**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.