

Spring 2020

# THE CHEMISTRY OF NATURAL WATERS – OXIDATION/REDUCTION CHEMISTRY IN NATURAL WATERS

## 1. CONCENTRATION UNITS OF WATER CHEMISTRY

- A. For gases, the “parts-per” scale represented a mole fraction. In water, the “parts-per” scale represents a mass fraction.
  - i. Do Problem 10-1 on page 412.

## 2. SOLUBILITY OF GASES

- A. Solubility of gases is governed by Henry’s Law.
  - i. Define Henry’s Law
  - ii. How does solubility of a gas vary relative to temperature of the liquid?

## 3. DISSOLVED OXYGEN

- A. What is the most important oxidizing agent in natural waters?
- B. Write the balanced half reaction for oxygen in
  - i. Acidic solution
  - ii. Basic solution
- C. Write the equilibrium expression for dissolved oxygen at 25°C.
  - i.  $K_H = ?$
- D. Do Problems 10-2 and 10-3 on page 414.

## 4. OXYGEN DEMAND: BIOLOGICAL

- A. Define biological oxygen demand (BOD).
- B. Do Problems 10-4 and 10-5 on page 415.

## 5. OXYGEN DEMAND: CHEMICAL

- A. Define chemical oxygen demand (COD).
- B. Do problem 10-7 on page 417.
- C. What is the general relationship between COD and BOD?
- D. In regard to the amount of organic substance in natural water:
  - i. What is TOC?
  - ii. What is DOC?

## 6. THE PE SCALE

- A. Define low pE.
- B. Define high pE.
- C. What is the relationship between oxygen availability and pE?
- D. Define aerobic and anaerobic.
  - i. Is pE generally high or low under:
    - 1. *Aerobic conditions?*
    - 2. *Anaerobic conditions?*
- E. Where in a body of water might you encounter:
  - i. Aerobic conditions?
  - ii. Anaerobic conditions?
- F. What does it mean when a body of water is stratified?
- G. In Figure 10-5 on page 429, what form of nitrogen would be available at a neutral pH and
  - i. aerobic conditions? Explain.
  - ii. anaerobic conditions?