SNC 1DI

Chemistry: Atoms, Elements & Compounds – PART 1

Lesson	Topic	Lesson	Learning Goals	Homework
1.1	Why Study Chemistry	☐ What is Chemistry?	• be able to define what chemistry is and its importance in human life	QL: pg 137 Qs 7&8 HW: Chemistry Around Us
1.2	Chemistry Basics	☐ Particle Theory ☐ Changes of State	• state all of the postulates of the particle theory • describe physical changes of state as related to the particle theory	**HW**: pg140 Q#1-5
1.3	Observing & Classifying Matter	☐ Classification of Matter	• distinguish between pure substances & mixtures as well as classify each substance in a subcategory (element/compound, heterogeneous/solution)	**QL: pg 146 Q 7-11** **HW**: pg143 Q#1-4 Pg147 Q#1-12
1.4	Properties	☐ Physical & Chemical Properties	• describe physical and chemical properties as related to the characteristics of the substance using proper scientific terminology	**QL: pg 149 Q#**3-7 **HW:** Pg161 Q#1-3, 6
	Lab	☐ Using Properties to Identify Substances	• conduct an inquiry to identify physical & chemical properties of common household substances • distinguish unknown substances based on their physical & chemical properties	Finish Lab
1.5	Physical & Chemical Changes	☐ Physical & Chemical Changes	• identify the difference between a physical & chemical change • understand the 5 key observations to indicate a chemical change • classify a reaction as physical or chemical	**HW:** pg161 Q#4,5,8,11 REVIEW: pg164 Q#1-19
	Lab	☐ Observing Physical & Chemical Changes	• conduct an inquiry to identify physical & chemical changes during a reaction • classify a reaction as either physical or chemical	Finish Lab
1.6	Atomic Theory	☐ Atomic Theory History ☐ The Atom: Proton, Neutron & Electron	• describe observational & theoretical evidence that contributed to the modern atomic model • describe the characteristics of the modern atomic model such as particles, charge, location and relative mass •	**HW:** pg 175 Q#1-6 **WS:** Working with Atomic Information
1.7	The Elements	☐ Bohr-Rutherford Diagrams ☐ Electron Dot Diagrams	• identify and use the symbols for the first 20 elements • describe patterns in the arrangement of electrons of the first 20 elements using Bohr-Rutherford diagrams	WS: BR Diagrams **WS:** Which Element Am I? HW: pg 187 Q#1-

Lesson 1: *What is Chemistry?*

Chemistry is the _____
_____

We study chemistry because:

1. _____
2. _____
3. _____
4. _____
5. _____

Chemistry Around Us

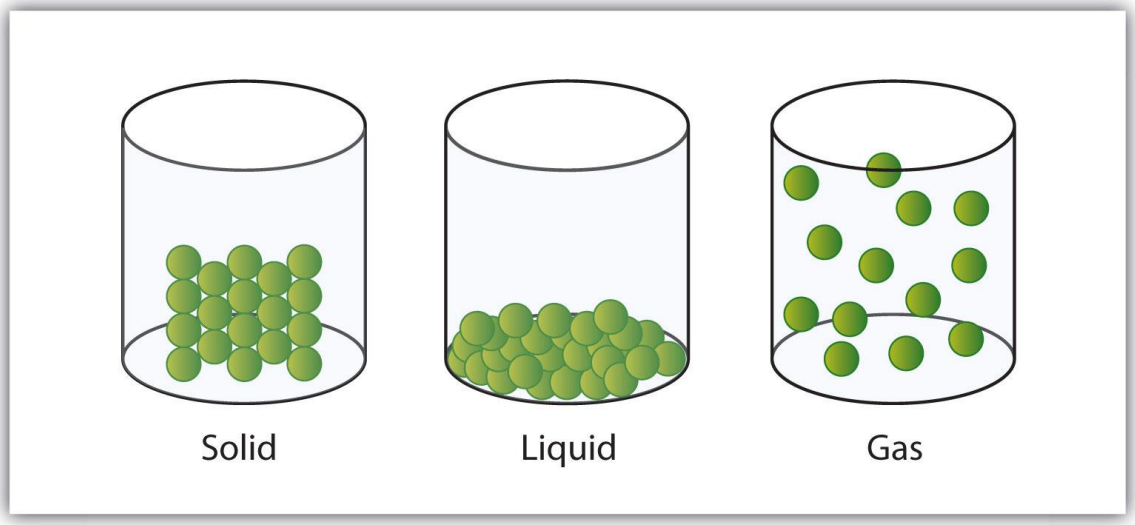
Starting from when you woke up this morning, write down all of the chemistry to have encountered today.

Lesson 2: Particle Theory of Matter

Over the centuries, scientists have created many models to explain what matter is. One of the most enduring models of matter is the particle theory. More than 2000 years ago in Greece, a philosopher named Democritus suggested that matter was made up of tiny particles. From there the particle theory was developed into 4 postulates;

1. _____
2. _____
3. _____
4. _____

Applying the PT to Substances



State	Solid	Liquid	Gas
Spaces between particles	Very small		
Forces between particles			Relatively weak
Arrangement of particles		Clumps of particles that slide past each other	

Thinking Questions – Use your knowledge of the particle theory to answer each of the following questions.

1. Explain these common situations:
    a. why smells of good food diffuse from a bag to your nose
    b. You have 100 mL of water in a beaker. You add 20 mL of table salt. The water level rises to only 105 mL.
    c. 50 mL of ethyl alcohol and 40 mL of water combined in a beaker add up to 90 mL of liquid

MATTER

PURE SUBSTANCES

MIXTURES

ELEMENTS

COMPOUNDS

SOLUTIONS

HETEROGENEOUS MIXTURE

Physical Property –

Hardness -

Malleability -

Ductility -

Melting and Boiling Points -

Lustre -

Solubility -

Viscosity -

Density -

Chemical Property

Combustibility –

Heat Change -

Lab: Physical & Chemical Properties

Problem: What are the physical and chemical properties of common substances?

Procedure:

Step 1: **PHYSICAL PROPERTIES**

1. Put a small amount of the substance on one area of the waxed paper.
2. Identify the substance's color and texture. ***RECORD DATA***.
3. Use a magnifying lens to observe the crystal shape of each substance. ***RECORD DATA.***

Step 2. **CHEMICAL PROPERTIES**

1. Test the substance's reaction to water by adding 3-4 drops of water to the substance. ***RECORD DATA.***
2. 2. Test the substance's reaction to vinegar by adding 3-4 drops of vinegar to the substance. ***RECORD DATA***.
3. Test the substance's reaction to iodine by adding 3 -4 drops of iodine to the substance in the spot plate. ***RECORD DATA.***

Observations: In your notebook, make an observation table like the one below.

Substance	Appearance	Crystal Form	Reaction with Water	Reaction with Vinegar	Reaction with Iodine

Questions:

1. For each white substance, there is a unique property that identifies it from the others. Identify this property for each one.

2. What is the identity of the unknown substances? Explain how your observations support each of your identifications.

3. Make a list of all of the chemical and physical properties you observed during this activity. **(Hint: Did you observe malleability?)**

Conclusion: Write a concluding statement to the physical and chemical properties of the substances in this lab.

Physical Change – _____

_____

e.g. changes of state (melting, boiling, freezing, condensation, etc.) and dissolving

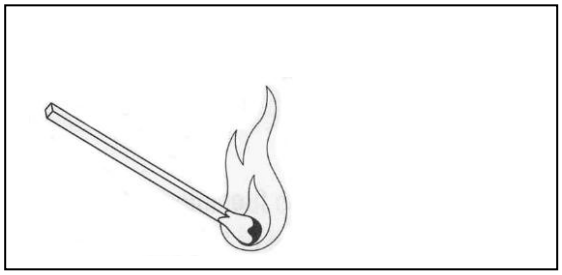
Most physical changes are _____.

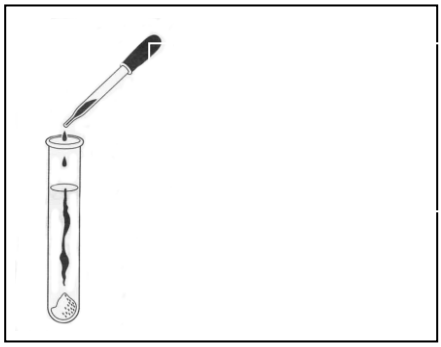
Chemical Change – _____

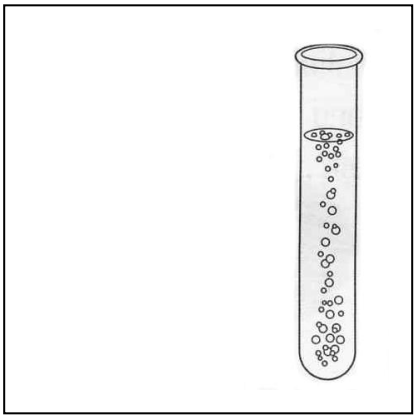
_____

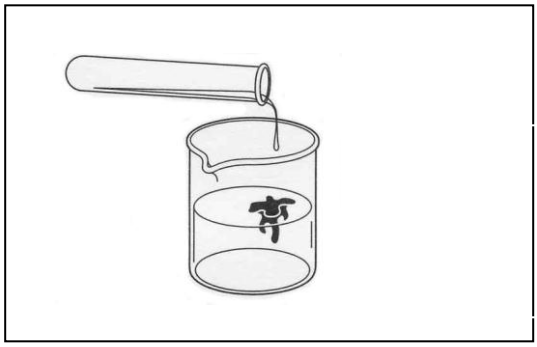
e.g. combustion, corrosion

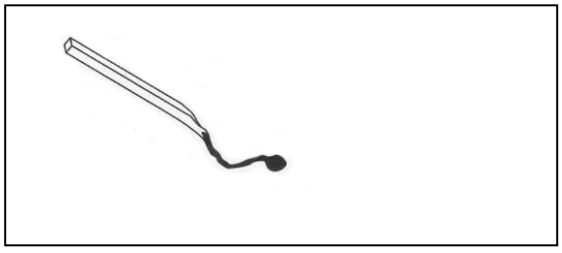
Clues that a Chemical Change has occurred:











Homework: Physical and Chemical Changes

State whether the following changes are physical or chemical. Explain how you know.

Change	Physical or Chemical?	Clue
ice melts		
sulfur is burned		
glass breaks		
a match is struck		
mercury is heated to produce mercury vapour		
copper sulfate dissolves in water		
a cake is baked		
iron rusts		
wax hardens on a candle		
silver tarnishes		
leaves change colour and fall		
nail polish remover evaporates		
wood burns		
a dish rag dries		
wood is hammered together to build a playhouse		
sugar dissolves in tea		
vinegar is added to baking soda		
muddy water is allowed to settle		
an egg is fried		
butter is melted for popcorn		
sand is separated from gravel		
food spoils		
lemonade powder is mixed in water		
the lawn is mowed		
metal rusts		
hair is bleached		
fireworks explode		
oranges are squeezed to make orange juice		
milk is poured on your oatmeal		
leaves change colour and fall		

Lab: Physical & Chemical Changes

Purpose:

Procedure: Read the procedures outlined at each station carefully.

Observations & Conclusions:

Observations Before		Observations After	Physical or Chemical Change?	Reason(s)
Hydrochloric Acid				
Magnesium				
Lead Nitrate				
Potassium Iodide				
Magnesium (burning of)				
Copper (II) Sulphate				
Water				

Discussion:

1. (a) How did you determine a physical change?

   (b) How did you determine a chemical change?

2. (a) Which of the experimental changes was the easiest to determine? The hardest?

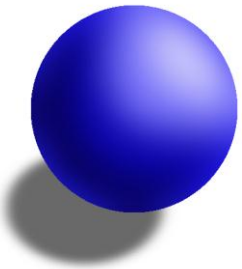
   (b) Do you think that classifying changes as physical is easier than chemical? Explain.

Lesson 6a: What are the Particles in the Particle Theory?

1. The Greeks (450 to 350 B.C.E., Before Common Era)

The ancient Greek people believed that all matter was made of the four "elements": _____, _____, _____ & _____.

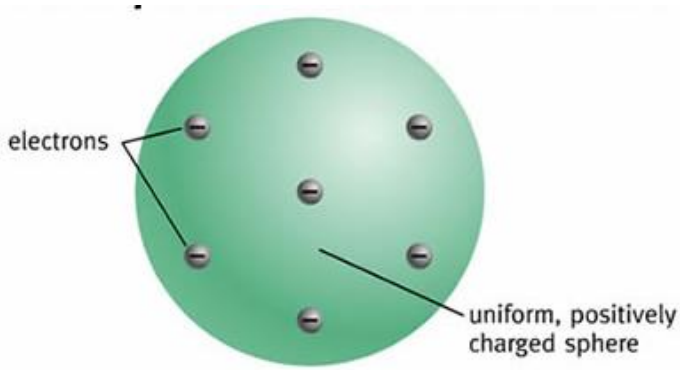
Everything on earth was a combination of these four things.



2. John Dalton (An English School teacher and a Chemist)- 1800s

Dalton suggested that all matter is made up of _____that could not be divided. He called these particles _____. Dalton believed that each element has its _____. When these atoms combine, they make_____.

3. William Crookes and J.J. Thomson (late 1800s)

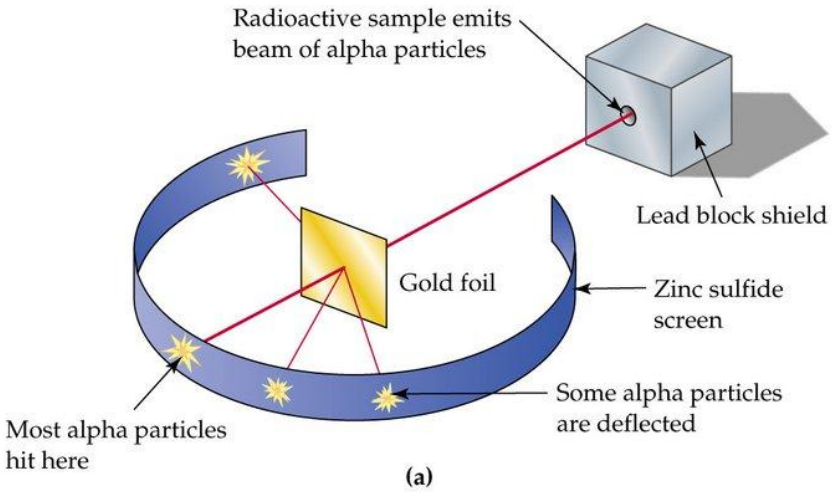


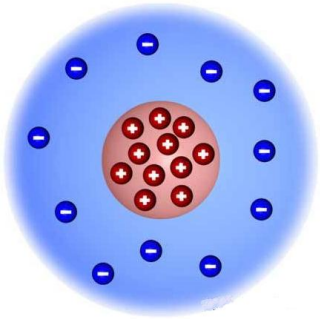
William Crookes invented the _____. When he put electricity through the gas in the tube, it gave off a _____. Thomson found that this light could be _____. Thomson said that atoms must have _____called _____. That meant that there must also be _____.

Thomson made up the "_____" model of the atom. Atoms are made up of positive charges and electrons all _____.

4. Rutherford's Gold Foil Experiment (1911)

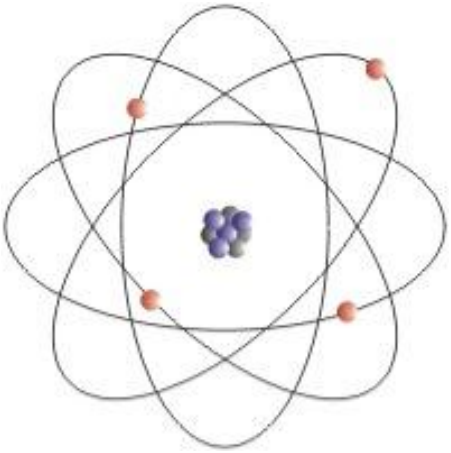
Ernest Rutherford was testing Thomson's model of the atom. He shone very tiny, high speed particles (called _____) through a piece of _____. He thought that the particles were so tiny that they would_____ the foil. Most of the particles did, but some _____. They must have hit something hard in the atom.





Rutherford decided that the atoms must contain _____ _____. Rutherford said that atoms contain a _____ nucleus, made up of positively charged protons, surrounded by a _____.

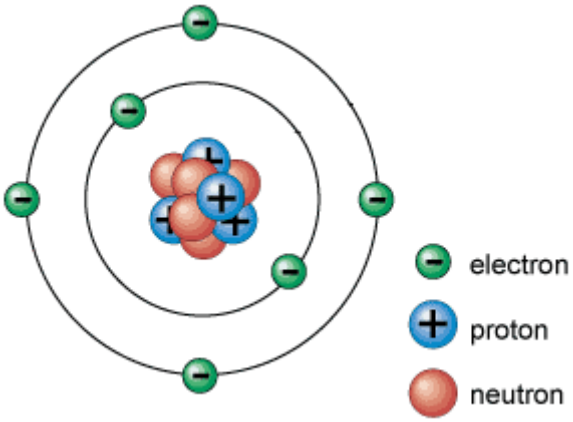
5. Bohr and Flame Tests



Neils Bohr studied the element hydrogen. When he added energy, the atoms always gave off the same _____. Each element has its own _____of light. Bohr realized that the light was given off when the electrons were given energy and got excited. When the electrons _____ _____, they give off this energy as _____.

Bohr realized that the electrons were not it clouds around the nucleus, they were in "_____", just like the planets orbit the sun.

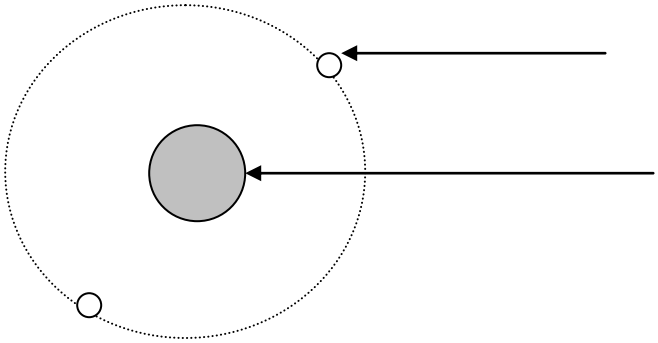
6. Chadwick and the Neutron



A third particle in the atom was found, called the _____. It is found in the _____ and has _____. This is the model of the atom that we still use today.

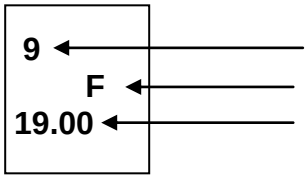
Lesson 6b: Atomic Structure

The following is a schematic drawing of the Bohr-Rutherford model of the atom:



Subatomic Particles	Position	Movement	Charge	Relative Size
proton				
neutron				
electron				

From the periodic table you can obtain the following information:
e.g. fluorine



Atomic number:

Atomic Mass (Mass Number):

To determine the number of neutrons:

To determine the number of electrons (assuming the atom has a neutral charge):

1.

6
C
12.01

element name: **# of protons =**
atomic number = **# of neutrons =**
atomic mass = **# of electrons =**

2.

5
B
10.81

element name: **# of protons =**
atomic number = **# of neutrons =**
atomic mass = **# of electrons =**

3.

19
K
39.10

element name: **# of protons =**
atomic number = **# of neutrons =**
atomic mass = **# of electrons =**

Atomic Number	Atomic Mass	Symbol	Name	# of protons	# of neutrons	# of electrons

Practice with Atomic Information

Atomic Number	Atomic Mass	Symbol	Name	# of protons	# of neutrons	# of electrons
17						
		Li				
	24.3					
				4		
			Nitrogen			
				97		
						6
		B				
	26.98					
				16		
			Fluorine			
2						
		Cs				
						18
	39.09					
			Tin			
		Si				
	132.9					
			Nickel			
1						
				31		
					5	
						30
			Manganese			
		Fr				
				47		
24						

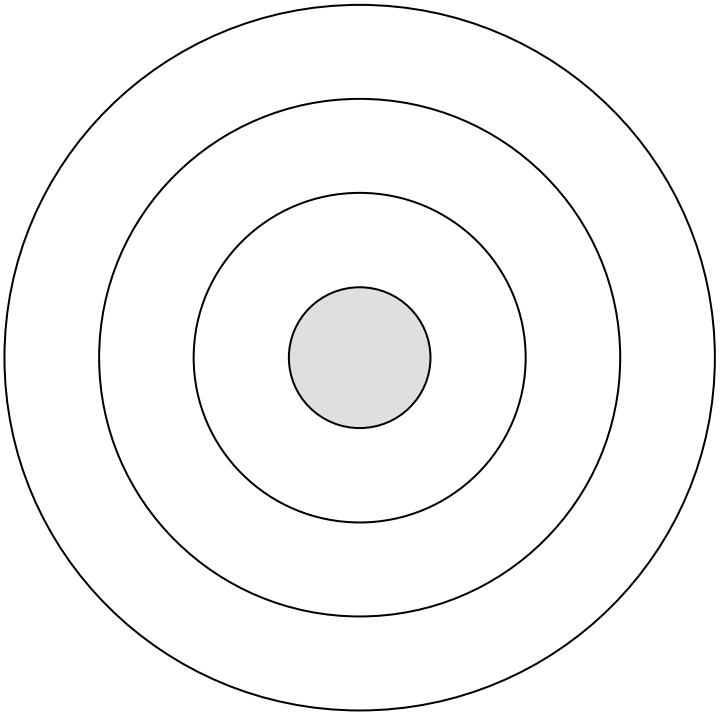
Lesson 7a: Bohr-Rutherford Diagrams

Bohr-Rutherford diagrams are simple diagrams that allow us to _____ and _____ of all _____ (protons, neutrons, and electrons). Remember that _____ are found in the _____, while _____ around the nucleus.

Electrons are placed in _____. Each shell holds a _____ of electrons.

Starting with the shell closest to the nucleus:

Shell _____ holds ____ electrons
Shell _____ holds ____ electrons
Shell _____ holds ____ electrons
Shell _____ holds_____



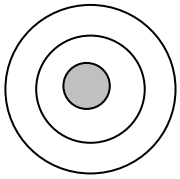
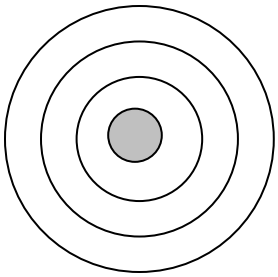
Draw the Bohr Rutherford diagram for Magnesium.

Lesson 7b: Electron Dot Diagrams

All atoms are _____ when they have _____ shell (a _____ electron arrangement).

Electrons are _____ from _____ electron shell. The electrons from the _____, therefore we can ignore all of the electrons in the inner shells.

So, instead of drawing Rutherford-Bohr diagrams (that show all of the electrons), we can draw _____ that show _____ (the _____ electrons):

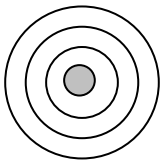
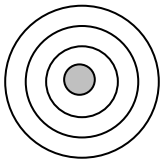
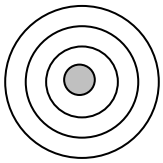
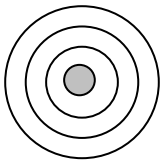
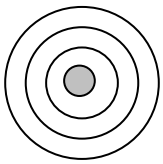
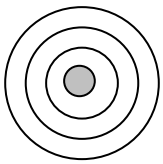
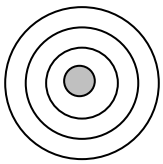
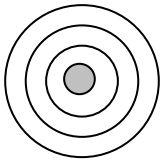
	Rutherford-Bohr Diagram	Electron Dot Diagram	Group #
eg. $_{9}F$			
eg. $_{20}Ca$			

Homework: Which Element is it?

The names of many elements seem to be obscure Latin, but in fact many of these names appear to be derived from common English words and phrases. Using the following clues, determine the names of the elements suggested.

1. An amusing prisoner
2. What may be granted after a divorce
3. Half a dime
4. What a doctor does
5. To add spices
6. The leg joint above the calf
7. Have went
8. An Asian sub-continent
9. A kitchen work area
10. What the cowboy said after riding the bronco
11. View by a boy named Calvin
12. What you do with dead people
13. Grab him
14. The Lone Ranger's horse
15. A famous English Theatre
16. Police officer
17. Not fat
18. Well driller's chant
19. To press a shirt
20. He who rules the sea
21. Large building used to store automobiles
22. What I do when I am hungry
23. Gin with water in it
24. What police do to a place of illegal activity
25. What factories manufacture cloth have
26. If you are not pro-money, you are ___.
27. Mind your own _____.
28. They injected the spy with ____.
29. What the farmer said to the rancher about runaway cattle
30. Mattresses may be soft or _____.
31. Some tiles are used on walls, others as _____.
32. Opposite of Guyium
33. Put on your coat. It's very _____.
34. What you get when you cut a whole into 2 parts
35. Two halves make a _____.
36. Musical instrument
37. A kind of car
38. Molly's jeans
39. What lies at the end of the yellow brick road
40. Mr. Foss is in our favour
41. Dog owned by Mickey Mousium
42. Carbonated soft drink
43. What actors do in movies
44. Said the runner after completing the marathon
45. What Reverend Sam does to engaged couples.

Rutherford-Bohr and Lewis (Electron) Dot Diagrams – Remember that Bohr Rutherford Diagrams draw all of the electrons while the Lewis diagrams only show the valence electrons!

Element	Atomic Number	Rutherford-Bohr Diagram	# of Electrons in the Outer Orbital	Group Number on Periodic Table	Electron Dot Diagram
Na					
Mg					
O					
Al					
H					
S					
C					
N					

Homework: After you have completed the above chart, draw the electron dot diagrams for atoms with atomic number 1 to 20, 34, 35, 36, 37, 38, 52, 53, 55, 56 and 85