

LABORATORY THREE

REPRODUCTION IN FLOWERING PLANTS: FLOWERS & FRUITS

LABORATORY SESSIONS

Date	22 October 2025 (Wednesday)			
Time	1000 – 1200	1200 – 1400	1400 – 1600	1600 – 1800
	B1	B2	B3	B4
Venue	Life Sciences Laboratory 3, Block S1A Level 4			

IMPORTANT INFORMATION

1. You must wear **appropriate attire (trousers, jeans, long skirts) and covered footwear**; else you will be denied entry into the laboratory.
2. Please re-use the **disposable laboratory coat** that was issued to you during the first session.
3. Please be **punctual**. You will be denied entry into the laboratory if you arrive later than 5 minutes after the scheduled class.
4. It is your responsibility to ensure that your attendance is noted. Absence from laboratory session incurs **50% penalty** to the assignment. If you are unable to attend, please contact the teaching team prior to the session and include official documentation for your absence. An alternative assignment will be issued to you under such circumstances.

ASSIGNMENT

Weightage	8%
Deadline	2359h, 28 October 2025 (Tuesday)
Late Submission	2359h, 29 October 2025 (Wednesday) 50% penalty
Missed Late Submission Deadline	No marks

INSTRUCTIONS

1. Please download the relevant files for this assignment and use the answer sheet provided.
2. Before submission, please rename your file according to the following format, **NUSNET UserID-Lab03**. Files that are not renamed to the stated format will be subjected to a **10% penalty**.
3. Marks **will not** be awarded based on **keywords alone** but will depend on the explanations of the responses that are submitted.

INTENDED LEARNING OUTCOMES

The main aims of this assignment are to learn of reproduction in plants and the diversity in fruit types. At the end of this laboratory session, you must be able to

- (1) Identify the main parts of a typical angiosperm flower, fruit and seed.
- (2) Differentiate an angiosperm as a monocot or eudicot based on its morphology
- (3) Determine the placentation patterns in various fruit types

All the best and have fun!

INTRODUCTION

Plants have been critical in shaping life on Earth. They are habitat engineers and provide shelter to many organisms. As autotrophs, plants can transform solar energy into chemical energy through photosynthesis, making them fundamental bases of food webs, and a ready source of food for many other organisms. The flowering plants — or angiosperms — have evolved to become the most successful group of plants and a major component of our own diet. In this laboratory session, you will be examining the reproductive parts of angiosperm plants that are important in reproduction to understand plant parts that are important to agriculture and our food supply: - flowers, fruits and seeds.

FLOWERS

Flowers are the sexual reproductive structures of angiosperms, and are involved in the production of gametes. Flowers may contain only male reproductive structures or only female reproductive structures, but most angiosperm species contain both male and female parts (called a ‘perfect’ flower).

Parts of a flower:

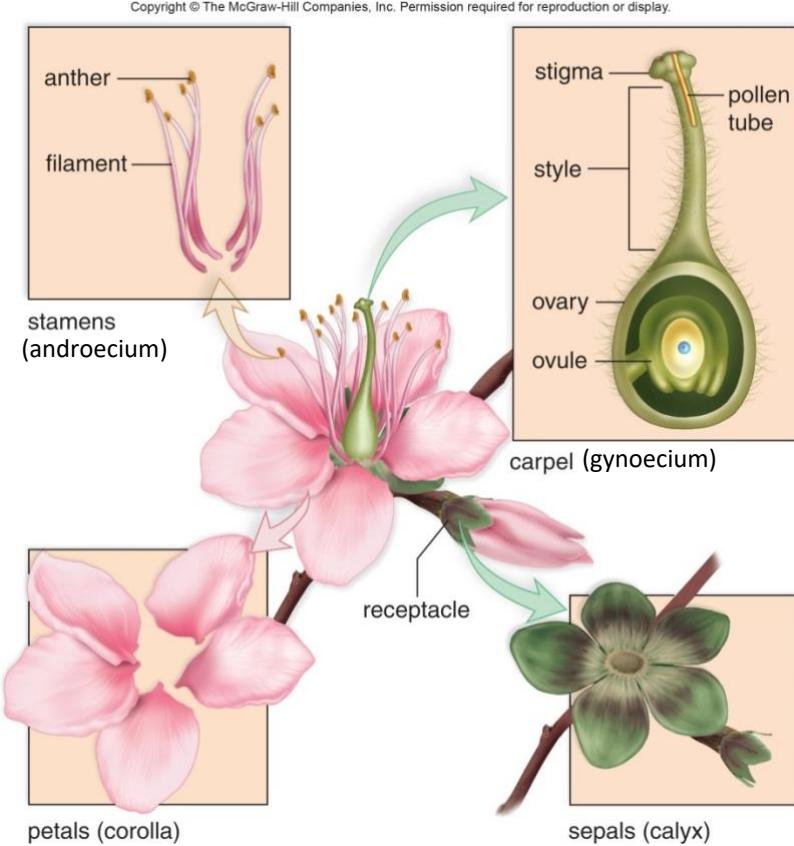
- **Pedicel** – stalk of the flower that attaches it to the stem
- **Receptacle** – end of the pedicel and the central base of the flower
- **Sepals** – outer leaf-like structures that enclose the flower when it is immature; in some species, the sepals look similar to the petals
- **Petals** – broad and brightly-coloured structures that attract pollinators.
- **Stamens** – male parts which consist of the **anther**, a football shaped structure that bears the pollen grains and the **filament**, which is thin and stalk-like
- **Carpels** – female parts, consisting of the **ovary**, a swollen structure that contains the ovules, a stalk-like **style** and the **stigma**, which is the sticky broadened tip; if parts of the carpels are fused into one, you can determine the true number by counting the lobes of the stigma.

TASKS

1. Examine the two specimens of two different species of angiosperm flowers provided to you —one is a monocot and one a eudicot. Determine the following information for **each** specimen:
- Provide the common and scientific names of the flower.
 - How many sepals, petals, stamens and carpels are present (see fig. 1)?
 - Generally, monocot species have their flower parts in threes or multiples of three. Eudicot species have their flower parts in fours or fives or multiples thereof. Explain if this flower specimen is a monocot or eudicot.

Fig. 1. Parts of a flower

Note:

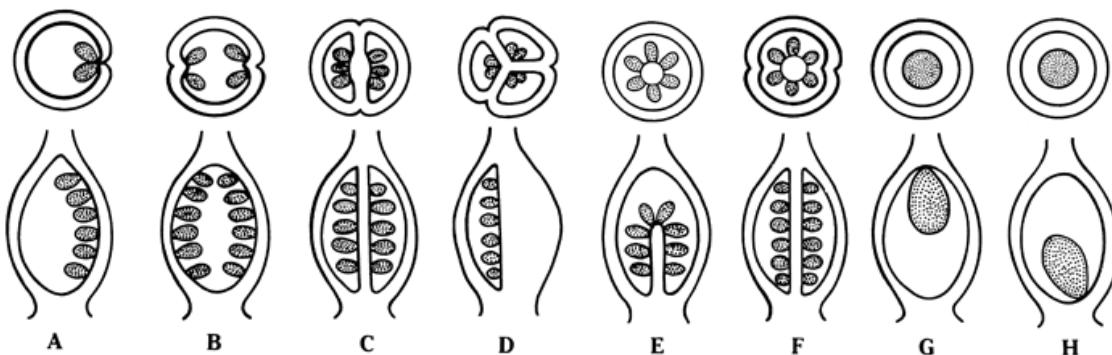
Gynoecium is all the carpels together*Androecium* is all the stamens together*Corolla* is all the petals together*Calyx* is all the sepals together

Identify the monocot species and label this **Species A**. Remove the sepals, petals and stamens until you can clearly see the ovary. Cut the ovary with a plastic knife to expose the internal structures. If possible, cut both a cross-section and a longitudinal section. Use the dissecting microscope to examine the ovary and ovules under higher magnification. Observe the following:

- How many chambers does the ovary have?
- How are the ovules attached to the ovary wall? Determine the placentation type of the ovary. Use fig. 2 below to determine your answer.
- Take a photograph of all plant parts arranged neatly [to be used in the answer]

Identify the eudicot species and label this **Species B**. Use a pair of forceps to remove the outer bracts, the sepals (calyx), and petals. Place the remaining parts under a dissecting microscope and remove the stamens until you can clearly see the stigma, style, and ovary. Peel back the ovary wall to expose the ovules within the ovary. Use the dissecting microscope to examine the ovary and ovules under higher magnification. Take a photograph of all plant parts arranged nearly [to be used in the answer]

Fig. 2. Types of placentation



A = marginal; **B** = parietal; **C** = axile (ovary with 2 loculi); **D** = axile (ovary with 3 loculi); **E** = free-central; **F** = free-central; **G** = apical; **H** = basal. Ovaries shown in cross section, with the longitudinal section below.

FRUITS AND SEEDS

When a flower is fertilized, **fruits** develop from the ovary and other structures associated with it. The wall of the ovary becomes the fruit wall or **pericarp**, while the ovules develop into seeds. Fruits can be classified as **dry** or **fleshy** depending on the characteristics of the pericarp. A fruit functions to help disperse seeds away from the parent plant. Some fruits eject their seeds when they dry, some are passively transported by wind or water, while most fleshy fruits are eaten by animals that travel away from the parent plant as they digest and eventually pass the seeds with their waste.

2. You are provided with the sweet pea, cherry tomato, chilli pepper, and longan. Cut the fruits open and see how the seeds are attached. Using Fig. 2, determine the type of placentation was present in the ovary from which these fruits developed?
3. Examine the strawberry and refer to fig. 3. The strawberry is an example of an **accessory fruit** because its edible parts do not develop from the ovary wall. Cut the strawberry longitudinally into two equal halves. Using the dissecting microscope to examine the strawberry, identify remnants of different floral structures, particularly the sepals, stamens and styles. What part of the flower did the red flesh of the strawberry develop from?

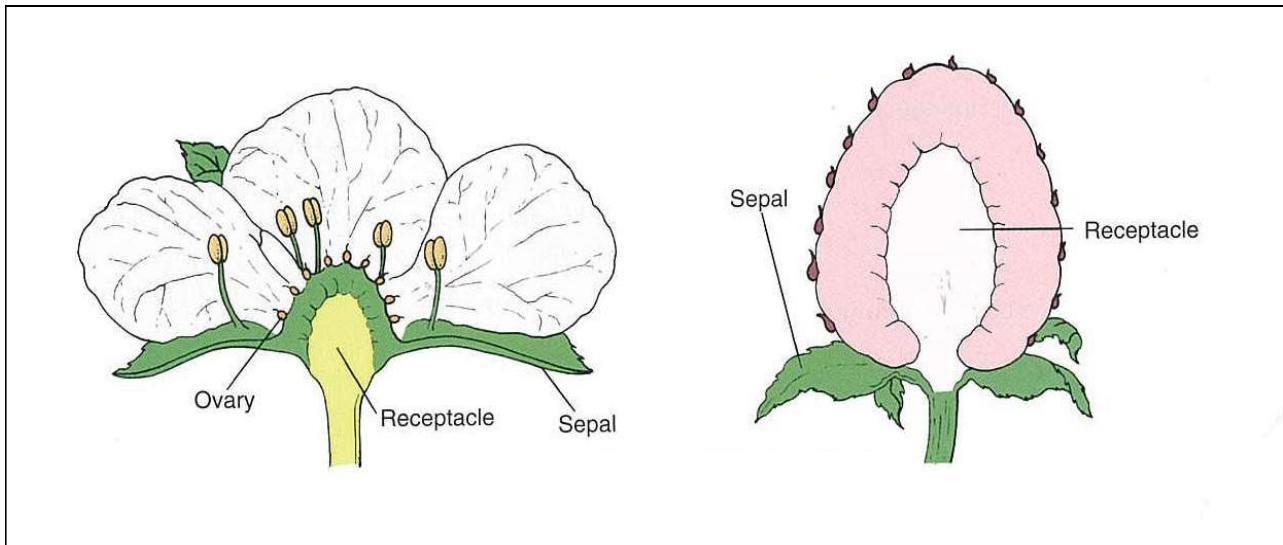


Fig. 3 Cross sections of strawberry flower and fruit.

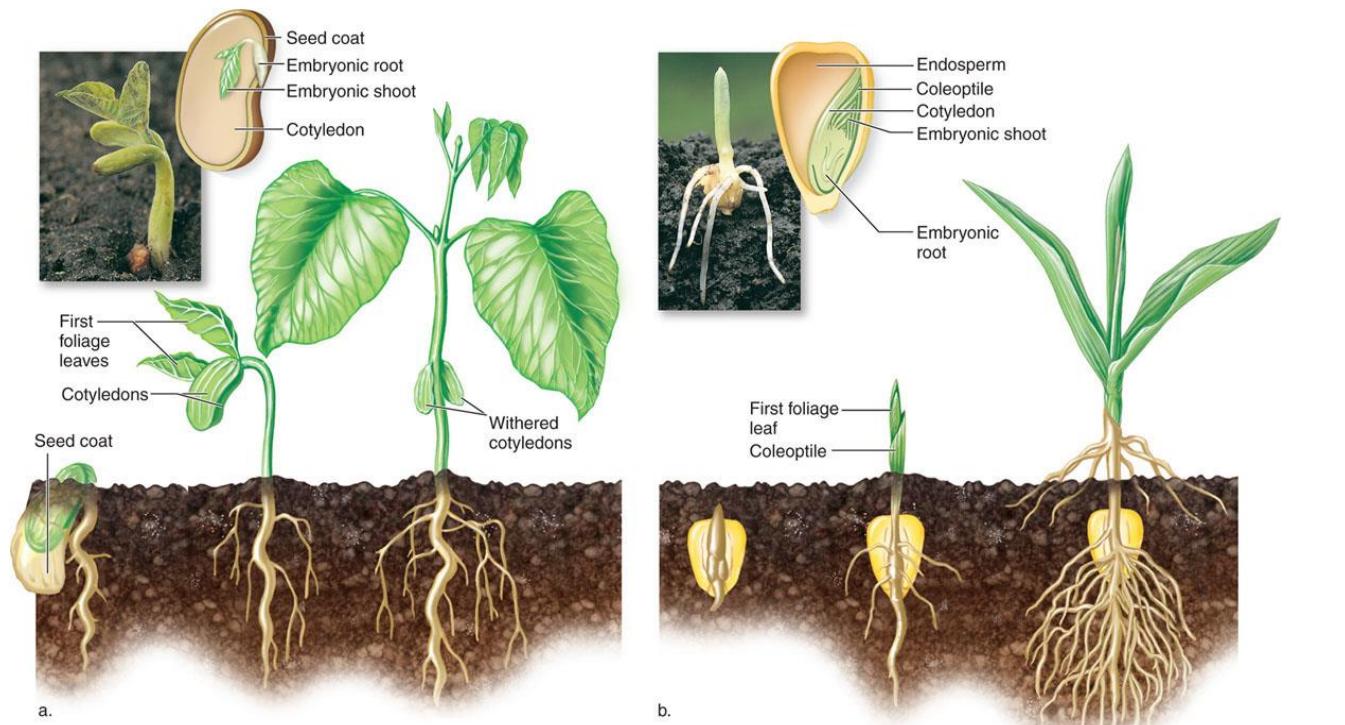
Seeds develop from the fertilized ovules and contain the embryonic plant and stored food for the embryo's development. The **cotyledons** are parts of the seed that help in nourishing the growing embryo. The dormant embryo is like a miniature plant - you can distinguish the **embryonic leaves, stem and roots**, especially in the eudicot seed. When a mature seed encounters the right environmental conditions, the embryo will resume its growth in a process called germination.

4. You are provided with one germinating seed each of a eudicot and monocot species. Examine the seeds and determine the various structures using fig. 4 below. If you are able, take apart the seeds to view internal structures. Take a photograph of all parts arranged nearly [to be used in the answer]. Determine which specimen is a eudicot and which is a monocot.

5. You are provided with one peanut fruit. The peanut fruit grows underground; a phenomenon is known as **geocarpy**. Crack the peanut fruit provided to open and examine the seeds. Remove the seed coat (the papery skin) and carefully separate the two halves of the seed to expose the peanut embryo. Using the dissecting microscope, identify the embryonic leaves, stem and root. Take a photograph.

Fig. 4. Seeds and germination in angiosperms. Determine which is a eudicot and a monocot species

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a: © Ed Re-schke; b: © Dwight Kuhn

QUESTIONS

1. Examine the two specimens or two different species of angiosperm flowers provided to you — one is a monocot and one is a eudicot. Determine the following information for each specimen (A) and (B):
 - Provide the common and scientific names of the flower. [2 marks per species]
 - Attach the image(s) that you captured and label the various flower parts. You can choose to present the flower parts in one image for each species, or create a composite figure for each species [2 marks per species]
 - Explain if this flower specimen is a monocot or eudicot. [2 marks per species]
 - (Specimen A): Identify the type of placentation in the ovary of the flower. Support your answer with a photograph and short explanation of your observation. [3 marks]

2. Determine the type of placentation for the sweet pea, cherry tomato, chilli pepper, and longan. [4 marks]

- 3. What colour is the true strawberry fruit? Include a labelled photograph from your tasks to indicate your answer. What is the purpose of the red flesh? [2 marks]**

- 4. You are provided with one germinating seed each of a eudicot and monocot species. Label all parts of the germinating seed on the photographs you've taken. Determine which specimen is a eudicot and which is a monocot. Provide a reason for your answer. [8 marks]**

- 5. Attach the photograph of the peanut, and label the embryonic leaves, stem and root. [3 marks]**