

Chapter 18:4

Groups vs. Periods (and what that means); Valence Electrons; Atomic Mass

Groups (columns) – certain elements have similar properties. We call these groups. On the periodic table groups = column (up and down). You will use mostly groups 1A – 18 A. Hydrogen is in the same group as Sodium.

Periods (rows) – elements that have electrons in the same electron levels are in the same row or period on the Periodic Table. Periods go left and right. Helium is in the same period as Hydrogen.

Valence Electrons – these are the outermost electrons in an atom. Each group (column) has the same number of valence electrons. The number of valence electrons is the same as the LAST DIGIT in the group number (at least for the elements we will use). Hydrogen, Lithium, and Sodium are all in Group (Column) 1A and have 1 valence electron. Fluorine and Chlorine are in Group 17A and have 7 valence electrons.

Octet Rule – Atoms are more stable that have a full shell of electrons. For most atoms (except H and He) this number is 8 (octet = 8). Atoms want to have 8 valence electrons. “If I 8, I full.” Only Group 18A have a full octet (8 valence electrons) naturally. All other elements will lose, gain, or share to reach 8 electrons.

Molecular Mass –

Add up the masses of the different atoms.

Ex. – $\text{NaCl} = \text{Na} + \text{Cl} = (22.99 + 35.45) = 58.44 \text{ a.m.u}$

If there are multiple atoms of an element, multiple (or add up each atom).

Ex. – $\text{H}_2\text{O} = \text{H}_2 + \text{O} = (2 \times 1.01) + (16.00) = 18.02 \text{ a.m.u.}$

Chapter 18:3

Making Atoms –

How to find the number of protons (= atomic #)

How to find the number of neutrons (= Mass # - atomic #)

How to find the number of electrons (= # of protons)

How to place the electrons in energy levels (fill up closest levels first)

Did atom boards – moved them toward valence electrons.

The row (period) an element is in equals the electron level the outer electrons are in.

If you are in the right most column of the Periodic Table (He, Ne, Ar...) then you have a full outer shell of electrons.

The column (group) an element is in tells you how many outer electrons are in the outer shell. These outer electrons are called valence electrons.

H, Li, Na are in the first column (group) so they have 1 electron in the outer level.

O is in group (column) 16, so it has 6 outer electrons.

Chapter 18:2

History of the Atom Theory -

Democritus, Greek Philosopher (circa 460-370 BC) – matter is made up of atoms (atomos – indivisible).

John Dalton (1808) – published a detailed atomic theory based on work with gases.

Each element made up of small particles called. Atoms.

All atoms of a particular element are identical.

Atoms of different elements have different properties, including mass and reactivity.

Atoms are not changed by chemical reactions, just rearranged.

Compounds are formed when atoms of different elements combine.

Compounds are defined by the number, type (element) and proportion of atoms. (hard sphere)

Thompson (late 19 century) – figured out that atoms have different particles, including electrons. Though electrons were like raisins stuck inside a roll.

Rutherford (early 20th century) experiment (atom is mostly empty space) – do a quick demo with boxes and a pen or something (with something inside).

Niels Bohr (early 20th century) – electrons are in fixed orbits. – photons.

How to read molecular symbol notation (what the subscripts and coefficients mean).

Magnets? - find need to find a substitute for the neutron.

Repeat about - *Isotopes – an element with a different number of neutrons. Hydrogen normally has no neutrons. Its atomic number is 1 and its mass number is 1. Deuterium, and isotope of Hydrogen, has 1 neutron, so its mass number is 2 (1 proton and 1 neutron).*

Be able to find number of neutrons from the mass number.

Chapter 18:1 – covered

*Everything is made of **atoms**. Atoms are the smallest part of matter.*

*Atoms combine into **molecules**. O is an atom; O₂ is a molecule: both are oxygen.*

*If two different atoms combine they make **compounds**: H₂O is a compound; O₂ is an element still, but it is a molecule of oxygen not just an atom.*

Structure of the atom -

*3 **subatomic particles** that make up the atom:*

Electrons; Protons; Neutrons

*One model of the atom looks like a solar system, with the protons and neutrons in the center of the atom, the **nucleus**. The **electrons** are the planets spinning around the nucleus.*

Nucleus – center of atom; contains protons and neutrons.

Protons – positively charged particles; in the nucleus; determine what element an atom is.

Neutrons – neutral particle in the nucleus; gives mass to the atom, but not charge.

Electrons – negatively charged particles; outside the nucleus; can be gained or lost to and from other atoms.

Reading the Periodic Table of Elements:

Chemical Symbol – one or two letters that stand for an element.

Atomic Number – the number of protons in an atom. Each element has a different atomic number.

Atomic mass – how much mass an atom has. Units are “a.m.u.” for “atomic mass units”

Mass Number – total number of protons and neutrons in the nucleus. This can change for an element.

Isotopes – an element with a different number of neutrons. Hydrogen normally has no neutrons.

Its atomic number is 1 and its mass number is 1. Deuterium, and isotope of Hydrogen, has 1 neutron, so its mass number is 2 (1 proton and 1 neutron).