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### Introduction to the atom

1. What are the 3 particles that make up an atom?
2. Which two particles make up the nucleus?
3. Sal Khan mentions that the term "orbit" is not correct when describing an electron. Why is this?
4. What is the charge of each subatomic particle?
5. The number of \_\_\_\_\_ tells us what an atom is (e.g. neon or carbon)
6. A neutral carbon atom with a mass number of 12 has \_\_\_\_\_ proton, \_\_\_\_\_ neutrons, and \_\_\_\_\_ electrons.
7. Why are the number of electrons not included in the mass number?
8. What is an isotope?

### Orbitals

1. What is the name of the model of the atom that resembles planets rotating around the sun?
2. True or False: Electrons in orbitals further away from the nucleus have more energy.
3. What does it mean to "excite" an electron?
4. True or False: Electrons close to the nucleus are easier to "pluck off" than ones further away.
5. True or False: The 2<sup>nd</sup> period corresponds with the 2<sup>nd</sup> shell of an atom.

### More on Orbitals and Electron Configurations

1. Match the shape with the type of orbital: p, s, sphere, dumbbell
2. How many electrons does nitrogen have in the 2p energy state?
3. How many electrons can go into the 2p energy state?
4. Order these orbitals by increasing energy (lowest energy first): 2p, 3s, 4s, 3p, 2s, 1s, 4p

### Electron Configurations 2

1. How many electrons does nickel have?
2. How many electrons does nickel have in the 2p subshell?
3. How many electrons does nickel have in the 3d subshell?
4. How many electrons does nickel have in the 5s subshell?
5. The highest energy electron in zirconium is in which subshell?

### Valence Electrons

1. What is a valence electron?
2. Using the Lewis symbol representation that Sal introduces, why does hydrogen only have one dot?
3. What atom in the 3<sup>rd</sup> row only has one dot?
4. How many valence electrons does carbon have?
5. What element in the 5<sup>th</sup> row has 4 valence electrons?
6. Why does iron (Fe) only have 2 valence electrons?

### Empirical, molecular, and structural formulas

1. Generally define each of the following:
  - a. Empirical Formula
  - b. Molecular Formula
  - c. Structural Formula

## Molecular Mass

1. How is molecular mass calculated?
2. What is the molecular mass of water?

## Balancing Chemical Equations

1. What is a chemical equation?
2. Why do chemical equations need to be balanced?
3. In the example that Sal goes through with Aluminum and Oxygen, what are the coefficients in that balanced equation for each reactant and product?

## Dot Structures I: Single Bonds

1. Why does carbon have four "dots"?
2. How many "dots" does hydrogen have?
3. How many electrons does carbon "want to have"?
4. For the molecule  $\text{CH}_3\text{NH}_2$ , determine the number of bonds on:
  - a. Nitrogen
  - b. Carbon
5. For the molecule  $\text{CH}_3\text{OH}$ , determine the number of bonds on:
  - a. Carbon
  - b. Oxygen

## Dot Structures II: Multiple Bonds

1. How many bonds are formed between the two carbon atoms in  $\text{C}_2\text{H}_4$ ?
2. Which atoms are joined by a double bond in the molecule  $\text{CH}_2\text{O}$ ?
3. How many bonds are formed between the two carbon atoms in  $\text{C}_2\text{H}_2$ ?