

wrong	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
right	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	
score	100	98.8	97.7	96.5	95.3	94.2	93.0	91.9	90.7	89.5	88.4	87.2	86.0	84.9	83.7	82.6	81.4	80.2	79.1	77.9	76.7	

# Seeds and Fruits

Name \_\_\_\_\_

In a previous exercise, you observed the flower and its many parts. You were also introduced to the events leading up to double syngamy. The zygote, the product of syngamy of egg and sperm, develops into the embryonic plant. The endosperm, the product of syngamy of the central cell and sperm, accumulates much storage material that is used for the development of the embryonic plant. The embryo and the endosperm reside in the integument of the ovule and together these constitute a SEED. Of course the seed is contained within the ovary of the carpel; the gynoecium will develop to form a FRUIT surrounding the seeds. Today you will study the seed and fruit of flowering plants.

## Seed Formation

The integument of the ovule becomes modified to form the **seed coat**. The **endosperm** starts developing immediately after double syngamy, forming a parenchymatous tissue inside the ovule and around the young embryo. It may store considerable amounts of food material, or it may transfer the food materials to the cotyledon(s) of the embryo and disappear completely. Meanwhile, the zygote undergoes a regular sequence of divisions to form an **embryo** organized into a central axis (**root apex, radicle, hypocotyl, and shoot apex**) with appendages (one or two **cotyledons**). The entire structure--seed coat, storage tissue (endosperm if still present), and embryo--constitutes the **seed** and is shed from the parent plant at maturity. The seed usually can withstand quite adverse conditions and remain dormant for considerable periods of time. It serves to disseminate the species.

In the remaining space, diagram and label a seed of *Capsella*. Be sure to connect lines from the labels printed in **bold** below over to your sketch. On the right are the parts of the embryo, on the left are the accessory structures that make it a complete seed

**seed coat**

**endosperm**

**shoot apex**

**cotyledons**

**hypocotyl**

**radicle**

**root apex**

# Fruit

The angiosperm seed is derived from the ovule which occurs within the ovary of the carpel. Changes in the ovary wall occur simultaneously with the maturation of the seed, giving rise to a **fruit**. Fruits are of various types--fleshy or dry and, when dry, dehiscent or indehiscent. In some species it may be the fruit with its contained seed(s) which is shed and distributed rather than the seed by itself.

Three classification schemes for some common fruit types are given below. Use the outline to classify the several different fruit types available in the laboratory. Note that a number of common foods are included and that many of these are erroneously classified as "vegetables" when they are actually fruits!

## Three Fruit Classification Schemes

### I. ORIGINS

- A. **Simple** fruit - formed from a single pistil (lily, apple, cucumber)
- B. **Aggregate** fruit - formed from a cluster of separate pistils borne in a single flower (raspberry)
- C. **Multiple** fruit - formed from the pistils of several to many flowers consolidated with other floral or inflorescence parts (pineapple, fig)

### II. COMPOSITION

- A. **True** fruit - composed of only the ripened ovary, with its contained seeds (lily)
- B. **Accessory** fruit - composed of the ripened ovary with other additional parts, such as receptacle, bracts, portions of perianth, etc. (apple, cucumber, fig)

### III. DESCRIPTIONS

- A. Fleshy Fruits
  - 1. **Drupe** - usually 1-seeded, fruit coat with fleshy outer and inner stony layers forming a pit (peach, plum, olive, raspberry, almond)
  - 2. **Berry** - few to many seeded, fruit coat soft and fleshy throughout (grape, banana)
    - a. **Hesperidium** - berry with tough glandular rind (orange, grapefruit)
    - b. **Pepo** - thick-skinned berry, with accessory rind (squash, cucumber)
  - 3. **Pome** - fleshy accessory fruit with cartilaginous core (apple, pear)
- B. Dry Fruits
  - 1. Dehiscent fruits
    - a. **Follicle** - single carpel splitting along one side only (milkweed, magnolia)
    - b. **Legume** - single carpel splitting along both sides (bean)
    - c. **Capsule** - compound pistil, splitting lengthwise or by pores (lily, iris, poppy)
  - 2. Indehiscent Fruits
    - a. **Achene** - 1-seeded, fruit coat free from seed coat (buttercup, sunflower)
    - b. **Caryopsis** (grain) - 1-seeded, fruit coat fused with seed coat (corn, wheat)
    - c. **Samara** - 1-seeded, fruit with winglike outgrowth (ash)
    - d. **Nut** - 1-seeded, thick hard wall, partially or completely surrounded by cup or husk (oak, hazelnut=filbert)

Examples:

	Origin	Composition	Description
Raspberry	aggregate	true	drupe
Apple	simple	accessory	pome
Mulberry	multiple	true	drupe

## The Peanut

Examine the peanut provided very carefully and dissect it as needed to answer the following:

Which flower parts are still visible?  sepals  petals  stamens  stigma  style  ovary

How many pistils were there in the gynoecium? \_\_\_\_\_

How many locules are inside the peanut? \_\_\_\_\_

How many carpels were there in the gynoecium? \_\_\_\_\_

Is the pistil simple or compound?  simple  compound

What is the redskin? \_\_\_\_\_

How many large fleshy structures are inside the redskin? \_\_\_\_\_

What are these fleshy structures called? \_\_\_\_\_

To what class of the flowering plants does the peanut belong? \_\_\_\_\_

What is the purpose of the fleshy structures? \_\_\_\_\_

What chemicals do they naturally contain (taste!)? \_\_\_\_\_

Do you find a miniature plant inside these fleshy structures?  yes  no

What part of a seed is conspicuous by its absence? \_\_\_\_\_

Classify the peanut fruit in terms of origin: \_\_\_\_\_

Classify the peanut fruit in terms of composition: \_\_\_\_\_

Classify the peanut fruit in terms of description: \_\_\_\_\_

When we eat peanuts without the redskin, do we eat a fruit, a seed, or what? \_\_\_\_\_

When we eat peanuts with the redskin, what are we eating? \_\_\_\_\_

Some people eat the peanuts in the "husk" or "shell" (a lot of fiber!).

What are these people eating? \_\_\_\_\_

## The Snow Pea (or Green Bean) Fruit

Examine the snow pea or green bean fruit very carefully and dissect it as needed to answer the following:

Which flower parts are still visible?  sepals  petals  stamens  stigma  style  ovary

Is the style and stigma present?  yes  no

Was the ovary superior or inferior?  superior  inferior

The flower was:  epigynous  hypogynous  perigynous

The fruit has a dark stripe running along both sides, but runs in a groove one side. Which side has the placenta? The side  with  without the groove.

How many pistils were there in the gynoecium? \_\_\_\_

How many locules were there in the ovary? \_\_\_\_

How many carpels were there in the gynoecium? \_\_\_\_

Was the pistil simple or compound?  simple  compound

How many ovules were there in the locule? \_\_\_\_

What color is the ovule? \_\_\_\_\_

Do you think that the ovules have become fully mature seeds?  yes  no

Classify the pea/bean fruit in terms of origin: \_\_\_\_\_

Classify the pea/bean fruit in terms of composition: \_\_\_\_\_

Classify the pea/bean fruit in terms of description: \_\_\_\_\_

## The Cherry Tomato Fruit

Examine the cherry tomato fruit provided very carefully and dissect it as needed to answer the following:

Which flower parts are still visible?  sepals  petals  stamens  stigma  style  ovary

How many sepals were in the flower? \_\_\_\_\_

Is the style and stigma present?  yes  no

If not, to which end of the fruit was it attached? \_\_\_\_\_

Was the ovary superior or inferior?  superior  inferior

The flower was:  epigynous  hypogynous  perigynous

How many pistils were there in the gynoecium? \_\_\_\_\_

How many locules were there in the ovary? \_\_\_\_\_

How many carpels were there in the gynoecium? \_\_\_\_\_

Is the pistil simple or compound?  simple  compound

The tomato has solid walls and a solid center with seeds in between.

The placenta is?  axile  radial  parietal

How many ovules are in the locule? \_\_\_\_\_

What color is the ovule? \_\_\_\_\_

Classify the tomato fruit in terms of origin: \_\_\_\_\_

Classify the tomato fruit in terms of composition: \_\_\_\_\_

Classify the tomato fruit in terms of description: \_\_\_\_\_

## The Strawberry Fruit

Examine the strawberry fruit provided very carefully and dissect it as needed to answer the following:

Which flower parts are still visible?  sepals  petals  stamens  stigma  style  ovary

How many sepals were in the flower? \_\_\_\_\_

How many pistils were there in the gynoecium? \_\_\_\_\_

How many carpels were there in the gynoecium? \_\_\_\_\_

Is the pistil simple or compound?  simple  compound

Is the style and stigma present?  yes  no

Was the ovary superior or inferior?  superior  inferior

The flower was:  epigynous  hypogynous  perigynous

From what part of the flower is all the red tissue? \_\_\_\_\_

What color is the **true** strawberry fruit? \_\_\_\_\_

Classify the strawberry fruit in terms of origin: \_\_\_\_\_

Classify the strawberry red tissue in terms of composition: \_\_\_\_\_

Classify the strawberry true fruit in terms of description: \_\_\_\_\_

### **Class Discussion Upon Cross Section:** (bonus only for those attending lab!)

What is the hollow area inside the strawberry? \_\_\_\_\_

What tissues comprise the white ring outside the hollow area? \_\_\_\_\_

What is the orange tissue between the white ring and the hollow? \_\_\_\_\_

What do you call the white lines radiating out from the white ring? \_\_\_\_\_

So what tissue layer is the red surface? \_\_\_\_\_