

- Study Questions: FUNDAMENTALS OF CHEMISTRY (Ch. 2)
- Explain what an atom is.
 - Smallest unit of matter that still retains the properties of an element
- What are the three basic subatomic particles that they consist of, and how are these arranged relative to each other? Give the charge and mass for each of these three particles.
 - Protons positive and mass 1
 - Neutron neutral charge and mass 1
 - Electron negative charge and mass 0
- What are elements and what characteristic makes one distinct from another?
 - Kinds of atoms, substance that cant be broken down to other substances by chemical reaction, distinction by atomic number/ number of protons
- What are compounds?
 - Substances consisting of two or more different elements combined in a fixed ratio
- Which six elements make up nearly all the mass of living things?
 - Hydrogen(1), Carbon(6), Nitrogen (7), Oxygen(8), Phosphate (15), Sulfur (16)
- What is the difference between atomic number and atomic mass?
 - Number is just the number of protons and mass is number of protons and neutrons
- What is an isotope?
 - Alternative forms of an element that differ in number of neutrons and therefore differ in their mass
- Explain what radioactivity is.
 - Unstable atom; nucleus breaks down emitting particles/energy
- What is meant by the half-life of a radioactive element? Explain, using an example.
 - Amount of time it takes for half of the atoms to break down
- Which kind of subatomic particle is most directly responsible for an element's chemical properties?
 - electrons
- What terms define the possible locations of these particles?

- o Orbitals, shells, valences
- How many can fit in the first shell of an atom?
 - o 2 electrons
- How many in the outer shell?
 - o 8 electrons
- What principle determines how atoms will interact with each other to form bonds?
 - o Chemical bond
- How many bonds are typically formed by an atom of hydrogen? Oxygen? Nitrogen? Carbon? Explain why.
 - o Hydrogen 1 bond
 - o Oxygen 2 bonds
 - o Nitrogen 3 bonds
 - o Carbon 4 bonds
- What are double and triple bonds? Give an example of each, and explain why they lead to a stable molecule in those cases.
 - o Double bonds: two pairs of electrons shared carbon dioxide CO_2
 - o Triple bonds: three pairs of electrons shared molecular nitrogen
- What is a molecule?
 - o Two or more atoms held together by covalent bonds
- Explain the difference between covalent and ionic bonds.
 - o Ionic bond is a complete electron transfer between oppositely charged ions while covalent is where atoms share pairs of valence electrons
- What does it mean to say a covalent bond is polar or non-polar? Give examples of polar and non-polar covalent bonds.
 - o Nonpolar electrons are shared equally ex H_2
 - o Polar electrons are not shared equally ex H_2O
- Is a molecule held together by polar covalent bonds always a polar molecule? Explain, giving an example.
 - o No because different elements differ in their affinity for electrons H_2O

- What is electronegativity? Explain how it affects whether covalent bonds are polar or non-polar?
 - o An atoms relative affinity for electrons
 - o The more electronegative an atom the more strongly it pulls shared electrons towards itself
- What are the *relative* electronegativities of the four most common atoms in organic molecules (C, H, O, N)?
 - o O 3.5 N 3 C 2.5 H 2.2
- In covalent pairings among them, which are polar and which non-polar ?
 - o
- Explain what hydrogen bonding is and where it occurs.
 - o Attraction between relatively negative and relatively positive ends of separate polar molecules
- Describe the relationship between the polarity of covalent bonding and hydrogen bonding.
 - o Allows the hydrogen to be attracted to a different electronegative atom nearby.
- What are van der waals forces? Between what kind of molecules do they occur? Give one example of their biological importance.
 - o Weak forces of attraction that are constantly moving electrons which form momentary imbalances in charge that cause attraction, occur between nonpolar molecules. Ex the reason why a gecko lizard can walk straight up a wall