Hydroponics in the Classroom

- Hydroponics is a method of growing plants without soil, using water
- The water must be enriched with nutrients
- The plants must also have something to support the _____

Plant Needs

- _____
- _____
- _____
- _____
- _____

Nutrient Basics

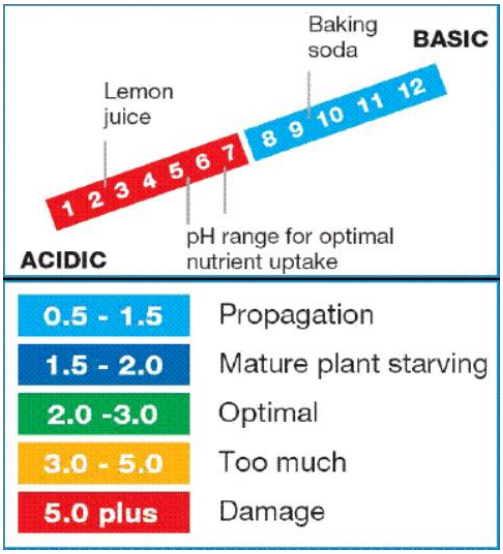
- Mineral nutrients are divided into two groups
  - _____
    - These are divided into primary and secondary nutrients
    - Primary: Nitrogen (N), Phosphorous (P), and Potassium (K)
    - Secondary: Calcium (Ca), Magnesium (Mg) and Sulphur (S)
  - _____
    - Iron (Fe)
    - Boron (B)
    - Zinc (Zn)
    - Copper (Cu),
    - Manganese (Mn)
    - Sodium (Na),
    - Chlorine (Cl)
    - Cobalt (Co)

Fertilizers

- Commercial Hydroponics Fertilizers
  - Advantage: _____
  - Disadvantage: _____
- Specialty Hydroponics Fertilizers
  - Advantage: _____
  - Disadvantage: _____
- Water Soluble Fertilizers
  - Advantage: _____
  - Disadvantage: _____
- We will be using a Specialty Fertilizer: _____
- There are two versions of this
  - Hydro-Fuel _____ and Hydro-Fuel _____
  - The version we use depends on which _____ the plants are at.
- Nutrient water will be premixed for each station and located at _____

pH

- pH is a scale to measure the overall _____ or _____ of a solution
- pH is measured from _____, with 7 being approximately _____
- Different plants like different pH levels
- A plant's _____ may change the pH of the water to suit its needs



pH Testing

- There are many different ways to measure pH
  - We will be using _____
- We can also adjust the pH of the water
  - Phosphoric acid – _____ (becomes more acidic)
  - Potassium Hydroxide – _____ (becomes more basic)
  - Vinegar – lowers pH
  - Baking Soda – raises pH

Test Meters

- When not in use, the test meters must be stored properly
  - They must either be _____or be _____
- We have two different types of test meters

Our Systems

- Armstrong tap water has a pH of about _____
- The pH range for Hydroponics systems is from about _____
  - The ideal pH for Hydroponics systems is_____
- This means that we must bring the pH of the water _____ before it can be used in most systems.
  - We use _____ in Aquaponics

- We use the term _____to refer to water that is around the target of 5.8 pH
- We will use pH neutral water to _____ our systems as needed

Growing Media

- Plants need additional structure for their _____
- There are many options for growing medium in a hydroponic system
  - _____
  - Expanded Clay (_____)
  - Perlite
  - Rockwool
  - Sand
  - Vermiculite
- We use Hydro-Corn in most of the systems

Light

- Plants need light to _____
- In the hydroponics room, the lights are run on _____
  - The light schedule is set to mimic _____
- These lights are extremely _____ and _____
  - Prolonged exposure to high intensity lights can cause _____ and _____
  - This is why _____ are recommended while working in the Hydroponics lab

Why take Hydro?

- Hydroponics incorporates many different aspects from multiple fields of study
  - _____: photosynthesis, nutrient cycles, microbes and root development
  - _____: Interaction of nutrients, pH adjusting, and the mixing of nutrient water

- _____: ancient history and hydroponics
- _____: research of plants from around the word
- _____: systems design and capillary movement