Determine what elements are denoted by the following electron configuration:

[Kr]5s<sup>2</sup>4d<sup>10</sup>5p<sup>5</sup>

1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>4s<sup>2</sup>3d<sup>10</sup>

1s<sup>2</sup>2s<sup>2</sup>2p<sup>3</sup>

[Xe]6s<sup>1</sup>



### <u>Chemistry</u>

Identity- Protons

**Isotopes-** Neutron

Ions- Electron

## **Identity- Protons**

- Each element contains a unique positive charge in their nucleus.
- Key Concept 23: The number of protons in the nucleus of an atom identifies the element and is known as the element's atomic number.







#### Greek Philosophers (cont.)

Table <b>4.2</b>	Dalton's Atomic Theory
Scientist	Ideas
Dalton (1766–1844)	<ul> <li>Matter is composed of extremely small particles called atoms.</li> <li>Atoms are indivisible and indestructible.</li> <li>Atoms of a given element are identical in size, mass, and chemical properties.</li> <li>Atoms of a specific element are different from those of another element.</li> <li>Different atoms combine in simple whole-number ratios to form compounds.</li> <li>In a chemical reaction, atoms are separated, combined or rearranged.</li> </ul>

#### What were the errors in the Dalton's Atomic Theory?



- Isotopes containing more neutrons have a greater mass.
- Isotopes have the same chemical behavior.
- Key Concept 25: The atomic mass (mass number) is the sum of the protons and neutrons in the nucleus.



• Can you get the mass number for an atom from the periodic table?



 Key Concept 26: The average atomic mass of an element is the weighted average mass of all the natural isotopes of that element.



- The four isotopes of lead and its abundances
  - are: Pb-204, 1.37%

Pb-206, 26.26%

Pb-207, 20.82%

#### Pb-208, 51.55%

Calculate lead's approximate atomic mass.

 The relative abundance of each isotope is usually constant.













carbon-12 98.9% 6 protons 6 neutrons

carbon-13 1.1% 6 protons 7 neutrons carbon-14 <0.1% 6 protons 8 neutrons



Atomic Mass

Atomic Number

## Element X- Atomic Mass

#### What is this atom mass?



## Boron-11

#### Room # 169429





#### What is this atom's mass?



#### How many neutrons does this atom have?



What would this atom's mass be if it has 7 neutrons?



#### How many neutrons does this atom have?

## **Ion-Electron**

 Key Concept 28: An ion is an atom or bonded group of atoms with a positive or negative charge.

## Ion-Electron

- REVIEW
- Cation positively charged ion
- Anion negatively charged ion
- Polyatomic Ions

"Poly" = many "atomic" = atoms Ion = charged

 Polyatomic ion - many atoms bonded together having an overall charge

Look at your Periodic Table







#### What type of ion is this?

# 





#### What type of ion is this?







The Basics The Foundations The Building Blocks of Chemistry

Call It Whatever You Want They Are Must Knows

Bh

## You must be able to:

Read a periodic table and use to key to determine:



Understand isotope format: lithium-6 verse lithium-7 <sup>6</sup>Li <sup>7</sup>Li

Understand how to write ions: Na<sup>1+</sup> Fe<sup>2+</sup>

- 1. What is my name?
- 2. What is my atomic number?
- 3. What is my average atomic mass?

#### (Pick one of my isotopes on the left side of the card to answer 4-9).

- 4. What is the atomic mass of that particular atom?
- 5. How many protons do I have?
- 6. How many neutrons do I have?
- 7. How many electrons do I have if I am neutral?
- 8. What happens to me if I gain a



9. What happens to me if I lose a

a. p+ (I become \_\_\_\_\_.)

- b. n° (I become \_\_\_\_\_.)
- c. e- (I become \_\_\_\_\_.)

(Pick an ion of the right side of the card to answer question 10).

10. How many protons and electrons do I have?

## End of Lesson 5

## Happy Atoms

- Key Concept 29: A happy ATOM is an ATOM that has its orbitals (shell) full. In order to become full that atom must gain or lose electrons.
- Most atoms form compounds in order to be happy.

## What do you need to know?

- Determining the number of electrons is the most difficult.
- You need to be able to answer these type of questions when talking about elements.
  - How many electrons does a neutral atom of Ca have?
  - What is the most common ion Oxygen will form?
  - How many electrons does Br<sup>-1</sup> have?

## Review are you ready for PIQ?

- Draw Bohr model diagrams for the following elements:
  - Silicon

• For the following elements list the electron configuration.

-Krypton

Define- Electron Configuration

• For the following elements list the noble-gas notation electron configuration

-Lead

Define- Photo Atomic Emission
 Spectrum

• Ring of truth clip- 35:00 to 43:30

- How many electrons are in each orbital
  - $-S \rightarrow$  $-D \rightarrow$  $-P \rightarrow$  $-F \rightarrow$

 Draw a simple model of E. Rutherford atom and explain the important experiment or discoveries he made.  How do you correctly write an element in isotope format?

- How many protons and electrons are in the following lons
  - $-Cl^{-}$
  - Al+3

- Draw the Lewis dot structure for the following atoms:
  - helium
  - boron

## One question on 6B has not been addressed.....

2) Give an example of a model that could be used to show the size of an atom?



## End of Lesson 6

## March Madness





## Modeling the size of an atom

- The mass of an atom is concentrated in its nucleus—a small, dense sphere with a diameter about 1/100,000 that of the atom.
- How can we translate the dimensions of the nucleus and the atom to things we can see and understand?



## Modeling the size of an atom

- 2 volunteers to go to Table 1:
  - Using a tape measure, measure the circumference of a basketball in *centimeters using* significant figures.
- 2 volunteers go to Table 6:
  - Rearrange the formula for the circumference of a sphere (circumference =  $2\pi r$ ) to solve for the radius (r).
- Everyone in your lab notebooks: Use this equation to calculate the radius of the basketball in cm to three significant figures.

Key Concept 28: SHOW WORK

## Modeling the size of an atom

- Key Concept 28 cont....Imagine that the basketball represents the nucleus of an atom. Assuming that the radius of an atom is about 100,000 times *larger* than that of the nucleus, calculate the radius of an atom that would have a basketball as its nucleus. Record the radius in *kilometers* to three significant figures.
- Obtain a map of your city and draw a circle on the map to illustrate the size of a city "atom" compared to its basketball "nucleus," assuming that the basketball is located in your school building.



Name \_\_\_\_\_ Hour \_\_\_\_

#### **Thickness Measured in Atoms**

#### **Pre-lab** questions

In this activity you will use information learned from prior labs to accurately determine and compare the thickness of 2 sheets of aluminum foil (Reynold's Aluminum Foil vs. Reynold's Heavy-Duty Aluminum Foil). For obvious reasons the rulers used to measure the height of cube and cylinder in Unit 1 would not be an acceptable option.

1. Why would the use of a ruler not be effective to measure the height (thickness) of your foil?

Remember, the formula on how to calculate the volume of a cube is (volume = length x width x height). By rearrange this formula one could determine the height (thickness) of our foil, if they could somehow determine its volume.

2. Rearrange the volume equation to solve for height (thickness).

The length and width of your sample could accurately be obtained by measuring with a ruler and using significant figures. Then the only variable that would need to be determined was the volume of your sample.

3. In the Mass and Volume lab, some lab groups used water displacement to measure volume. Could this method of measurement have been used to find the volume of your foil? Explain.

## **Comparing Units of Volume**

 Key Concept 3: Volume measures the amount of space an object takes up, and is a derived SI unit.



<u>Key Concept 4: The</u> <u>volume of a cube is</u> <u>V=length x width x height</u>

#### **Significant Figures**

- Often, precision is limited by the tools available.
- Key Concept 7: The significant figures of a number are those digits that carry meaning contributing to its precision. When measuring significant figures include all known digits plus one estimated digit.



## Learning Check



#### What is the length of the wooden stick?



## **Ring of Truth Videos**

- <u>Noodles</u>
- Oil on water
- Gold leaf

## End of Unit 6