

# WATER TREATMENT SKAA 2912

**OPENCOURSEWARE** 

#### WATER QUALITY PARAMETERS (Measurement Units)

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# Introduction

- The water quality parameters can be divided into three categories:-
  - Physical parameter
  - Chemical parameter
  - Biological parameter





# **Physical Parameters**

- Solids
- Turbidity
- Color
- Absorption/Transmittance
- Taste and Odor
- Temperature
- Conductivity





# **Chemical Parameters**

- pH
- Alkalinity
- Hardness
- Organic constituents
- Inorganic constituents
  ➢Non-metallic
  ➢Metallic
- Disinfection by-products





# **Biological Parameters**

#### • Pathogenic organisms

- Bacteria
- Viruses
- Protozoa
- Cyanobacteria

#### Indicator organisms

- Coliform bacteria
- Enterococcus
- Coliphage
- Other fecal indicator organisms
- Heterotrophic bacteria





## Introduction

 Water quality (WQ) parameters are used as a gauge to develop good potable drinking water, where the quality of a tested water is illustrated
 QUALITATIVELY and QUANTITATIVELY.





### Measurement Units (Concentrations)

- Concentrations are normally used to quantitatively measure physical or chemical parameters
- Two types of measurement units are employed:
  - Liquids:

Mass/Volume (e.g. mg/L, µg/L, mol/L or Molarity (M))

- Solids:

Mass/Mass units (e.g. g/g, mg/kg, µg/kg)





### Measurement Units (Unit conversion)

• Conversion mg/L  $\rightarrow$  parts per million (ppm)

 $1\frac{\text{mg}}{\text{L}} = \frac{1 \text{ mg}}{1000 \text{ g solution}} = \frac{1 \text{ mg}}{10^6 \text{ mg solution}} = 1 \text{ ppm}$ 

- What is the unit for:
  - Parts per billion (ppb)?
  - Parts per trillion (ppt)?





- Equivalents per liter (eq/L) or milliequivalents per liter (meq/L)
  - Used for measurement which involves the combination of several different elements
  - Three cases use eq/L:
    - a. salt ions: one equivalent is one mole of electric charge (without regard to sign)
    - b. oxidation-reduction reactions: one equivalent is one mole of electrons (e<sup>-</sup>)
    - c. Acids & bases: one equivalent is one mole of H<sup>+</sup>





- Converting mg/L to meq/L
  - Based on equation

$$\frac{\text{meq}}{\text{L}} = \text{concentration}\left(\frac{\text{mg}}{\text{L}}\right) \times \frac{1}{\text{Equivalent weight}}$$

where

Equivalent weight = 
$$\frac{\text{Atomic or Molecular Weight}}{|\text{Valence}|}$$





To convert mg/L → meq/L, 3 steps conversion involved:-

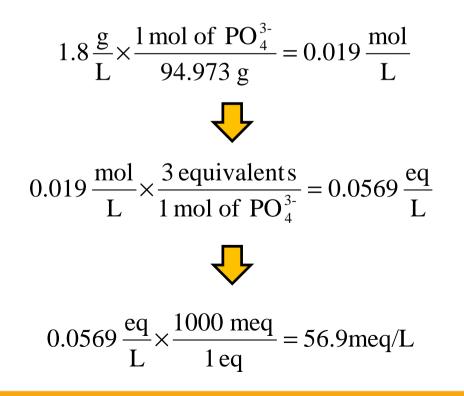






#### Example:

Convert 1.8 g/L of phosphate ion (PO<sub>4</sub><sup>3-</sup>) into meq/L. (MW PO<sub>4</sub><sup>3-</sup> = 94.973 g)







#### Practice (Let's do it the reverse way!)

Convert 4 meq/mL of calcium chloride dihydrate into g/L (CaCl<sub>2</sub>.2H<sub>2</sub>O: MW = 147)

Ans: 294 g/L





### Measurement Units (Interconversion)

- Species concentrations represented by a single element
- Only applicable for species that can be interconverted chemically or biologically
- Example: Nitrogen, phosphorus, sulfur





## Measurement Units (Interconversion)

#### Example:

A water sample contains 1.4 mg  $NO_2^{-}-N/L$ .

a.What is the concentration of nitrite ion in the water sample? Ans: 4.6 mg NO<sub>2</sub><sup>-</sup>/L

a. If all nitrite ion is converted to nitrate, calculate the concentration of nitrate ion in the water sample Ans: 6.2 mg NO<sub>3</sub>-/L





## References

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