b) mixture of different atoms
 - c) pure substance that can decompose
 - d) pure substance that can't be further broken down
18. List any four types of information usually recorded on a periodic table in addition to the element's name.
19. In a statement, what is the relationship between valence electrons and group number?

IONS, CHARGE AND FAMILY*SI-2-08: Why do families react differently during chemical reactions?*

20. Examine the diagrams below and circle the particles that are stable:



21. Draw a Bohr diagram of lithium below:

- What group number and family name of this element?
- Why is this not a stable electron configuration?
- What would make it more stable?

22. Draw a Bohr diagram for chlorine below:

- What group number and family name of this element?
- Why is this not a stable electron configuration?
- What would make it more stable?

23. Draw a Bohr diagram for Oxygen below and its most stable ion next to it. *Label the charge on the ion:*

24. Complete the table for these Metallic Elements

Element Name	Element Symbol	Bohr Diagram	# of Valence Electrons	Group Number / Family	Ionic Charge
Magnesium					
Aluminum					

25. Continue the table for these Non-metallic Elements

Nitrogen					
Sulphur					
Neon					

26. In a statement, what is the relationship between valence electrons and group number?

27. What is the general trend in ion formation for metals and non-metals?

28. Draw Bohr diagrams to show how beryllium and fluorine react together.

29. Use the words from the list to fill in the blanks in the paragraph below:

attract *charge* *electron* *ionic bond* *transferred* *opposite*
positive *positively charged* *negative* *negatively charged*

When an atom gains or loses a(n) _____, an ion is formed. All ions have a(n) _____.


Metals tend to form _____ ions while non-metals tend to form _____ ions. When a metal atom reacts with a non-metal atom, one or more electrons are _____, which results in the formation of ions. One of these ions will be _____ and one will be _____. Because of these _____ charges, the ions _____ each other forming a(n) _____.

INTERPRETING CHEMICAL FORMULAE

SI-2-10: How do you use a formula to find the elements in a molecule and number of atoms of each element?

Before you can analyze chemical formulae and chemical equations you must first be able to identify what kind of information a chemical formula has within it.

1. The *symbol* of an element represents one atom of that element
 - *In chemistry we rarely include the number 1*

Numbers	Pictures
Na = 1 Na	Na = 

2. A **subscript** is a number written at the lower right corner of the symbol of an element. If there is more than one atom of the element, then a subscript is use to indicate the number of atoms.
 - *A subscript outside a bracket multiplies all the elements inside the bracket*

Numbers	Pictures
H₂O =	H₂O =
Mg₂(PO₄)₂ =	Mg₂(PO₄)₂ =

3. A **coefficient** is a number in front of a chemical that indicates the number of particles present.
 - *A coefficient multiplies the number of atoms of each element in the formula*

Numbers	Pictures
3 O₂ =	3 O₂ =
3 CuSO₄ =	3 CuSO₄ =
4 Pb(NO₃)₂ =	4 Pb(NO₃)₂ =

Name of Substance	Chemical Formula	Compound or Element	Number of each elements
water (essential for all living things)	H ₂ O	compound	2 - Hydrogen 1 - Oxygen
nitrogen gas (part of air)	N ₂	element	
carbon dioxide (part of air, and what we breath out)	5 CO ₂		
potassium iodide	2 KI		
sucrose (table sugar)	C ₁₂ H ₂₂ O ₁₁		
calcium carbide (lets off explosive gas)	6 CaC ₂		
tri-nitro-toluene (TNT)	2 C ₇ H ₅ N ₃ O ₆		
sulfuric acid (very corrosive)	H ₂ SO ₄		
lead (II) nitrate	3 Pb(NO ₃) ₂		
ethanol (alcohol)	C ₂ H ₅ OH		
copper (II) nitrate	2 Cu(NO ₃) ₂		

4.

a) Na₂CO₃

Element	# of Atoms
Total	

c) 3 BaCl₂

Element	# of Atoms
Total	

e) NH₄C₂H₃O₂

Element	# of Atoms
Total	

b) Ca₃(PO₄)₂

Element	# of Atoms
Total	

d) K₂CrO₄

Element	# of Atoms
Total	

f) 4 Al₂(CO₃)₃

Element	# of Atoms
Total	

1																		18																																																																																																																																																																	
Atomic # →																		Atomic Mass →																																																																																																																																																																	
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Periods

58 Ce* Cerium 140.1	59 Pr Praseodymium 140.9	60 Nd Neodymium 144	61 Pm Promethium (145)	62 Sm Samarium 150.4	63 Eu Europium 152.0	64 Gd Gadolinium 157.3	65 Tb Terbium 158.9	66 Dy Dysprosium 162.5	67 Ho Holmium 164.9	68 Er Erbium 167.3	69 Tm Thulium 168.9	70 Yb Ytterbium 173.0	71 Lu Lutetium 175.0
90 Th** Thorium 232.0	91 Pa Protactinium (231)	92 U Uranium 238.0	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (254)	100 Fm Fermium (257)	101 Md Mendelevium (256)	102 No Nobelium (259)	103 Lr Lawrencium (262)