

Plant Kingdom — Assignment 2

Class 11 Biology · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Classification of Plants and Alternation of Generations

1. Distinguish between cryptogams and phanerogams.
2. What is meant by the dominant phase in the life cycle?
3. Explain alternation of generations in plants with the terms gametophyte and sporophyte.

Bryophytes — The Amphibians of the Plant Kingdom

1. State two characteristics of bryophytes.
2. How does the bryophyte sporophyte obtain nutrition?
3. Describe the life cycle of a moss.

Pteridophytes — The First Vascular Plants

1. State two features that distinguish pteridophytes from bryophytes.
2. What are sporophylls?
3. Describe the life cycle of a pteridophyte.

Gymnosperms — Naked Seeds

1. State two features of gymnosperms.
2. How are male and female gametophytes in gymnosperms reduced?
3. Describe the life cycle of Pinus.

Angiosperms — Flowering Plants

1. Distinguish between monocots and dicots.
2. State two characteristic features of angiosperms.
3. Compare angiosperms with gymnosperms.

Economic Importance and Summary

1. State the economic importance of gymnosperms.
2. Give two uses of angiosperms.
3. Summarise the increasing dominance of the sporophyte across the plant groups.

Part B — Integrated problems (multi-topic)

1. Trace the increasing dominance of the sporophyte from bryophytes to angiosperms, naming the dominant phase at each level.
2. Explain why bryophytes are called amphibians of the plant kingdom, although they are terrestrial.
3. Pteridophytes are the first vascular plants but are still restricted to moist habitats. Explain why.
4. Compare the seed habit of gymnosperms and angiosperms, and state one advantage of enclosing seeds in fruits.
5. Describe alternation of generations using a named bryophyte and a named pteridophyte.
6. List the chief economic uses of bryophytes, pteridophytes, gymnosperms and angiosperms.

Answer Key

Classification of Plants and Alternation of Generations

Cryptogams have hidden reproductive organs and no seeds (bryophytes, pteridophytes); phanerogams bear seeds and have visible reproductive organs (gymnosperms, angiosperms). The dominant phase is the one that is the main, conspicuous, long-lived stage. Alternation of generations is the alternation of a haploid gametophyte (produces gametes) and a diploid sporophyte (produces spores by meiosis); the sporophyte becomes progressively more dominant from bryophytes to angiosperms.

Bryophytes — The Amphibians of the Plant Kingdom

They live in moist places but need water for the movement of motile antherozoids to the archegonium for fertilisation. The sporophyte is attached to the gametophyte and depends on it for nutrition. Life cycle of a moss (*Funaria*): spore → protonema → leafy gametophyte (haploid) → antheridia and archegonia → fertilisation (needs water) → zygote → sporophyte (dependent) → capsule → spores.

Pteridophytes — The First Vascular Plants

Pteridophytes have vascular tissue (xylem and phloem) and a dominant sporophyte; bryophytes lack true vascular tissue and have a dominant gametophyte. Sporophylls are the spore-bearing leaves (often aggregated into a strobilus). Life cycle: sporophyte → sporangia → spores → prothallus (gametophyte) → antheridia/archegonia → fertilisation → zygote → sporophyte.

Gymnosperms — Naked Seeds

Gymnosperms bear naked seeds (ovules not enclosed in an ovary) and have a dominant sporophyte; the male gametophyte is a pollen grain and the female gametophyte is reduced. Life cycle of *Pinus*: sporophyte (sporophylls in cones) → microspores and megaspores → pollen and reduced female gametophyte → ovule → seed. Economic uses: timber, resins, turpentine, and an edible seed in some species.

Angiosperms — Flowering Plants

Monocots: one cotyledon, parallel venation, fibrous roots, floral parts in 3s. Dicots: two cotyledons, reticulate venation, tap roots, floral parts in 4s or 5s. Angiosperms have flowers, seeds enclosed in fruits and double fertilisation. Compared with gymnosperms, angiosperms have enclosed seeds (fruits), flowers, more reduced gametophytes and dominate most habitats.

Economic Importance and Summary

Gymnosperms: timber, resin, turpentine, and seeds of some species. Angiosperms: food (cereals, pulses, fruits), medicines, timber, fibres, oils. Sporophyte dominance: bryophytes (gametophyte dominant) → pteridophytes (sporophyte dominant) → gymnosperms → angiosperms (sporophyte most dominant, gametophyte maximally reduced).

Integrated problems

1: bryophytes (gametophyte) → pteridophytes (sporophyte) → gymnosperms (sporophyte) → angiosperms (sporophyte dominant; gametophyte reduced to a few cells). 2: They are terrestrial but need water for the motile antherozoids to swim to the archegonium — hence 'amphibians of the plant kingdom'. 3: They still need water for fertilisation (motile sperms swim to the archegonium), so they are restricted to moist habitats. 4: Both bear seeds but gymnosperm seeds are naked and angiosperm seeds are enclosed in fruits; fruits protect the seed and aid dispersal. 5: Funaria (bryophyte: gametophyte dominant) and Pteris (pteridophyte: sporophyte dominant). 6: bryophytes — peat/Sphagnum packing; pteridophytes — ornamentals/medicines; gymnosperms — timber/resins; angiosperms — food/medicines/fibres.