Name _____ Period _____
Due date _____

SEED GARDEN PROJECT

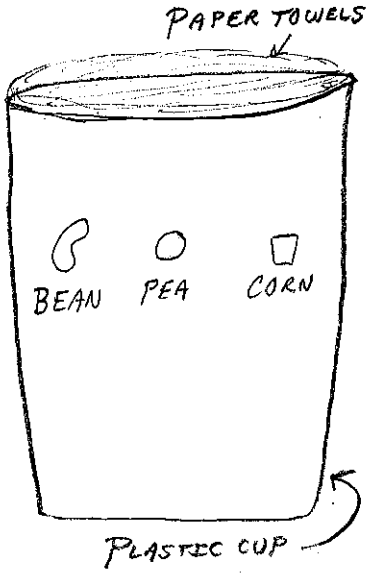
Seeds are small packages containing dormant embryonic plants. If you give seeds the right conditions, the seed coat will break open and the baby plant will begin to grow. What structures come out of germinating seeds?

In this project you will plant 3 different seeds (bean, pea, & corn) and journal the growth of their structures over time. You will also complete a Seed Garden Summary at the end.

MATERIALS:

Clear plastic cup	Bean seed
Paper towels	Pea seed
Labeling tape	Corn seed
Sharpie	Water

PROCEDURE:



1. Tear off a piece of paper towel as tall as you. Fold it in half the long way, then fold it in half again the "hot dog" way. Now roll up the paper towel like a sleeping bag leaving the middle hollow like a paper towel tube. The rolled paper towel should fit snug inside the plastic cup. Crumple up another small piece of paper towel and stuff it inside to hollow inside to provide additional support and to help absorb water.

2. Saturate the paper towel with water. Plant the 3 seeds several inches down from the top of the cup between the plastic cup and paper towel so you can watch them grow. Spread the seeds out away from each other, avoiding any folded areas or creases in the paper towel.

3. Draw your 3 seeds/seedlings in the journal pages that follow. See the sample journal in this project form to give you an example of how to journal. Make descriptive observations about what structures are growing and changing. Be sure to water your plants, but do not submerge them (except Day 1 - you can give them as much water as you want). You will make 9 entries in your journal; there are 5 pages of journal paper so you may make multiple entries on one page.

SEED GARDEN JOURNAL

DATE	OBSERVATIONS (Describe all 3 seeds/seedlings each time)	DRAWINGS (Draw all 3 seeds/seedlings and label all structures each time)

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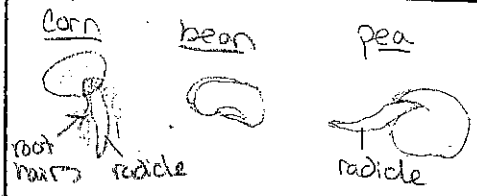
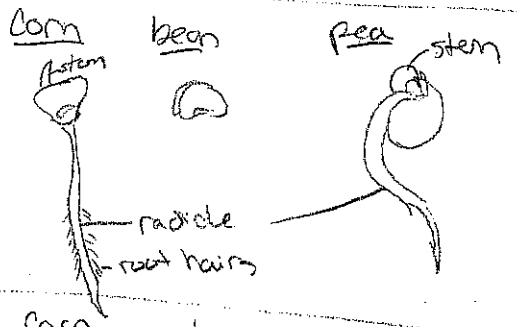
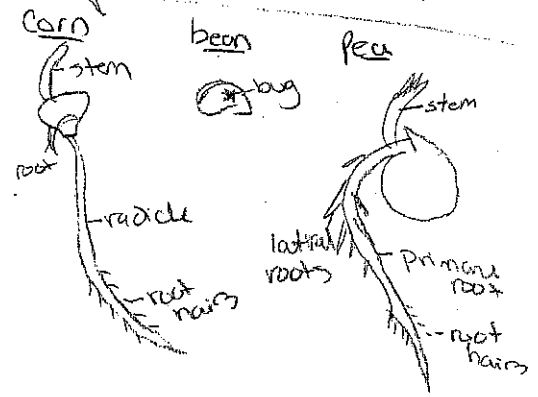
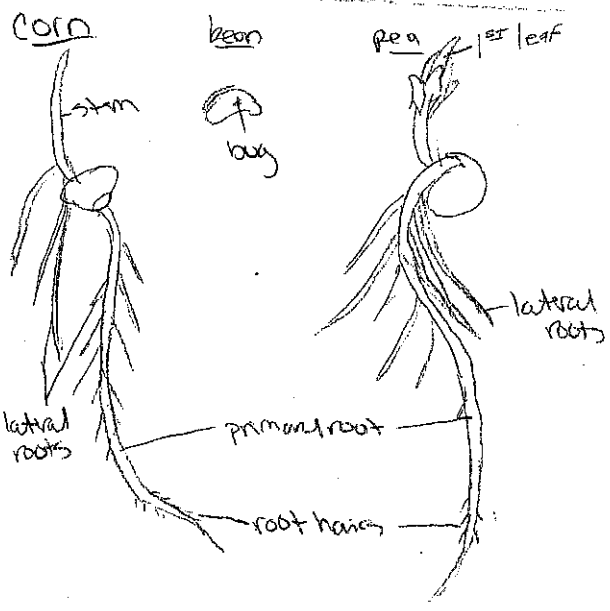
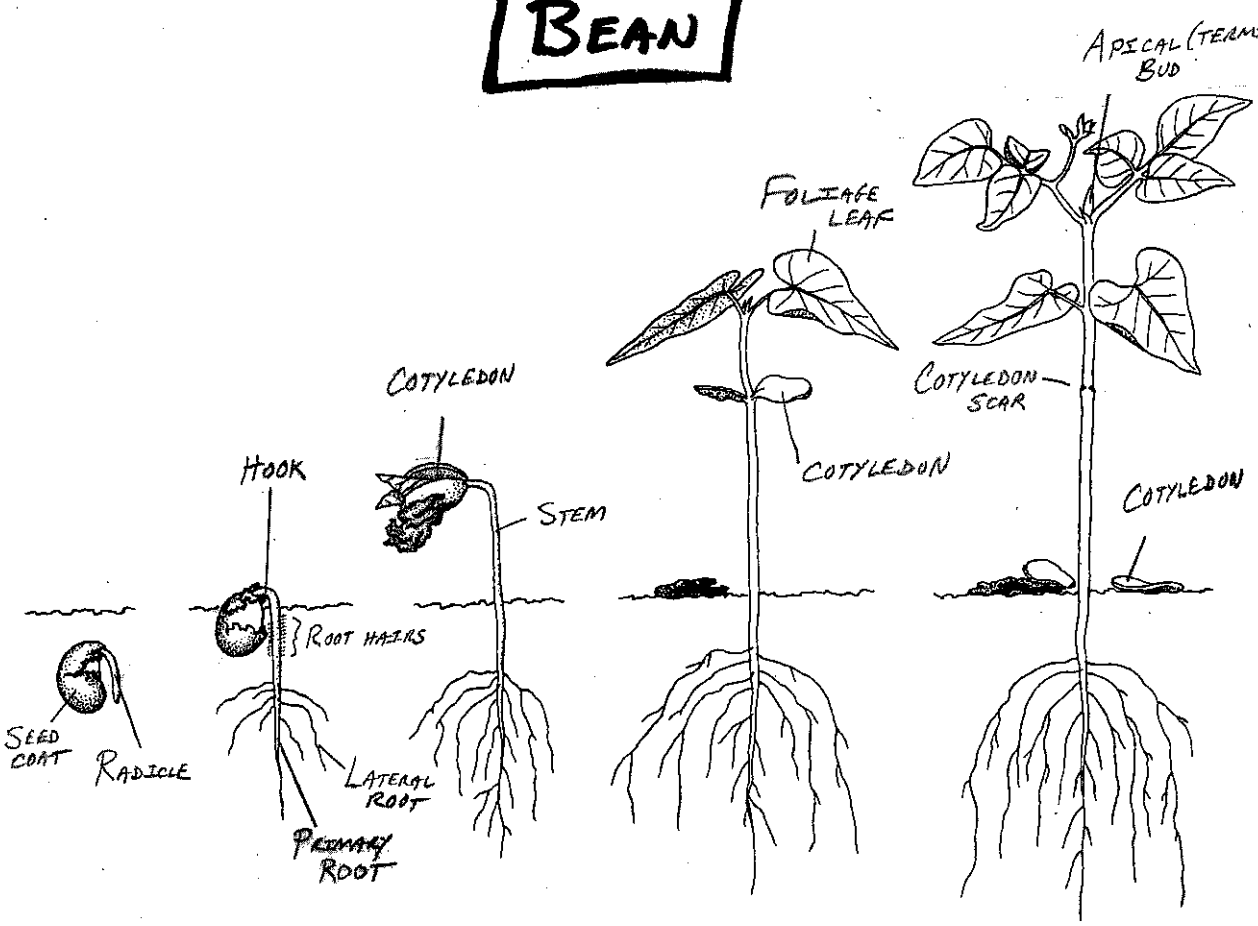
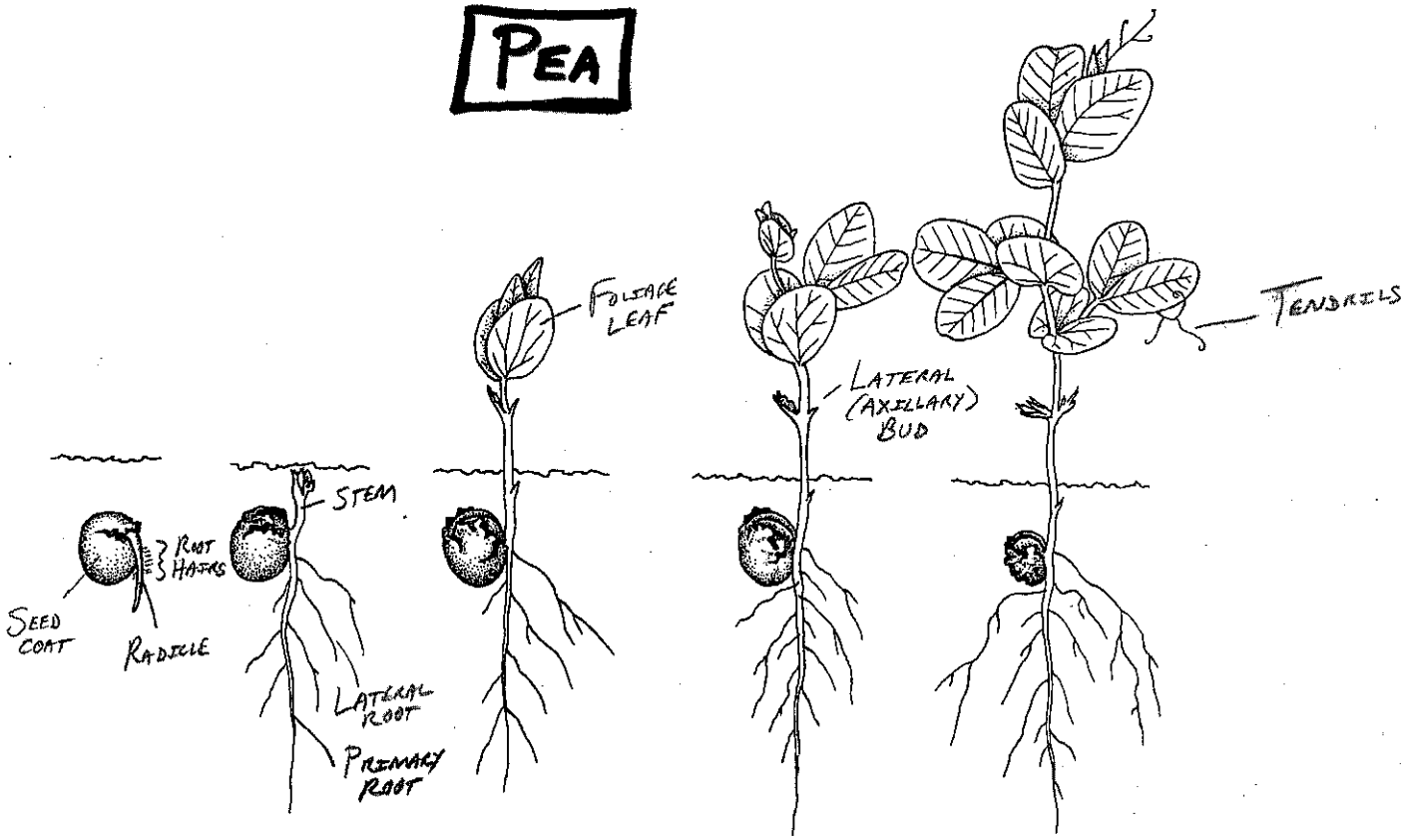
* Sample Journal *

DATE	OBSERVATIONS (Describe all 3 seeds each time)	DRAWINGS (Label all structures See Sample Journal in back of lab)
12-1	The corn is growing a radicle and root hairs The bean still looks the same, still split in the middle The pea is also growing a radicle & don't really see root hairs yet	
12-4	The corn grew a large radicle and root hairs and is growing a stem The bean looks the same, still split The pea grew a larger radicle, and also grew a stem	
12-6	The corn grew a longer radicle and a larger stem and it looks like there is another radicle growing. w/more root hairs The bean still looks the same and there is also a little bug on it The pea grew a longer primary root with lateral roots and root hairs. And also grew a larger stem w/ little leaves	
12-8	The corn grew a longer primary root and more lateral roots. The stem is almost coming out of the cup The bean still has no growth but the bug is still there The pea grew a bigger primary root and a lot more lateral roots w/ hairs. The stem with the leaves is almost coming out of the cup also.	

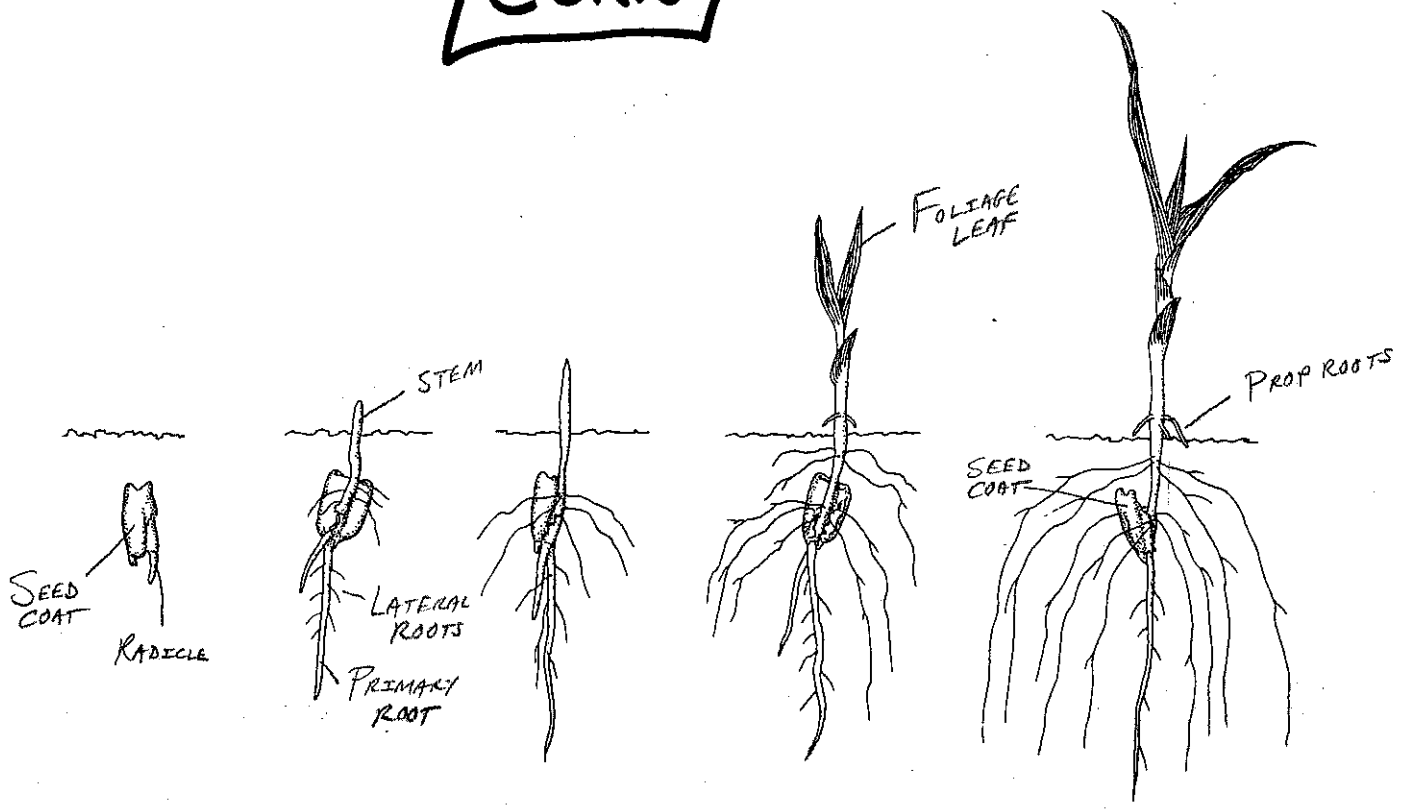
BEAN


APICAL (TERMINAL) BUD
FOLIAGE LEAF
COTYLEDON
HOOK
STEM
COTYLEDON SCAR
COTYLEDON
COTYLEDON
ROOT HAIRS
SEED COAT
RADICLE
LATERAL ROOT
PRIMARY ROOT

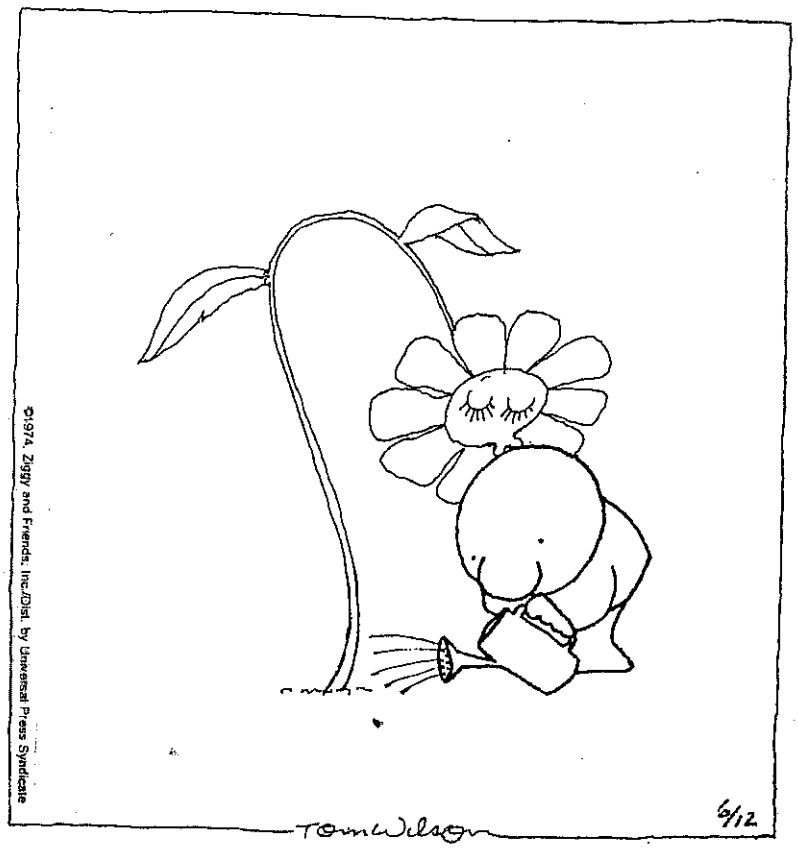
PEA


FOLIAGE LEAF
TENDRILS
LATERAL (AXILLARY) BUD
STEM
ROOT HAIRS
SEED COAT
RADICLE
LATERAL ROOT
PRIMARY ROOT

CORN


SEED COAT
RADICLE
STEM
LATERAL ROOTS
PRIMARY ROOT
FOLIAGE LEAF
PROP ROOTS
SEED COAT

ZIGGY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TOM WILSON
6/12

SEED GARDEN SUMMARY

In this project, you planted bean, pea, and corn seeds to observe their growth over time. Answer the following questions based upon your seeds, the labeled diagrams in the packet, and on your knowledge of horticulture.

1. Which structure emerged first on all of your seeds (or should have)?

_____

2. What 2 main functions does the structure named in #1 above do? (HINT: It's the first root)

A. _____

B. _____

3. Which of your plants grew the best? _____

Why do you think this is? _____

_____

4. What environmental hazards did your seed garden face? (i.e. cold temperature)

_____

_____

5. What was the "fate" of the cotyledons in your bean seed? In other words, what happened to them as the plant germinated & grew and they rose up out of the cup? (circle one)

THEY GREW INTO LARGE LEAVES THEY SHRIVELED UP AND GOT SMALLER

6. TRUE or FALSE: The cotyledons in the pea plant also grew up and out of the cup like the bean

_____

7. TRUE or FALSE: There was fungus visible on the corn seedling

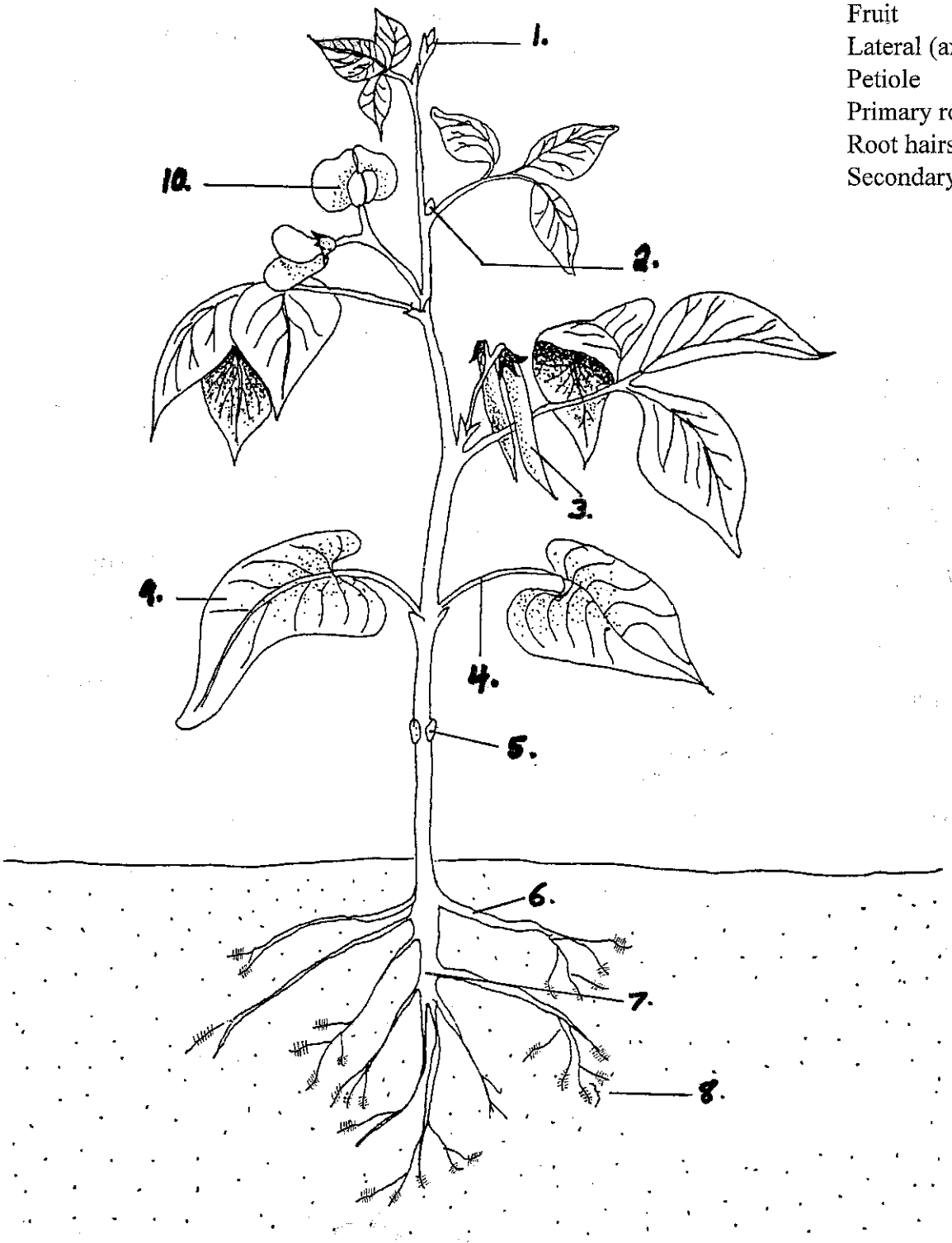
_____

8. Did you observe root hairs on any of your root systems? _____ What is the function of root hairs?

_____

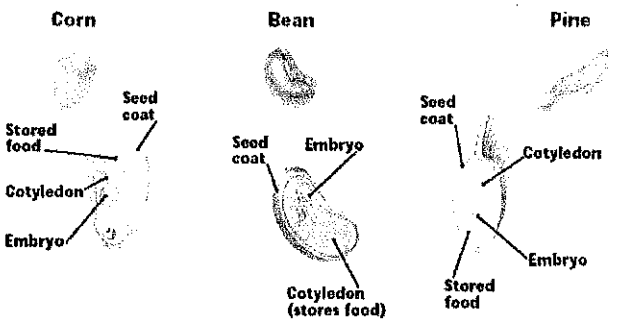
9. Label the following terms on the bean plant below:

Apical (terminal) bud
Cotyledon scar
Flower
Foliage leaf
Fruit
Lateral (axillary) bud
Petiole
Primary root
Root hairs
Secondary (lateral) root



Germination and Seedling Development

THE STRUCTURES OF THREE DIFFERENT SEEDS ARE SHOWN HERE ☺



Seeds and Dormancy

Seeds are the exclusive means of regeneration for the annual flowering plants. In other plants, seeds are an alternative strategy to regeneration by buds, bulbs, rhizomes, stolons, or tubers. In those plants, the primary roles of the seed are to disperse the population and to reinvigorate the genetic diversity of the germ line.

Dormancy prevents immediate germination when the mature seed is in an inappropriate environment, and it is a programmed phase in the life cycle. Dormancy's function ends, and a germination window opens, at a time when the emerging seedling will have the optimum chance for survival.

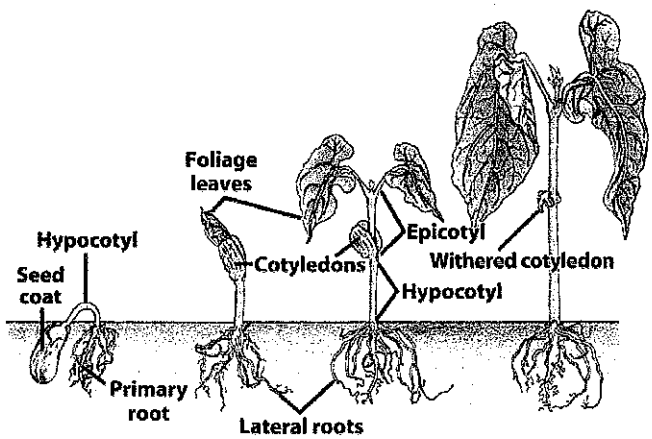
After-ripening removes the dormancy and allows the seed to respond to germination stimuli. Seeds of summer annuals after-ripen when exposed to winter and early spring temperatures, a treatment called stratification. Exposure to cold temperatures can also promote dormancy in some seeds.

Dormancy is caused by one or more conditions of the seed. Physiological dormancy of the embryo is the most common. It may be caused by the presence of an inhibitor molecule, an inadequate level of a growth hormone, or some other internal factor.

Other causes of dormancy are a hard or impervious seed coat, an underdeveloped embryo, or some combination of those factors. Some hard-coated seeds require physical scraping, such as tumbling down a swift-flowing stream and being scraped on the stream bed. Others may require exposure to a forest fire or passage through the gut of an animal to weaken the seed coat.

Germination

The seeds from the previous year's crop of summer annuals wait to germinate in spring. Seeds of many species will germinate when soil temperatures reach a threshold constant. Others require daily fluctuations of temperature, waiting until the daily fluctuation becomes sufficiently large.



Garden bean

Germination is the process of seeds developing into new plants. First, environmental conditions must trigger the seed to grow. Usually, this is determined by how deep the seed is planted, water availability, and temperature. When water is plentiful, the seed fills with water in a process called imbibition. The water activates special proteins, called enzymes, that begin the process of seed growth. First the seed grows a root to access water underground. Next, the shoots, or growth above ground, begin to appear. The seed sends a shoot towards the surface, where it will grow leaves to harvest energy from the sun.

QUESTIONS ON READING PASSAGE "Germination and Seedling Development"

1. List any 3 structures that the CORN, BEAN, & PINE SEED share in common:

_____ _____ _____

2. TRUE or FALSE: Annual flowering plants rely on seeds alone for reproduction _____

_____ 3. What do seeds "reinvigorate?"

A. Flowering B. Genetic diversity C. Vegetative propagation

_____ 4. Which process "removes the dormancy" of a seed?

A. After ripening B. Seed dispersal C. Cotyledon formation

5. Give any one way the seed coat can be weakened _____

_____ 6. What does "imbibition" by a seed mean?

A. The seed responds to cold temperature
B. The seed sheds its seed coat after germination
C. The seed absorbs sufficient water to germinate

7. In the box below draw a BEAN SEEDLING and label:

- COTYLEDON
- FOLIAGE LEAF
- LATERAL ROOT
- PRIMARY ROOT