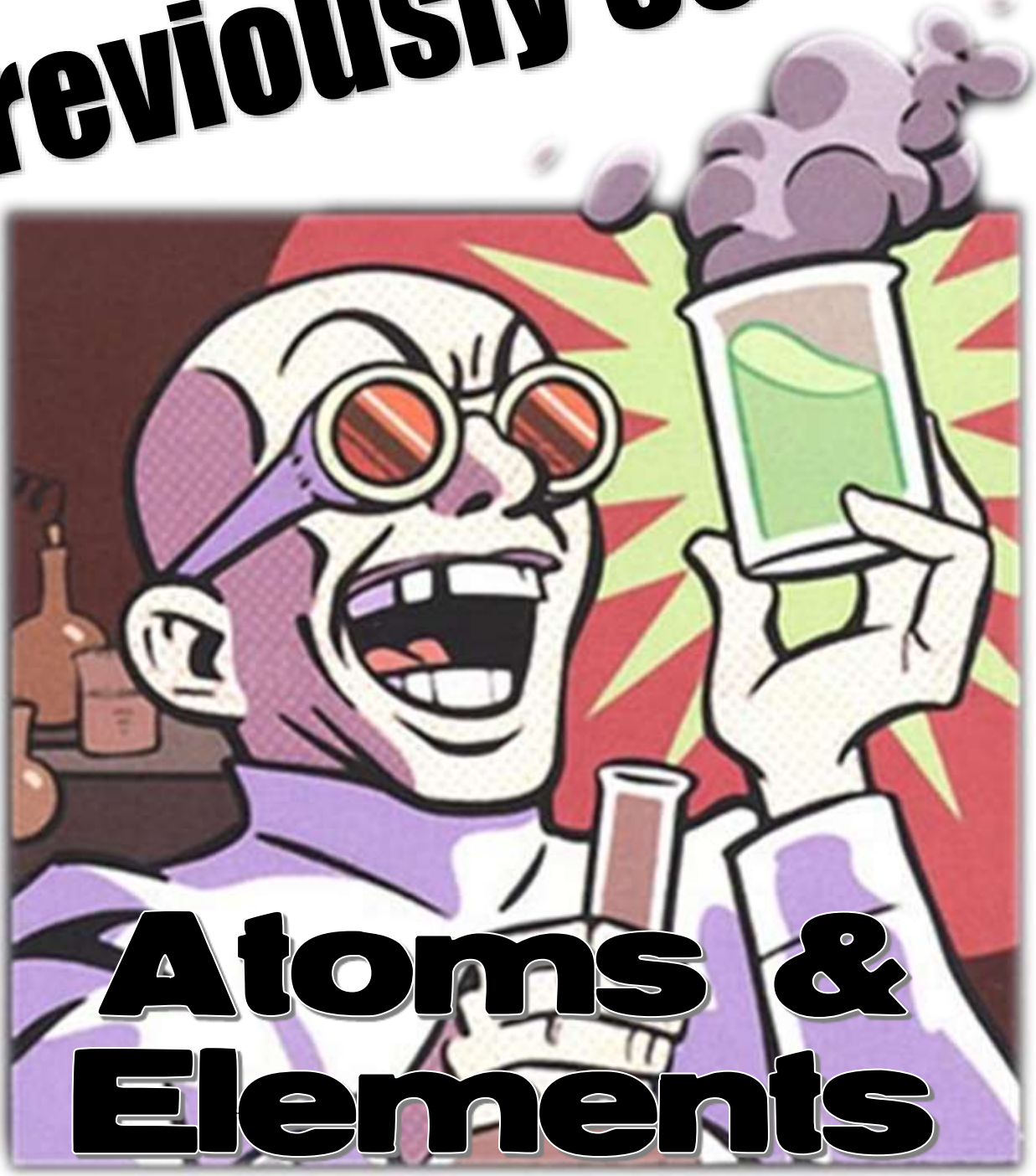
Previously Seen In



Atoms & Elements

Science 20F Introduction to Chemistry In Action

Review:

The Modern Atomic Theory

The Modern Atomic Theory

- The Modern Atomic Theory builds upon Bohr's Atomic Model
- The Atom is made up of 3 subatomic particles
  1. Protons
  2. Electrons
  3. Neutrons

Protons

- A subatomic particle found within the nucleus of an atom
- **Have a positive charge of +1**
- **Have a mass of 1 atomic mass unit** (amu)

Electrons

- A subatomic particle that travels outside of the nucleus
- **Have a negative charge of – 1**
- **Have a very small mass (almost zero)**

Neutrons

- A subatomic particle located in the nucleus of an atom
- **Have no charge**
- **Have a mass of 1 atomic mass unit (amu)**

The Atomic Number

- A concept developed by Henry Moseley
- **Tells us the number of protons in the nucleus of an atom**
- Can be used to identify any known element because every element has a unique atomic number
  (ex) Carbon has an atomic number of 6, Oxygen has an atomic number of 8, Copper has an atomic number of 29
- **In its natural state an atom has no charge** so the number of protons (positive charges) must be equal to the number of electrons (negative charges)
- **Also tells us the number of electrons in an atom**

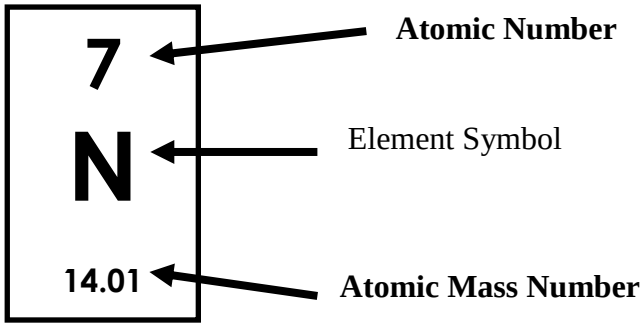
The Atomic Mass Number

- All atoms have a mass
- Tells us the mass of the nucleus of an atom
  Protons + Neutrons
- **# of Neutrons = Atomic Mass Number – Atomic Number**
- **Note**: Neutrons are slightly bigger than protons so the atomic mass number is usually a decimal. **Round the atomic mass number to the nearest whole number** before making any calculations

Review:

The Modern Atomic Theory

A Diagram



Review:

About the Periodic Table

Columns in the Periodic Table

- The periodic table arranges the elements in columns (vertically).
- **A single column is a group or family.**
- The Periodic Table has 18 groups or families
- A family contains elements that have the similar but not identical properties.
- Members of the same family tend to react the same way with other elements and are considered to have similar chemical properties

Hydrogen

- Hydrogen is a special case
- **Hydrogen is a halogen**
- However, since Hydrogen has only one valence electron, it often reacts like an Alkali Metal
- Hydrogen is the most reactive known element

Alkali Metals

- The Alkali Metal Family occupies the first column on the left of the periodic table.
- It includes lithium (Li), sodium (Na), potassium (K), etc.
- Each element has one electron in its outer orbit (one valence electron)
- These metals are the most reactive metals in the periodic table because of the single electron in the outer orbit

In their natural state, alkali metals are always found combined with other substances because of their reactivity. The most common element in the family is sodium (Na) which is found all over the earth in compounds like salt (sodium chloride NaCl)

Alkali Earth Metals

- The alkaline earth metals family is located in the second column of the periodic table.
- Alkaline earth metals are less reactive than the alkali metal family. Their lesser activity arises from having 2 electrons in the outer orbit.

Chalcogens

- The Chalcogen family is located in the 16^{th} column of the periodic table.
- The Chalcogen family is slightly less reactive than the halogen family since they require 2 electrons to complete their outer orbit.

Review:

About the Periodic Table

Halogens

- The halogen family is the 17th family in the periodic table.
- Halogens are one electron away from filling their outermost orbit.
- The halogens are the most reactive non-metals in the periodic table.
- In their natural state, the highly reactive halogens are found combined with other elements, for example NaCl

Noble Gases

- The noble gas family is the 18th family on the right of the periodic table.
- They are called noble gases (and sometimes inert gases) because they generally do not form compounds with other elements.
- They are unreactive because their outer orbits are completely filled with electrons.
- No natural compounds formed from these gases exist.

Rows in the Periodic Table

- Rows in the Periodic Table are called **periods**
- The periodic table has 7 periods
- Elements in periods do not demonstrate similar properties as they do in families

Periods do show trends:

1. As you move from left to right along a period the elements change from metals to non-metals
2. The period an element belongs to tells us how many electron shells the element has
   (ex) Carbon (C) is in the 2nd Period and has 2 electron shells

Review:

The Lewis Dot Diagram

Lewis Dot Diagrams (or Electron Dot Diagrams)

- **Diagrams in which dots are placed around the chemical symbol of an elements to illustrate the valence electrons**
    1. each dot represents one valence electron
    2. the element's symbol represents the core of the atom (the nucleus and all the inner electrons)

example:

Boron

-**3 valence electrons**

-2 shells

-5 protons

-6 neutrons

- A convenient, shorthand method to represent an element and its valence electrons
- Not as "bulky" as a Bohr Diagram
- Provides more information about the electron structures of an atom which allow us to predict various chemical properties

In the space below, draw Lewis Dot diagrams for the elements of the second period if the periodic table

In the space below draw Lewis Dot diagrams for following families:

Alkali Metals:

Review:

The Lewis Dot Diagram

Alkali Earth Metals:

Chalcogens:

Halogens:

Noble Gases:

What patterns do you notice?

Science 20F -Previously Seen In Atoms and Elements **REVIEW QUESTIONS**
Mr. Lloyd
Kelvin High School

Question #1: Atomic Structure

Complete the following table:

Element	Element Symbol	Atomic Number	Number of Protons	Period Number	Number of Shells	Number of Valence Electrons	Atomic Mass
Aluminum							
Silicon							
Calcium							
	Mg						
	Be						
		19					
		10					
						7	***35amu***
				3		***6***	
						2	***137amu***

Question #2: More Atomic Structure

Complete the following table:

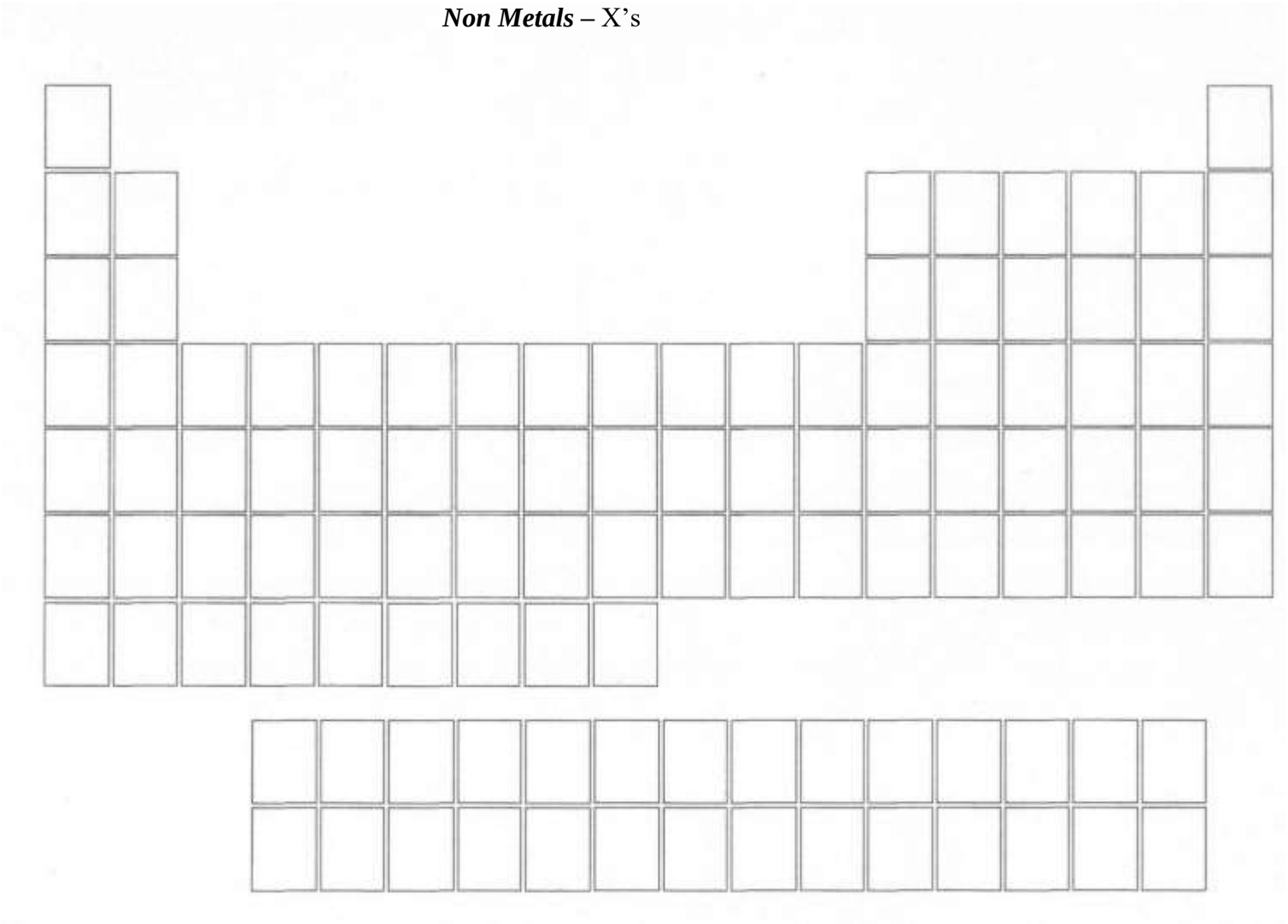
Element Name	Bohr Diagram	Lewis Dot Diagram
Aluminum		
Argon		
Calcium		

Science 20F -Previously Seen In Atoms and Elements **REVIEW QUESTIONS**
Mr. Lloyd
Kelvin High School

Question #2: The Periodic Table

Identify the following items on the blank periodic table below. You **MUST** identify each item using the colour specified:

Halogens – Blue
Alkali Metals – Silver/Grey
Transition Metals – Yellow
Noble Gasses – Green
Staircase – Black
Chalcogens – Red
Alkali Earth Metals – Brown
Metals – M's
Non Metals – X's



Question #4: More Periodic Table

In the space below, identify and describe **FIVE** trends (patterns) that appear on the Periodic Table:

Question #5: Properties

*A **Physical Property** is a property of an object that can be observed and measured without changing the chemical identity of the substance*

(a) In the space below, identify and describe **TEN** Physical Properties

*A **Chemical Property** is a property of an object that describes how a substance behaves (reacts) in the presence of other substances*

(b) In the space below, identify and describe **FIVE** Chemical Properties

Science 20F -Previously Seen In Atoms and Elements **REVIEW QUESTIONS**
Mr. Lloyd
Kelvin High School

Periodic Table of The Elements