

ANSWER KEY (Out of 33 points)

1. Explain what “hydroponics” means. 4
In hydroponics, no soil is used so the plant’s roots are given nutrients directly (“no work”)
2. Plant need nutrients to grow and what else? 5
-warmth, light, support, and access to oxygen and carbon dioxide
3. What do the prefixes micro- and macro- mean? 2
(Look this up.)
Macro - large
Micro - very small
(*The terms are near opposites of one another.*)
4. Where does coir come from? 2
Coir comes from the middle (fibrous) coat of a coconut
5. Name 3 reasons coir is used for growing plants. 3
-is very rot-resistant
- helps keeps air in the soil
-absorbs a lot of water (30% more than peat moss)
6. List the three macro-nutrients needed by plants. 3
- nitrogen
- phosphate
- potassium (or potash)

7. Mark which of the following is NOT a micro-nutrient needed by the **roots** of plants (look for 3): 3

- | | | |
|------------------------------------|--|--|
| <input type="checkbox"/> calcium | <input type="checkbox"/> copper | <input checked="" type="checkbox"/> fluoride |
| <input type="checkbox"/> magnesium | <input type="checkbox"/> iron | <input type="checkbox"/> molybdenum |
| <input type="checkbox"/> sulfur | <input checked="" type="checkbox"/> lead | <input type="checkbox"/> zinc |
| <input type="checkbox"/> boron | <input type="checkbox"/> manganese | <input checked="" type="checkbox"/> lithium |

8. Name two reasons for using hydroponics? 4
weather is not an issue / food can be grown anywhere / plants grow faster / it uses less water / more food is needed.

Fill In The Blanks 7

9. When sprouting seeds, **warmth** is more important than light.
10. It is important that the area around the seed is kept **moist** for the first couple of days.
11. **Stir/mix** the nutrient solution **twice** a day to keep the nutrients from settling.
12. Replace nutrient water solution totally every **two weeks** to avoid the risk of **algae/bacteria** growth.
13. Discourage algae growth in the nutrient solution by wrapping the bottle in **aluminum foil**.

More Challenges**Set up experiments to test any of the following**

Remember to state a hypothesis, plan your procedures, include a control and take good records of your observations.

- Rate of plant growth in nutrient rich solutions versus nutrient poor solutions in a hydroponic system.
 - Hint: seed plants in identical hydroponics containers. Give half of the plants nutrient enriched water and the other half pure water.
- Effect of acidity of the water on plant growth. T
 - Hint: plant seeds in identical hydroponics containers. Give all plants nutrient rich water. Make the water in the reservoir acidic (pH = 5 or lower) for a third of the plants, basic (pH = 9 or higher) for another third, and neutral (pH = 7) for the last third.
- Rate of plant growth in traditional (nutrient rich) soil versus a hydroponics system.
- Can you give plants too many nutrients?



Be sure to visit www.3NE.ca

- **Sustainable Food Centre Project:**
<https://www.3ne.ca/community-projects/sustainable-food-centre/>
- **News about the Growcer Hydroponics Unit:**
<https://www.3ne.ca/news/>
- **Check out the Learning Resources:**
<https://www.3ne.ca/learning-resources/>
- **Share job opportunities with your students:**
<https://www.3ne.ca/jobs-more/>



Alberta Curriculum Connections

7	Science	Unit A: Interactions and Ecosystems	- Illustrate how life-supporting environments meet the needs of living things for nutrients, energy sources, moisture, suitable habitat, and exchange of gases
		Unit B: Plants for Food and Fibre	-Investigate plant uses; and identify links among needs, technologies, products and impacts -Investigate life processes and structures of plants, and interpret related characteristics and needs of plants in a local environment -Analyze plant environments, and identify impacts of specific factors and controls - Describe methods used to increase yields, through modifying the environment
8	Science	Topic E: Freshwater and Saltwater Systems	- Recognize that fresh water and salt water contain varying amounts of dissolved materials, particulates and biological components; and interpret information on these component materials - Analyze human impacts on aquatic systems; and identify the roles of science and technology in addressing related questions, problems and issues
		Unit C: Environmental Chemistry	- Investigate and describe, in general terms, the role of different substances in the environment in supporting or harming humans and other living things
9	Science	Unit C: Cycling of Matter in Living Systems	- Analyze plants as an example of a multicellular organism with specialized structures at the cellular, tissue and system levels
		Unit D: Energy Flow in Global Systems	- Explain the response of humans to impacts on climate change
14	Science	Unit C: Investigating Matter and Energy in the Environment	- Describe the relationship between photosynthesis and cellular respiration in terms of biological energy storage - Identify life functions common to living systems
		Unit D: Investigating Matter and Energy in the Environment	-Assess the impact of modern agricultural technology on the natural pathways of recycling matter -Explain how various factors influence the size of populations -Describe the relationship between land use practices and altering ecosystems
20	Science	Unit D: Changes in Living Systems	General Outcome 3: Students will analyze and describe the adaptation of organisms to their environments, factors limiting natural populations, and evolutionary change in an ecological context.
30	Science	Unit D: Energy and the Environment	General Outcome 1: Students will explain the need for balancing the growth in global energy demands with maintaining a viable biosphere.