

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? _____