Name _____

Period _____
Due date _____

Edible Roots

Roots anchor the plant in the soil and provide the water and minerals required for survival and growth. They accomplish this absorption with their large surface area, often several thousand square feet in size, and many times greater than that of the leaves & stems combined. The extensive branching of roots also prevents the erosion of topsoil, which is usually 6 to 12 inches deep. In areas of the world where the plant cover has been destroyed, millions of acres of productive land have been lost through soil erosion. Roots also serve as a storage site for sugar and starch. The plant uses this stored energy supply as needed, and especially in the spring to initiate new growth before leaves and photosynthesis are available.

Like stems & leaves, roots exhibit striking differences in sizes, shapes, and colors. Roots of herbaceous plants vary from the delicate fibrous forms in grasses to the thick and fleshy design in beets and carrots. In contrast, roots of large trees are massive and woody, and resemble the stem in appearance.

In this laboratory activity, you will examine five edible taproots and one fleshy fibrous root. You will also taste test samples of these roots to evaluate their flavor and sweetness.

MATERIALS:

Carrot	Beakers	Butter
Parsnip	Hot plates	Salt & Pepper
Beet	Water	Cutting knife
Turnip	Strainer	Light Microscope
Sweet potato	Plates	Buttercup (Ranunculus) root slide
Radish	Forks	

PROCEDURE:

PART 1: COOKING ROOTS

1. Samples of each root will be boiled (except radish) while you are visiting each root vegetable station.

2. After taste testing each root sample, record your results on the data table on the next page.

TASTE TEST

Put an "X" in each appropriate box:

ROOT SAMPLE	More Sweet	More Starchy	I would eat this again	I would not eat this again
CARROT				
PARSNIP				
BEET				
TURNIP				
SWEET POTATO				
RADISH				

PART II: STATIONS

At each station, look at the root sample and read the information card.

CARROT

3. Draw the whole carrot.

LABEL:
- Leaf
- Lateral root
- Petiole
- Taproot

_____ A. According to the information card, how do carrots help our health?

1. Healthy eyesight, better brain function, stronger hair
2. Healthy eyesight, strong nails, flexibility
3. Healthy eyesight, healthy skin, growth
4. Healthy eyesight, reduced heart disease, better coordination

_____ B. What is one reason carrots taste so good to humans?

1. They are high in protein
2. The carotene tastes delicious
3. They are high in sugar
4. They are high in fat

_____ C. How do carrots benefit rabbits?

1. Lower rates of cancer
2. Rabbits wear down their nails digging them up
3. Rabbits grow thicker fur
4. Rabbits wear down their ever-growing teeth

D. In your own words, give 3 reasons why you should eat carrots:

_____

_____

_____

PARSNIP

4. Draw the whole parsnip.

LABEL: - Lateral root
- Taproot

5. Look at the cross-section of the parsnip and draw it here:

LABEL: - Epidermis

A. Parsnips and carrots are related. TRUE FALSE

_____ B. The lifecycle of a parsnip is:

1. Annual 2. Biennial 3. Perennial

_____ C. One advantage of parsnips is:

1. They keep fresh in storage for a long time
2. They are high in vitamin A
3. They are a good source of protein
4. Parsnips are great to serve at parties!

_____ D. What insult is directed at parsnips?

1. They are pale like Casper the Ghost
2. They smell like rotten potatoes
3. They are old-fashioned vegetables
4. They taste like a pencil eraser

BEET

6. Draw the whole beet.

LABEL:
- Leaf
- Root hairs
- Petiole
- Taproot

7. Flatten out one leaf and draw it here:

LABEL: - Vascular tissue

What color is the vascular tissue? _____

_____ A. Which vegetable is listed as a "cousin" to the beet?

1. Yam 2. Turnip 3. Radish 4. Parsnip

B. Name any 4 ways beets can be served: _____ _____ _____ _____

C. Beets are actually a cultivar of: RADISH SWISS CHARD

D. Beets store a large amount of _____ and _____.

TURNIP

8. Draw the turnip. LABEL: - Root hairs
- Tap root

What 2 colors are the turnip epidermis? _____ _____

_____ A. Compared to a radish, a turnip is:

1. Larger 2. Smaller 3. The same size

_____ B. When selecting a turnip, you should look for:

1. Fibrous roots
2. Lateral roots
3. Adventitious roots
4. Root hairs

_____ C. What fun holiday craft was traditionally made out of a turnip?

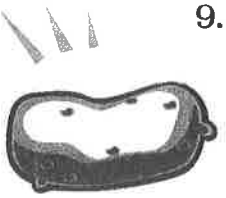
1. Christmas stocking
2. Dyed Easter eggs
3. Jack-o-lantern
4. Fire cracker

D. It was a compliment for a young German man to receive turnips from a young lady:

TRUE FALSE

SWEET POTATO

9. Draw the sweet potato. LABEL: - Lateral root



What color is the parenchyma inside the sweet potato? _____

C. Beets are actually a cultivar of: RADISH SWISS CHARD

D. Beets store a large amount of _____ and _____.

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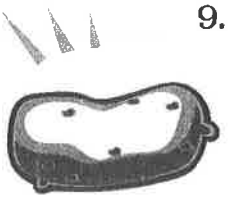


What color is the parenchyma inside the sweet potato? _____

3. Look at the prepared slide of the buttercup (Ranunculus) root.

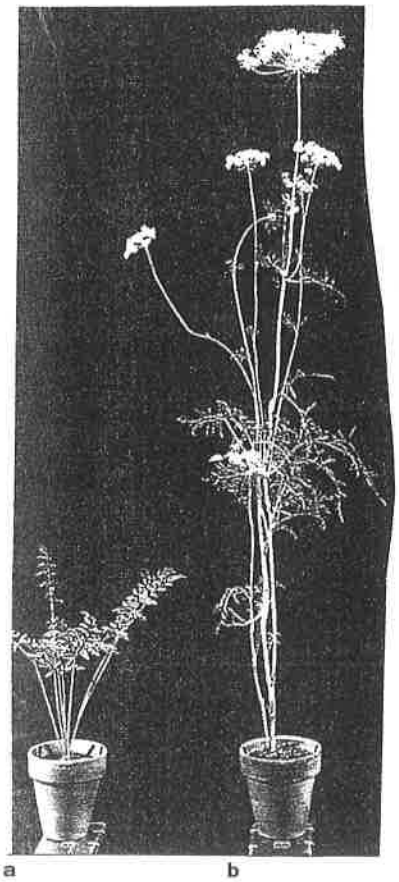
Draw it here:

LABEL:
- Dermal Tissue
- Ground Tissue
- Vascular Tissue

____4. What type of ground tissue is found abundantly in roots?

1. Parenchyma 2. Collenchyma 3. Sclerenchyma

Carrot plants that have escaped from cultivation are commonly known as Queen Anne's lace. The plant is said to have been named after Queen Anne of England (1665–1714)



a b

Look at the diagram of 2 years of carrot growth on the left.

5. In what year are carrots harvested? A B

____ 6. In the 2nd year, what familiar flower blooms?

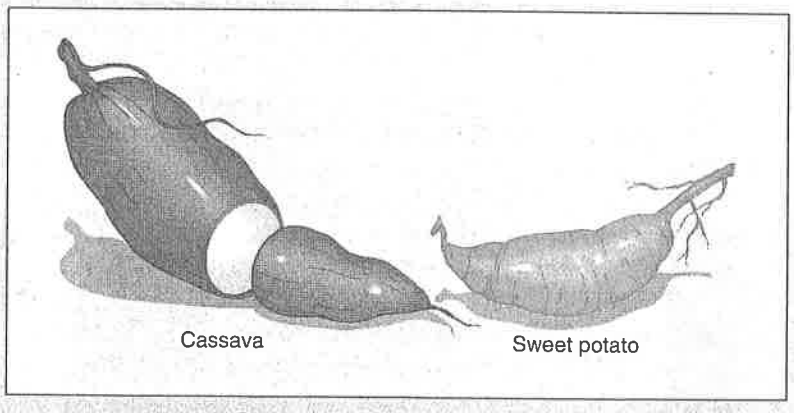
A. Roses
B. Crocuses
C. Queen Anne's Lace
D. Butter-and-Eggs

Important Root Crops

Many roots are storage organs, which store the products of photosynthesis and are important sources of food for human consumption. Root crops are predominantly taproots, including carrots, beets, sugar beets, parsnips, turnips, rutabagas, and radishes. These taproot crops are *biennials*, plants that accumulate starch and sugar in their roots during the first year's growth and then use it to reproduce during the second year. However, the roots are harvested as annuals—that is, after the first year's growth. Only a few root crops—sweet potatoes, yams, and cassava—are fibrous roots.

Worldwide, more cassava and sweet potatoes are grown than all other roots combined (see figure). Cassava (*Manihot esculenta*), also called manioc, is a tropical American plant that is grown in many tropical countries worldwide for its edible starchy roots, which resemble very large sweet potato roots. It is a mainstay in the diets of millions of people. Tapioca is a granular starch squeezed out of cassava roots and used to make puddings and to thicken soups, primarily in North America and Europe. Sweet potatoes (*Ipomoea batatas*), also American in origin, are widely planted not only in the Americas but also in West Africa, China, India, and the Pacific Islands. Sweet potatoes are often confused with yams, a root crop belonging to a different genus (*Dioscorea*).

Because roots are generally rich in carbohydrates and certain vitamins but poor in proteins, people must consume them with other foods in order to achieve a balanced diet. The most nutritious roots are sweet potatoes and yams, both of which contain about 5 percent protein and are rich in vitamins A and D in addition to iron, calcium, and other minerals.



Cassava (*Manihot esculenta*) and sweet potato (*Ipomoea batatas*) are very important tropical root crops.

7. Sweet potatoes are one of the top 2 root crops grown and sold in the world.

TRUE FALSE

8. Sweet potatoes are one of the most nutritional root vegetables.

TRUE FALSE