

Final Exam in plant biosystemics 2

Questions

Part I : Course questions (10 points) : Answer concisely and precisely.

Q1- For each of the following descriptions, provide the correct botanical term (one word or short phrase)? (4 pts)

- Inflorescence where the main axis terminates in a flower and growth is limited.
- A root system where numerous thin roots arise from the stem base, typical of monocots.
- Term for a flower that lacks one or more of the four main whorls (calyx, corolla, androecium, gynoecium)
- Type of leaf attachment when the petiole is attached to the center of the blade (like a shield).

Q2- List three fundamental differences between gymnosperms and angiosperms? (3 pts)

Q3- What are the four extant phyla of gymnosperms? (1 pts)

Q4- What is the origin of the storage tissue in a pine (Gymnosperms) seed and in a bean (Angiosperms) seed? (1 pts)

Q5- What is double fertilization? Name the two fusion events and their products. (1pts)

Part II: Multiple choice questions (6 points – one correct answer)

1- In gymnosperms, the seed storage tissue is:

- a) endosperm b) perisperm c) megagametophyte d) cotyledons

2- Double fertilization is characteristic of:

- a) Pinophytes b) Gnetophytes c) Angiosperms d) Cycadophytes

3- The gymnosperm ovule is NOT:

- a) surrounded by integuments b) enclosed in an ovary
c) borne on a cone d) provided with a micropyle

4- Which of these plants has flagellated sperm?

- a) Pine b) Oak c) Ginkgo d) Wheat

5- A mature female pine cone consists of:

- a) megasporophylls b) seed scales bearing ovules c) sterile bracts only d) an ovary

6- Gnetophytes are distinguished by:

- a) absence of vessels b) presence of vessels in xylem c) unisexual flowers d) naked seeds

Part III : Case Study (4 points)

1- You are studying an unknown flowering plant. Observations:

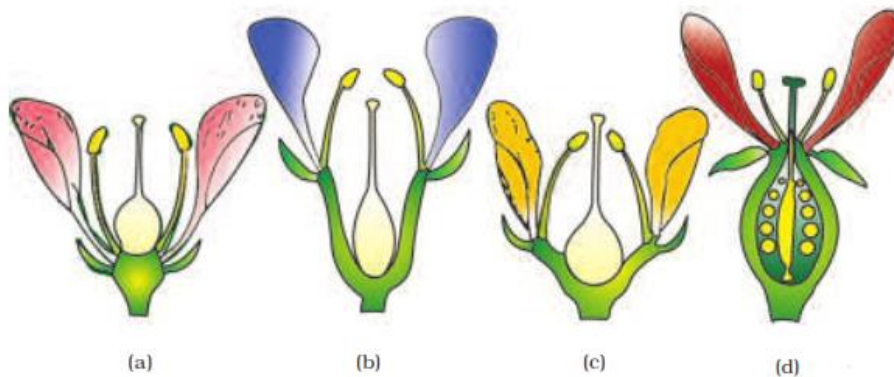
- Flowers are small, dull green, without petals, and produce large amounts of dry, lightweight pollen.
- Stigmas are feathery and exerted.
- The plant is grown in large fields and is wind-pollinated.
- However, when isolated from wind, some seeds still form without any pollinator.

Q1- What type of pollination is primarily expected based on floral traits? Name the scientific term (anemogamy/entomogamy) ?

Q2- What is the likely mechanism that allows seed set in the absence of wind? Provide the specific term and explain how it eliminates pollen transport uncertainty ?

Q3- Would you expect this plant to have high genetic diversity among its offspring? Why or why not?

2- Based on floral insertion, what types of flowers are illustrated in the figure below?



Good Luck



Standard Answer Key

Part I : Course questions (10 points) : Answer concisely and precisely.

Q1- The correct botanical term (one word or short phrase)? (4 pts)

- Inflorescence where the main axis terminates in a flower and growth is limited. (Cymose)
- A root system where numerous thin roots arise from the stem base, typical of monocots. (Fibrous root system)
- Term for a flower that lacks one or more of the four main whorls (calyx, corolla, androecium, gynoecium) (Incomplete flower)
- Type of leaf attachment when the petiole is attached to the center of the blade (like a shield). (Peltate)

Q2- Three differences between gymnosperms and angiosperms (3 pts – 1 per correct difference)

Gymnosperms: naked seeds (not enclosed in an ovary); angiosperms: seeds enclosed in an ovary (fruit).

Gymnosperms: no double fertilization; angiosperms: double fertilization producing triploid endosperm.

Gymnosperms: female gametophyte (megagametophyte) is the nutritive tissue; angiosperms: triploid endosperm is the nutritive tissue.

(Optional third) Gymnosperms: predominantly wind pollination; angiosperms: diverse pollinators.

(Or) Gymnosperms: most lack vessels (except Gnetophytes); angiosperms: have vessels in xylem.

Q3- Four phyla of gymnosperms (1 pt – 0.25 each)

Coniferophyta (Pinophyta) ; Cycadophyta ; Ginkgophyta ; Gnetophyta.

Q4- The origin of the storage tissue in a pine (Gymnosperms) seed and in a bean (Angiosperms) seed : (1 pt – 0.5 each)

- Pine seed: megagametophyte (haploid female gametophyte tissue).
- Bean seed: endosperm (triploid, but often consumed and cotyledons become storage organs; technically endosperm is the original nutritive tissue in angiosperms). Accept "cotyledons" if student specifies that endosperm is consumed.

Q5- Double fertilization:

Unique to angiosperms. Two fusions: (0.25 pt)

- **Syngamy**: one male gamete + egg cell → diploid zygote. (0.25 pt)
- **Triple fusion**: second male gamete + two polar nuclei → triploid primary endosperm nucleus (PEN). (0.5 pt)

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1-

Q1- Anemogamy (wind pollination). (1 pt)

Q2- Autogamy (self-pollination). Eliminates uncertainty of pollen transport; no need for external agents. (1 pt)

Q3- Low genetic diversity because self-pollination (autogamy) reduces genetic exchange between individuals.

Offspring are largely homozygous (1 pt)

2- The figure shows three main types of flowers based on the position of floral parts relative to the ovary:

(a) : **Hypogynous** – Ovary superior, other parts attached below the ovary. (0.25 pt)

(b) and (c) : **Perigynous** – Ovary half-inferior, other parts on the rim of the thalamus at the same level. (0.5 pt)

Epigynous – Ovary inferior, other parts arise above the ovary. (0.25pt)