Name: _____ Unit 3: THE HYDROSPHERE NOTES: 3.08

FOCUS: Water Quality

ESSENTIAL QUESTION: What is meant by the term "water quality"? Can you identify and explain variables that would indicate the health of a water supply?

- **Water Quality** is... a measure of the health of a water supply
- The health of a water supply is determined by measuring several indicators (variables that reveal the health of the water system).
  - Indicators are similar to symptoms in the human body:
    - Normal temperature, rosy cheeks, shiny hair, strong fingernails, clear nose/chest, pain-free, normal muscle tone, alert = healthy body
    - Fever, pale skin, dull/brittle hair, brittle fingernails, stuffy nose/congested chest, headache, swelling, weakness, fatigue = unhealthy body
  - In a water supply, there are symptoms that indicate health or "unhealth".
  - Ecologists regularly collect water samples to monitor the health of a water supply.

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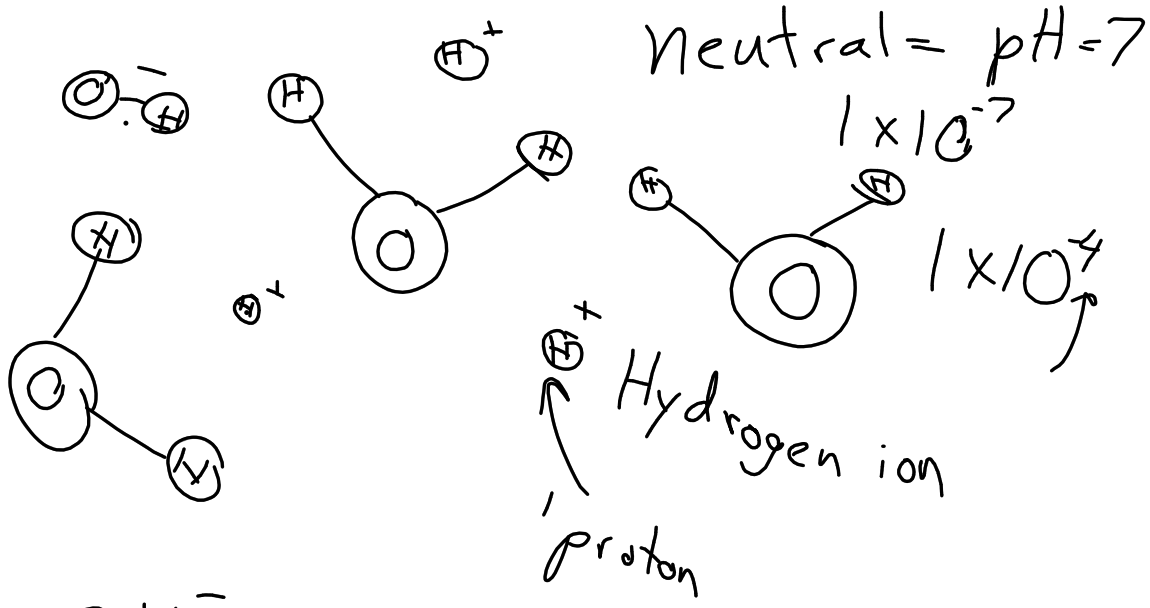
Indicators of Water Quality

	Turbidity	pH	Dissolved Oxygen
Definition:	**Turbidity**: measure of the degree to which water loses its transparency due to the presence of suspended particulates (cloudiness)	**pH**: the acidity of the water (presence of hydrogen ion) 0 – 7 is acidic 7 is neutral 7 – 14 is basic	**Dissolved Oxygen**: the amount of oxygen dissolved in the water
Levels:	**Ideal Level**: 1 NTU (Nephelometric Turbidity Units) **High Level**: 5 NTU and above	**Surface Freshwater**: 6.0 - 9.0 **Swamps**: as low as 4.3 **Salt Water**: 7.7 - 8.1	**Average Level**: 9.0 ppm (parts per million) Must be 4.5 ppm to support diverse population of fish
Causes:	**Causes of increased turbidity**: increased levels of phytoplankton sediment from erosion, resuspended sediments from the substrate (stirred by bottom dwellers), waste discharge, algae growth, and urban runoff.	**Causes of changes in pH**: natural conditions (especially in swamps), dumping of waste (batteries), acid rain and farm runoff (lime)	**Causes of changes in dissolved oxygen**: turbulent actions (waves, rapids), water depth, water temperature, and plant growth
Results:	**Results of high turbidity**: high turbidity increases the absorption of sunlight (like a dark t-shirt) thus making the water warmer. Warmer water has lower levels of dissolved oxygen causing fish and larvae to die. Blocks sunlight for photosynthesis	**Results of changes in pH**: a change in pH by 2 units results in a water system having 100 times a difference in acidity. Most aquatic life cannot withstand water outside of the optimum pH thus resulting in death.	**Results of changes in dissolved oxygen**: When DO drops too low, fish die. When DO is too high, the water actually tastes better but can corrode water pipes. High DO also leads to algae overgrowth



$H^+ > OH^-$ = acidic

$H^+ = OH^-$ neutral

$H^+ < OH^-$ basic(alkaline)

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Indicators of Water Quality

	Temperature	Nitrates	Bio-indicators
Definition:	measure of average kinetic energy	: compound that contains the nitrogen based polyatomic ion NO_3 (Ex: Sodium Nitrate) $NaNO_3$	: Aquatic species that are sensitive to pollution and depend on specific conditions to live. (The "canary in the coal mine".) Examples: Caddis fly nymphs
Levels:	Low: cannot be tolerated below 32°F High: only rough fish can tolerate temperatures above 97°F	**Drinking Water Max**: 10mg/L = 10 ppm **Fish**: Below 90 mg/L seems to have no effect on warm water fish 1000g = 1L = 1,000,000mg	**Lot of Variety**: Healthy water source **Very Little Variety**: unhealthy water source (indicator of high levels of pollution)
Causes:	**Causes of change in temperature**: source of water, time of year suspended sediments depth of water, shade from shoreline plants heat pollution.	**Causes of nitrates**: Fertilizer runoff (both farm and home), manure pits, leaks in septic systems, animal waste, and rain trapping car exhaust	**Causes of changes in bio-indicators**: pollution that results in changes in pH, temperature, dissolved oxygen or nitrate levels
Results:	Results of changes in temperature: changes in temperature can make aquatic life susceptible to disease and at extreme levels can result in death of plants and aquatic species.	**Results of presence of nitrates**: nitrates can increase the plant production and fish population resulting in overcrowding. If algae increases due to nitrates, the D.O. levels can decrease killing fish. Nitrates are converted to nitrites in humans (can kill children).	Results of few varieties of bio-indicators present: the lack of a large number of different varieties of bio-indicators is indicative of pollution and causes a loss of biodiversity

indicator	standard
lead	1.0 ppm
pH	6-9
D.O.	4 ppm

arsenic

lead 0.2 ppm

lead 53 ppm