

Aquatics

Nebraska Department of Water, Energy and Environment (DWEE)

Did you know that two atoms of hydrogen plus one atom of oxygen produces a molecule of water or H₂O? Wow!

It is amazing that zillions of these tiny water molecules can fill up a puddle, pond, lake, river, and all the oceans of the world. Can you believe that something so small is essential for human and animal survival?

Here in Nebraska...

- Clean water is one of Nebraska's most valuable resources.
- Water provides opportunities for many different uses, such as agriculture, industry, recreation, fish, wildlife, and human consumption.
- The High Plains Aquifer System underlies about 85% of Nebraska and supplies 95% of all groundwater used here.
- Nebraska's groundwater provides 82% of the state with drinking water.
- Due to concerns about surface and groundwater quality, it is imperative for people to understand the processes which affect our water system. Knowledge of physical, chemical, and biological interactions will help students understand that there is a "whole world" of water management problems which professionals address daily.

Objective 1: Physical and Chemical Properties

- Understanding of the physical and chemical attributes of water including: Density, composition, physical phase, dissolved oxygen, salinity, alkalinity, temperature, pH, specific conductance, temperature, turbidity, hardness and suspended sediment. Density, composition, physical phase, dissolved oxygen, salinity, alkalinity, temperature, pH, specific conductance, temperature, turbidity, hardness and suspended sediment
- What are the two primary nutrients that affect water quality?
- Describe two methods of measuring dissolved oxygen in a water sample.
- Explain what specific characteristics of water make it possible for aquatic species to survive when a lake freezes over.
- What are the biological indicator species used for? List two types of these organisms.

Sample Question

Alkalinity is a measure of:

- a. The concentration of nutrient in water.
- b. The acidity of water.
- c. The buffering capacity of water.
- d. The concentration of dissolved salts in water.

Reference Material

- Handbook of Common Methods in Limnology, Owen T. Lind.
- [Common Water Measurements](#)
- [Basics of Groundwater Hydrology](#)

Objective 2: Point and Non-Point Source Pollution

Principles to Know:

- Identify types of urban non-point source pollution and their causes.
- Differentiate between non-point and point source pollution and know the different sources, consequences, management and legislation affecting each.
- Understand local watersheds impact in the problem.
- Determine the impacts on our natural resources.

Sample Questions:

1. True or False – Nonpoint source pollution refers to agriculture and not to any urban activities.
2. Section 319 of the Clean Water Act (CWA) is significant because, unlike the rest of the CWA, it addresses:
 - a) degradation of wetlands
 - b) factory point source discharge
 - c) nonpoint source pollution
 - d) waste water system discharge
3. Which of the following conservation practices have proven effective at reducing runoff from agricultural fields grassed waterways
 - b) terraces
 - c) conservation tillage
 - d) field borders or filter strips
 - e) all of the above

Reference Materials:

[U.S. Environmental Protection Agency \(EPA\) Laws](#)

[U.S. Environmental Protection Agency Non-Point Source Pollution](#)

Objective 3: Watershed

Identify what a watershed is and be able to follow the hydrologic cycle through a watershed.

Sample Questions:

- 1) What is the process by which moisture is added to the atmosphere?
 - a. evaporation
 - b. infiltration
 - c. condensation
 - d. precipitation

- 2) Evaporation from soils, plant surfaces, and water bodies, together with water losses through plant leaves, are known collectively as
 - a. evaporation
 - b. precipitation
 - c. evapotranspiration
 - d. transpiration

Reference Material

[National Oceanic and Atmospheric Administration \(NOAA\) Water Cycle](#)

Objective 4: Water Resources

- Understand the significance of Nebraska's water resources (Sandhill lakes, groundwater, wetlands) how they are classified, used, and defining characteristics they possess.
- Identify the positive and negative conditions for Nebraska lakes and aquatic species. This means knowing beneficial habitat for certain species and understanding the relationship among species, as well as conditions which threaten those relationships.
- Know the distinction between saline and alkaline wetlands.
- Understand the differences between Oligotrophic and Eutrophic lakes.

Sample Questions:

1. The soils found in wetlands which help in their designation are:
 - a. clay soils
 - b. hydric soils
 - c. sandy soils
 - d. wet soils

2. True or False – The Ogallala Aquifer is cavernous lakes and flows in underground rivers.

Reference Materials

[Nebraska Game & Parks Commission Wetlands of Nebraska](#)

[Nebraska Department of Water, Energy, and Environment Surface Water](#)

[Nebraska Department of Water, Energy, and Environment Water Planning](#)

Objective 5: Aquifers & Groundwater

- Explain aquifer characteristics such as permeability, hydraulic conductivity, transmissivity, etc.
- Define groundwater quality risk factors (what geological or chemical conditions make groundwater vulnerable to contamination; these can be geologic characteristics or chemical characteristics).

Sample Questions:

1. The total void space between the grains or the cracks and solution cavities that can fill with the water is termed _____.
 - a. Permeability
 - b. Porosity
 - c. Capillary fringe
 - d. Water table
2. Darcy's law assumes _____ flow, which means that the water will follow distinct flow lines rather than mix with other flow lines.
 - a. Turbulent
 - b. Laminar
3. In a groundwater recharge zone, the pressure head _____ with increasing depth; in a discharge zone, the pressure head _____ with increasing depth.
 - a. Increases, decreases
 - b. Decreases, increases
 - c. Increases, increases
 - d. Decreases, decreases

Reference Material

[EC94-135 Understanding Pesticides and Water Quality in Nebraska](#)
[Nebraska's Natural Resources Districts](#)
[University of Nebraska-Lincoln Water Sources](#)

Objective 6: Water Map Data

- Interpret hydrograph and bathymetric (lake profile) map data.
- Know the difference between oligotrophic and eutrophic lakes.

Sample Questions:

1. On a hydrograph, what does the area under the curve equal?
 - a. Peak runoff rate
 - b. Time since start of a storm
 - c. Rainfall intensity
 - d. Total runoff

2. What is a hydrograph?
- Graph of watershed runoff versus time
 - Graph of watershed depth
 - Graph of rainfall intensity
 - Graph of storm duration

Reference Material

[Nebraska Department of Water, Energy, and Environment Maps and Data Sets](#)

Objective 7: Aquatics Species

- Be familiar with native fish of Nebraska, their defining characteristics and preferred habitats
- Know specific indicator species for pollution and stress tolerance
- Understand how predator/prey relationships control populations

Sample Questions:

1. The age of a fish may be determined by analyzing what?
- Scales
 - Otoliths
 - Spines
 - All of the above
2. Gills can function to _____.
- Take up oxygen
 - Maintain osmotic balance
 - Eliminate wastes
 - All of the above

Reference Materials

[Fresh Water Fish of North America, Peterson Guide](#)
[Nebraska Game & Parks Commission Nebraska Fish](#)