**Water Quality Indicators Guided Notes**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Extra Notes:**

**Parts Per Million**

1. Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substances found in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are measured in parts per million (\_\_\_\_\_\_\_\_\_\_\_\_) or even smaller amounts.
2. This means that for every \_\_\_\_\_\_ million parts (units) of water there is a certain number of parts of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Example:
	1. 8 / 1,000,000 = \_\_\_\_\_\_\_ ppm

**Water Quality Indictors**

1. **Alkalinity**
	1. is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to neutralize \_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. produced by minerals such as ­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sediment composed of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	4. Water with \_\_\_\_\_\_\_\_\_\_\_\_\_\_ alkalinity is usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. **Ammonia**
	1. produced by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of organic matter and animal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to most aquatic life, especially at high \_\_\_\_\_\_\_\_.
	3. Bacteria readily \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ammonia to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	4. Nitrates are a plant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	5. is a form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and part of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. **Bacteria**
	1. Most bacteria are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in nutrient and other organic cycles.
	2. Excess \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cause algal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. As algae die and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the high bacterial load rapidly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolved oxygen.
	4. Certain types of bacteria indicate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ waste \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	5. *Escherichia coli* are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bacteria found in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of warm-blooded organisms. Most strains are harmless but one *E.* *coli* strain can cause severe diarrhea and kidney \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. **Dissolved Oxygen**
	1. a product of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the water, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ oxygen it can hold.
	3. Summer is often a time of oxygen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms.
	4. Most organisms need at least \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_ ppm of oxygen in order to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	5. Even \_\_\_\_\_\_\_\_\_\_\_\_\_ water rarely contains more than \_\_\_\_\_\_\_\_ ppm.
5. **Conductivity**
	1. measures the water’s ability to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ water is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ conductor.
	3. The addition of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solids, especially \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, increases the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of water.
	4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is measured using a conductivity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. **Hardness**
	1. refers to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in water.
	2. Hard water has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ concentrations of these \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. Soft water has \_\_\_\_\_\_\_\_\_\_\_\_\_\_ concentrations.
	4. Water hardness often originates from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. **Nitrate**
	1. a primary plant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. Nitrate is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ soluble and moves \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from surface to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. Excess nitrate causes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ blooms that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ water quality.
	4. Under normal conditions, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ keeps the amount of available nitrogen in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the demands.
	5. However, excessive use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ release have created a surplus of nitrate.
	6. The result is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from excess \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with reduced \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
8. **Pesticides**
	1. Effects on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms – Moderately to highly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to mammals, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
9. **pH**
	1. pH is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion (H+) concentration.
	2. The pH scale is \_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_.
	3. Seven is \_\_\_\_\_\_\_\_\_\_\_, below seven is \_\_\_\_\_\_\_\_\_\_\_, and above seven is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
	4. Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organisms exist within a pH range of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
10. **Phosphate**
	1. Phosphate’s concentrations in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ water is generally \_\_\_\_\_\_\_\_\_\_\_; however, phosphorus is used extensively in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. The primary sources of phosphates to surface water are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. High levels of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can over stimulate the growth of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	4. This in turn, will cause high DO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to fish and many aquatic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
11. **Sediment**
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes loose soil to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the waterways
	2. Suspended sediment \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to plants and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolved oxygen.
	3. As sediments settle, they can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bottom (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) organisms.
12. **Temperature**
	1. Most aquatic organisms live within a temperature range of +32º F (+0º C) to 90º F (32º C).
	2. Rapid temperature change and temperature extremes can stress aquatic organisms.
	3. Temperature affects the oxygen-carrying capacity of water.

**As the water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the amount of dissolved oxygen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**14 Dissolved Oxygen (ppm)**

**12**

**10**

**8**

**6**

**4**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **Winter Summer**

1. **Total Dissolved Solids (TDS)**
	1. TDS is the measure of the material \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. This measure is related to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and conductivity.
	3. Hard water has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ TDS than \_\_\_\_\_\_\_\_\_\_\_\_\_\_ water.
2. **Total Suspended Solids**
	1. TSS is the measure of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the water.
	2. TSS is related to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. Water with high TSS usually has high \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (TDS) as well.
3. **Turbidity**
	1. Turbidity refers to water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ suspended in the water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ turbidity.
	3. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is one type of instrument used to measure turbidity.
4. **Toxic Chemicals**
	1. Toxic chemicals usually come from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ production.
	2. The effects are often \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ until years after they have entered the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. Toxic chemicals include heavy metals (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, mercury), organic compounds (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, PCB), inorganic substances (arsenic) and others.