Diagnostic/Introductory Activity

Based on the information below, refer to a Periodic Table to name the three individual elements. Place the element symbol in the space with the question mark (?), and complete the other required fields on the element card.

Atomic#
6

?

P=__6__

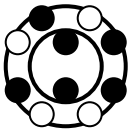
N=____

E= __6_

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr
Diagram



Uses:

Atomic mass
32.1

?

P=__16_

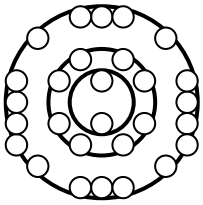
N=____

E= ____

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr
Diagram



Uses:

_____
_____

?

P=____

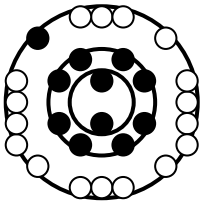
N=____

E= ____

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr
Diagram



Uses:

Inside the Atom

Suggested time: 1.25 Hours

What's important in this lesson:

- The atomic structure of common elements
- Three fundamental particles (neutron, proton, and electron), and their charge, location, and relative mass in a simple atomic model (e.g., the Bohr-Rutherford model);
- The relationship between the properties of elements and their position in the Periodic Table

Complete these steps:

1. Complete the Diagnostic/Introductory Activity. Get this checked as being completed on your Course Checklist.

2. Use the textbook, *Science 9 Concepts and Connections, Science 9 or Science Power 9,* get started on the student handout. If you are having difficulty with a section note this in the box below: Questions for Teacher and move on to the next activity in your student handout. You may need to use the internet for additional information and/or reference to a Periodic Table.

3. Once the student handout is complete check your answers or your teacher will with the Answer Key. Get this checked as being completed on your Course Checklist.

4. You'll need at least 10-15 minutes to complete the quiz on the material you've reviewed today. If you've got at least that much time ask your teacher for the quiz and hand the quiz in when you're done. If you don't have enough time move on to the Reflective Activity and try the quiz next day.

5. Complete the Reflective Activity. Get this checked as being completed on your Course Checklist.

Hand-in the following to your teacher:

1. The lesson quiz.

Questions for the teacher:

Inside the Atom

Early scientists once thought that the atom was the smallest particle of matter on earth. However, scientists now know that atoms are made up of even smaller particles. These particles are: protons, neutrons, and electrons.

These particles are arranged in very specific locations in every atom. Consequently, an atom can be compared to a ball. At the centre of the ball lies the nucleus **(fig 1).** The nucleus consists of protons and neutrons. These particles are packed very tightly, and make up the majority of mass of an atom. Circling the nucleus are electrons. Scientists once thought these electrons orbit the nucleus much like the planets of our solar system orbit the sun. However, today scientists have realized that electrons move in randomized manner, in defined energy levels called **shells**. One of earlier modern scientists developed a model of the atom that we use today. A Danish physicist named Niels Bohr suggested that a regular pattern for the position and motion of electrons is present in every atom. The diagram below **(fig 1),** is an example of a **Bohr diagram**. Throughout this lesson a Bohr diagram will be used to illustrate the organization of electrons in individual atoms. Scientists also discovered that atoms have both positive and negative charges associated with them:

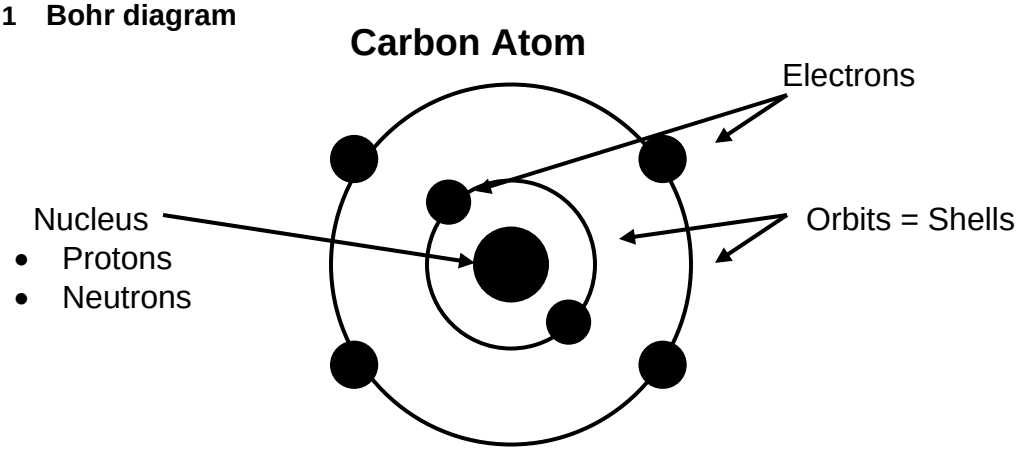
- Electrons have negative (-) charges
- Protons have positive (+) charges
- Neutrons have no charges. They are neutral.

Lastly, atoms have the same number of electrons and protons. Since they are equal in number and have opposite charges, they cancel each other out to give an **atom no charge**. This is summarized in the chart below.

Name of particle	Where it is found	Charge
electron	Outside the nucleus	-
neutron	Inside the nucleus	0
Proton	Inside the nucleus	+

The atom below is a carbon atom, The centre of the atom is the nucleus and contains protons and neutrons. The electrons orbit the nucleus in two different pathways, called shells.

Fig. 1 Bohr diagram



Each energy level, or shell, is identified with a **letter**. We will take a look at the first three shells. The first shell is referred to as “K”, second “L”, and third shell “M”. Each shell can only hold a certain number of electrons.

- The “K” shell can hold up to 2 electrons
- The “L” shell can hold up to 8 electrons
- The “M” shell can hold up to 18 electrons

As a result of the limitations on each shell, the number of shells depends upon the electrons. Before an electron can enter a shell, the previous shell must be filled. For example, an Oxygen atom has 8 protons, therefore 8 electrons. The first two electrons fill the “K” shell. The remaining 6 electrons enter, and occupy the “L” shell. Finally, the outermost shell of an atom is very important, because of this it has a special name, valence shell. If a shell is the valence shell, it can only hold up to 8 electrons, even if it is the “M” shell. Lastly, the “K” shell can only hold 1 or 2 electrons, even if it is a valence shell.

Activity 1:

How many shells?

How many shells are needed for each of the following? Write your answer in the space.

1. How many shells do 2 electrons need? _answer 1_
2. 4 electrons need _____ shells.
3. 8 electrons need _____ shells.
4. 12 electrons need _____ shells.
5. 18 electrons need _____ shells.

Complete the Chart

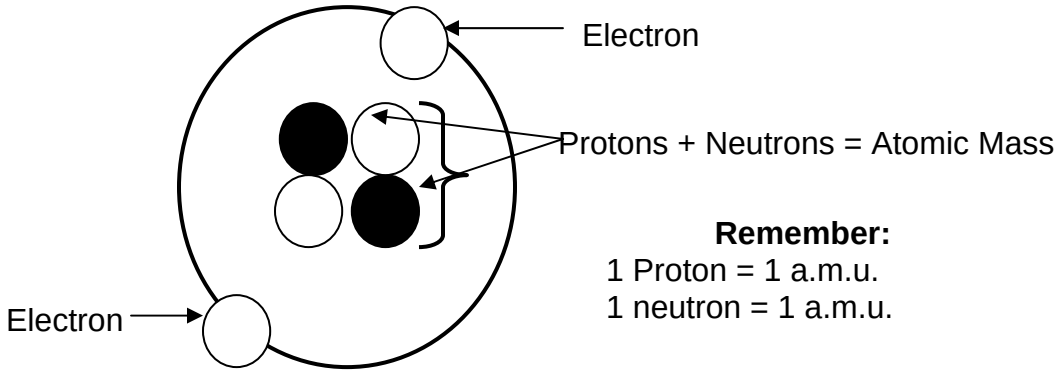
Complete the Chart by filling in the missing information. The first atom is done as an example:

#	Atom	# of Electrons	Number of electrons in each shell			Last shell complete? (yes or no)
			K	L	M	
1.	Sodium	**16**	**2**	**8**	**6**	**No**
2.	Carbon					
3.	Lithium					
4.	Sulphur					
5.	Argon					
6.	Aluminum					
7.	Hydrogen					
8.	Neon					
9.	Helium					
10.	Boron					

Atoms of specific elements have different kinds of matter. This difference is distinguishable by an atom's number of protons and electrons. This difference is represented by each individual atoms **atomic number**. The atomic number of an atom is the number of protons. Since protons make up the majority of mass of most atoms, the atomic number represents the number of protons. Atoms can also be differentiated by the atoms atomic mass. The atomic mass is measured in **atomic mass units (a.m.u.).** You can measure the atomic by the following information.

- Each proton is 1 a.m.u.
- Each neutron is 1 a.m.u.

Since electrons are very light, they are not included in the atomic mass. Therefore the atomic mass equals the total number of protons and neutrons within the nucleus. Lastly, some atoms that are alike have slightly different mass. This is because the number of neutrons can vary. Atoms that are of this type are called **isotopes**.



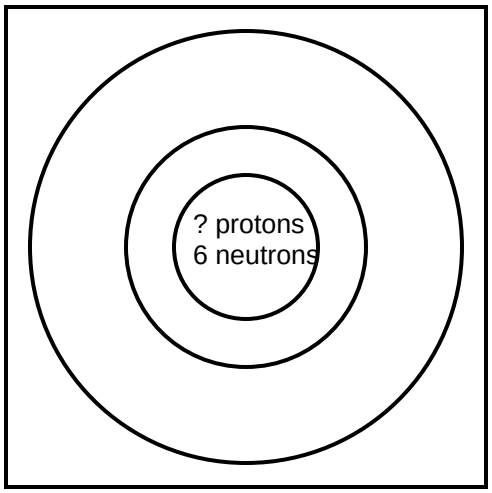
Activity 2:

Complete the following chart to determine the Atomic Mass: An example is given for the element iodine,

Name of element	Number of protons	Number of neutrons	Atomic mass
1. iodine (example)	**53**	**74**	**53 + 74 = 127**
2. potassium	**19**	**20**	
3. zinc	**30**	**35**	
4. hydrogen	**1**	**0**	
5. silver	**47**	**61**	
6. lead	**82**	**125**	
7. calcium	**20**	**20**	
8. sulphur	**16**	**16**	
9. gold	**79**	**118**	
10. cobalt	**27**	**32**	

Activity 3:

What can you find?



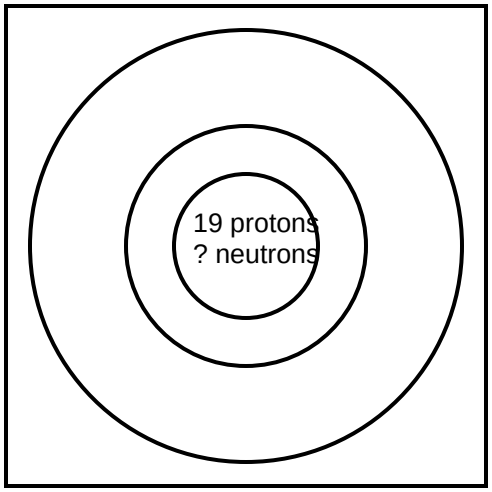
Remember the atomic number is the number of protons.

Atom has an **atomic mass of 11**

1. How many neutrons does this atom have? _____.

2. How many protons? _____.

3. What is the atomic number? _____.

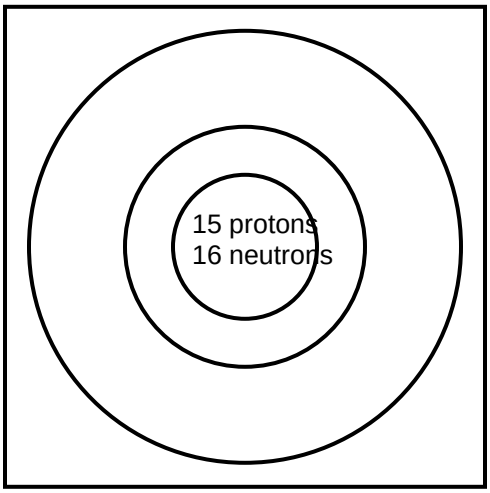


Atom has an **atomic mass of 39**

4. How many protons does this atom have? _____.

5. How many neutrons? _____.

6. What is the atomic number? _____.



7. How many protons does this atom have? _____.

8. How many neutrons? _____.

9. What is the atomic number? _____.

10. What is the atomic mass? _____.

You are given information in the chart below on individual elements. The given information has a direct relationship with the missing information, which allows you to determine the missing data. Complete the chart by filling in the missing information by using the given data. Use a periodic table to check your work.

	Atom of…	Protons	Neutrons	Atomic Mass	Electrons	Atomic Number
1.	Copper	29		64	29	
2.	Potassium	19	20			19
3.	Carbon		6	12		
4.	Nitrogen	7		14		
5.	Sodium			23	11	
6.	Oxygen			16		8
7.	Mercury	80		201		
8.	Nickel		31	59		
9.	Magnesium	12	12	24		
10.	Aluminum	13		27		

*** Helpful hint,**
Atoms naturally want to be neutral,

Atomic # = # protons = # electrons

Step 1: Starting with **hydrogen** and finishing with **argon**, complete the square for each element by filling in the atomic number, name, and atomic mass.

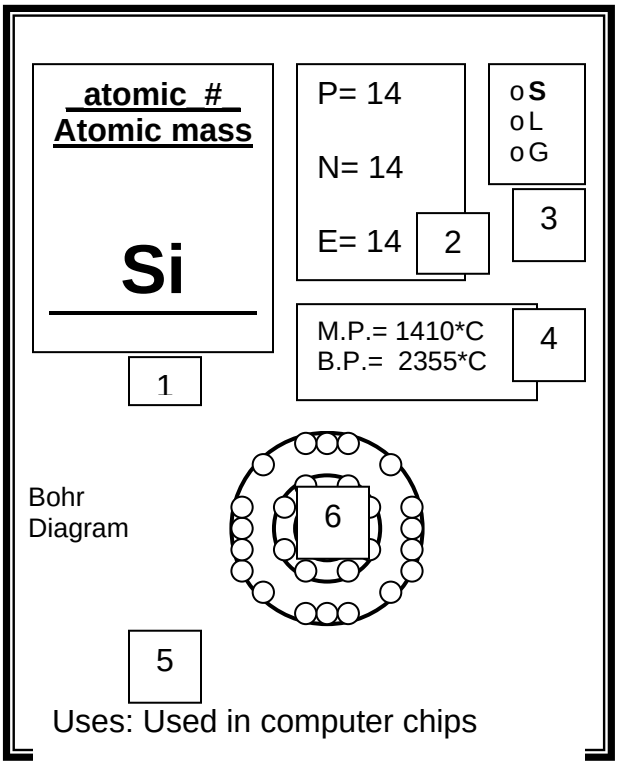
Step 2: Determine the number of protons, neutrons, and electrons in an atom of each element.

Step 3: Identify the element is a solid, liquid, or gas at room temperature.

Step 4: Give the melting (M.P.) and boiling points (B.P.) in degrees celsius.

Step 5: List one use for each element.

Step 6: Draw a Bohr diagram to show the arrangement of electrons and the number of valence electrons.



Step 7: Use the following colours to shade in the square for each element. You should ONLY colour the small square in the upper left-hand corner and not the entire box.

Green = Li and Na	Pink = O&S	Blue = Be and Mg	Purple = F & Cl
Orange = B and Al	Red = C & Si	Tan = N & P	Yellow = He, Ne, Ar

Step 8. Cut the cards apart and arrange ***according to atomic number*** in the pattern shown. Once you have the cards arranged in the correct order, glue them to a large sheet of construction paper.

1							2
3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18

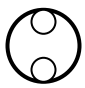
Assessment and Evaluation: Unit 1 Lesson 4

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



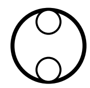
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



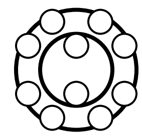
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



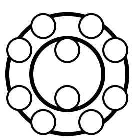
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



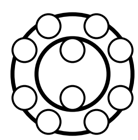
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



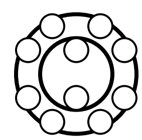
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



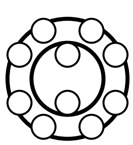
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



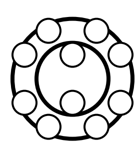
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



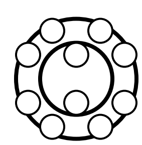
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



Uses:

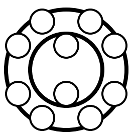
Assessment and Evaluation: Unit 1 Lesson 4

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



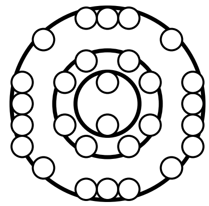
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



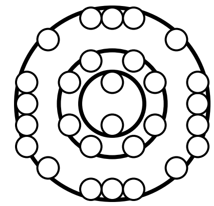
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



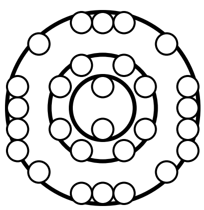
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



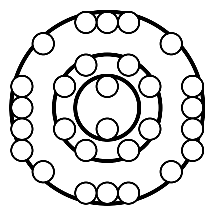
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



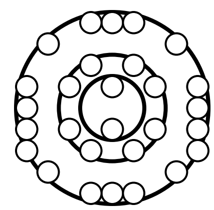
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



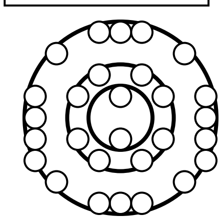
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



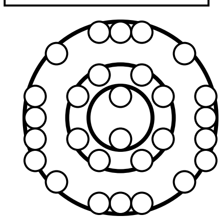
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



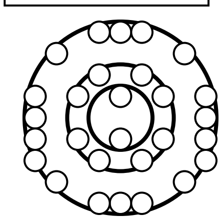
Uses:

P=____
N=____
E= ____

o S
o L
o G

M.P.= ________
B.P.= ________

Bohr Diagram



Uses:

Reflection Activity: Unit 1 Lesson 4

You have discovered elements form an alien planet, the following is the only information you have on each individual element. Using a Periodic Table and information given, match the alien element with earths. Place your answer in the space provided under each box the boxes.

A)

Atomic

Nano

P=____

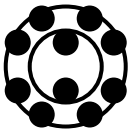
N=____

E= ____

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr Diagram



Uses:

B)

Atomic

Kypto

P=____

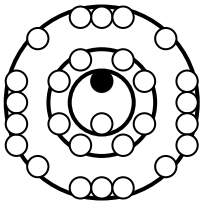
N=____

E= ____

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr Diagram



Uses:

C)

Atomic

Plasmo

P=____

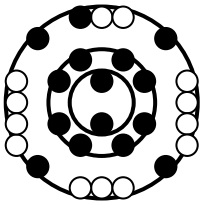
N=____

E= ____

o S
o L
o G

M.P.= _____
B.P.= _____

Bohr Diagram



Uses:

A)_____ B)_____ C) _____