

NCERT Exemplar Solutions of Class 11 Biology – Chapter: 3 – Plant Kingdom

SHORT ANSWER TYPE QUESTIONS

1. Food is stored as Floridian starch in Rhodophyceae. Mannitol is the reserve food material of which group of algae?

Solution:

Mannitol is the reserve food material of Phaeophyceae, the brown algae.

Explanation: Different groups of algae store different reserve food materials - Chlorophyceae stores starch, Rhodophyceae stores Floridian starch, and Phaeophyceae stores mannitol and laminarin.

2. Give an example of plants with

- Haplontic life cycle
- Diplontic life cycle
- Haplo-diplontic life cycle

Solution:

- Volvox
- Pinus
- Ectocarpus

Explanation:

- Haplontic: Dominant phase is haploid (gametophyte), diploid phase is short-lived
 - Diplontic: Dominant phase is diploid (sporophyte), haploid phase is short-lived
 - Haplo-diplontic: Both phases are equally dominant
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3. The plant body in higher plants is well-differentiated and well developed. Roots are the organs used for absorption. What is the equivalent of roots in the less developed lower plants?

Solution:

Rhizoids, these are the thread-like structures. In liverworts unicellular rhizoids are present and in mosses multicellular rhizoid with oblique septa are present.

Explanation: Rhizoids serve the same function as roots in lower plants - anchorage and absorption of water and minerals, but they lack the complex tissue organization of true roots.

4. Most algal genera show haplontic lifestyle. Name an alga which is

- Haplo-diplontic
- Diplontic

Solution:

- Ectocarpus is the algae which are Haplo-diplontic
- Fucus is the algae which are diplontic

Explanation: While most algae are haplontic, some show different life cycle patterns with varying dominance of haploid and diploid phases.

5. In Bryophytes male and female sex organs are called _____ and _____.

Solution:

a. antheridium and b. archegonium

Explanation: Antheridium produces male gametes (antherozoids) and archegonium contains the female gamete (egg). Both are multicellular sex organs with sterile protective layers.

SHORT ANSWER TYPE QUESTIONS

1. Why are bryophytes called the amphibians of the plant kingdom?

Solution:

- a. They inhabit two well-defined habitats i.e. land and water.
- b. Bryophytes can complete their life cycle without water; water is required for fertilisation.
- c. Water also plays an important role in dehiscence of antheridium and archegonium.
- d. As it lacks proper vasculature, water conduction occurs through capillary action.

Hence a thin film of water is required on land, for survival.

Explanation: Bryophytes are transitional between aquatic and terrestrial life, requiring water for reproduction while being able to survive on land, similar to how amphibians need both water and land environments.

2. The male and female reproductive organs of several pteridophytes and gymnosperms are comparable to floral structures of angiosperms. Attempt to compare the various reproductive parts of pteridophytes and gymnosperms with reproductive structures of angiosperms.

Solution:

Reproductive parts of pteridophytes and gymnosperms	Reproductive structures of angiosperms
Strobili/cone	Flower
Microsporophyll	Stamen
Megasporophyll	Pistil/Carpel
Microsporangium	Anther
Megasporangium	Ovule

Explanation: This comparison shows the evolutionary relationship between different plant groups, with similar reproductive structures performing analogous functions across different taxa.

3. Heterospory i.e., the formation of two types of spores – microspores and megaspores is a characteristic feature in the life cycle of a few members of pteridophytes and all spermatophytes. Do you think heterospory has some evolutionary significance in the plant kingdom?

Solution:

Heterospory led to in situ embryo development. The embryo derives nutrition from the female gametophyte and is better protected. Heterospory led to the evolution of seed habit, which helped the plants to flourish and tide over long periods of unfavourable conditions.

Explanation: Heterospory represents a crucial evolutionary advancement that paved the way for seed formation, providing better protection and nutrition for developing embryos.

4. How far does Selaginella one of the few living members of lycopodiales (pteridophytes) fall short of seed habit?

Solution:

Selaginella produces macro and microspores. The megaspores and microspores germinate and produce female and male gametophytes. The embryo was retained within the female gametophyte up to the development of rhizophore, roots and leaves only. Hence, there is no complete retention of an embryo. The seeds of Selaginella and Lycopodium failed to develop protective covering called the integument.

Explanation: Selaginella shows some features of seed plants but lacks complete seed development, particularly the protective integument that characterizes true seeds.

5. Each plant or group of plants has some phylogenetic significance concerning evolution: Cycas, one of the few living members of gymnosperms is called as the 'relic of past'. Can you establish a phylogenetic relationship of Cycas with any other group of plants that justifies the above statement?

Solution:

Cycas is the connecting link between Gymnosperms and Pteridophyte. They show similarities with pteridophytes like flagellated antherozoids, circinate ptyxis, megasporophyll is leaf-like, presence of archegonia etc.

Explanation: Cycas retains many primitive features that link it to pteridophytes, making it a "living fossil" that provides insights into plant evolution.

6. The heterosporous pteridophytes show certain characteristics, which are the precursor to the seed habit in gymnosperms. Explain.

Solution:

Genera like selaginella, Sylvania, Marsilea etc produces two kinds of spores. Micro and macrospores which are known as heterosporous.

i. Evolutionary heterospory

- ii. In-situ development of the embryo within the female gametophyte.
- iii. The decrease in the number of megaspore to one.

Explanation: These characteristics represent evolutionary steps toward the seed habit, showing how pteridophytes bridge the gap between simpler spore-producing plants and seed plants.

7. Comment on the lifecycle and nature of a fern prothallus.

Solution:

Life Cycle:

1. Fern shows diplo-haplontic life cycle.
2. Diploid sporophyte represents the dominant, independent, photosynthetic plant body.
3. The sporophyte bears sporangia which produce spores by meiosis.
4. These spores germinate to form free-living prothallus which represents a gametophyte.
5. Sexual reproduction: syngamy results in the formation of a diploid zygote. Zygote germinates into a diploid sporophyte.

Prothallus:

1. It represents the gametophytic phase.
2. Multicellular, independent, green, photosynthetic thallus.
3. It needs damp and shady places.
4. Bears sex organs, rhizoids and food-laden parenchymatous cells.

Explanation: The fern prothallus is a small, heart-shaped structure that represents the sexual phase of the fern life cycle, contrasting with the large sporophyte that we commonly recognize as the fern plant.

8. How are the male and female gametophytes of pteridophytes and gymnosperms different from each other?

Solution:

Pteridophytes	Gymnosperm
Male gametophytes are the antherium	Antheridium absent
Cone may or may not be present	Cones distinctive feature
Motile male gametes are produced	Non-motile gametes
Female egg not enclosed in an ovule	Neck canal cells are absent

Explanation: These differences reflect the evolutionary advancement from pteridophytes to gymnosperms, particularly in reproductive efficiency and protection of gametes.

9. In which plant will you look for mycorrhiza and coralloid roots? Also, explain what these terms mean.

Solution:

Mycorrhiza can be seen in Pinus and coralloid root in Cycas.

Mycorrhiza – symbiotic association between the roots of higher plants & fungi. Fungi help the plants in the absorption of nutrients especially phosphorus in return it gets shelter.

Coralloid roots – when the roots of higher plants like Cycas shows association with BGA (Blue Green Algae). It is also an example of a symbiotic association.

Explanation: Both represent important symbiotic relationships that help plants obtain nutrients - mycorrhiza for mineral absorption and coralloid roots for nitrogen fixation.

