Millimoles, mEq
Chapter 12 reading
Chapter 9 (prerequiset to understand the parenteral calculations

Objectives:

Students should be able to

- Calculate the concentration in millimols, milliequivalents & milliosmols.
- Calculate the electrolyte weight required to prepare a solution with a desired millimols, milliequivalents or milliosmols.
- Convert from mg% to millimols and milliosmols and vice versa

Reading

In addition to the section below, the students are responsible for the following pages from the Ansel Pharmaceutical Calculations book
195-210

Ask yourself why and how I am doing these calculations

The next section is the text associated with the online minilecture

What is a Mole?

A mole is the molecular weight (M Wt) of a substance in grams.
Mol= Weight in grams / M Wt
mMol= Weight in mg / M Wt

Can you solve the following?

How many millimoles of monobasic sodium phosphate (M Wt 138) are present in 100 grams substance?
How many milligrams would 1 mmol of monobasic sodium phosphate weigh?

Milliequivalent

- Electrolytes are very essential to the body and if lost, they have to be replaced.
- *Milliequivalent (mEq)* is a common way, in the USA, of expressing the required concentration of electrolytes.

How to calculate the milliequivalent?

- Equivalent = mols x absolute value of the valence.
- Milliequivalent is more used than Equivalent.
- 1000 mEq = 1 equivalent
- Valence = sum of **<u>either</u>** the positive or negative charges.

What is the valence of each of the following?
$CaCO_3$, $CaCl_2$
How many equivalents of Na^+ are produces by dissolving 1.5 mol of Na_2SO_4 in water?

Osmolarity

- As mentioned before the osmotic pressure is important for biological processes that involve diffusion of solutes or the transfer of fluid through semi-permeable membrane.
- The osmolarity of the parenteral solution, and osmotic diuretics is essential.
- Osmotic pressure depends on the number of solute particles (molecules or ions).
- Osmol (Osm) the weight in grams, of a solute osmotically equivalent to one gram-molecular weight of an ideally behaving **nonelectrolyte**.
- For nonelectrolyte 1 Osm = 1mol
- 1 mOsm = 1mmol
- For **Complete ionized solute**
    - The # of particles = number or resulting ions
    - **Complete ionized solute**
- $KCl = K^+ + Cl^-$
    - mOsm= (<u>wt of substance mg</u>)x # of species Mwt
    - 1 mol of KCl ionizes to 1 mol of K^+ + 1 mol of Cl^-
    - So 74.5 grams of KCl is **1 mol** but **2 Osm**.
- Water of hydration does not contribute to the number of particles.
- How many mg are equivalent to 7 mOsm?
- $CaCl_2.2H_2O = Ca^{2+} + 2Cl^- + 2\ H_2O$
- MWt = 147

- **Osmolarity and Osmolality**
- 2 common ways of expressing Osmol **<u>concentration</u>** are osmolarity and osmolality.
- Osmolarity = # of Osm/ L of solution
- Osmolality = # of Osm/ Kg of water
- At very diluted solutions
    - osmolarity = osmolality