

Exercise Questions

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1. What is the basis of classification of algae?

Solution:

Presence of pigments which imparts traditional color on algae is the main basis for the classification of algae.

Name of the pigment	Chlorophyll type	Color imparted
Chlorophyceae	Chlorophyll a and chlorophyll b	Green
Phaeophyceae	chlorophyll a, chlorophyll c, fuxoxanthin	Brown
Rhodophyceae	chlorophyll a and chlorophyll d, phycoerythrin	Red

Now, algae are classified on different criteria such as:

- Flagellation
- Storage products
- Cellular organization
- Constitution of cell walls

2. When and where does reduction division take place in the life cycle of a liverwort, a moss, a fern, a gymnosperm and an angiosperm?

Solution:

Reduction division takes place in the following stages:

- Liverworts – Meiosis takes place in the spore mother cells of the capsule in sporangium resulting in haploid spore formation
- Moss – Meiosis occurs in spore mother cells of spore sacs in the capsule of sporangium
- Fern – sporangia are endured on sporophylls (fertile leaves). The process of meiosis occurs in spore mother cells of sporangium for the formation of haploid spores.
- Gymnosperm – meiosis occurs in microsporangia located in the microsporophylls, in the microspore mother cells for the formation of haploid pollen grains giving rise to male gametophyte
- Angiosperm – pollen grains that are formed in microspore mother cells leads to the formation of male gametophyte in the anther of the stamen. The megaspore mother cell located in the nucleus of the ovule undergoes meiosis for the formation of haploid megaspore which eventually forms the female gametophyte.

3. Name three groups of plants that bear archegonia. Briefly describe the life cycle of any one of them.

Solution:

Bryophytes, Pteridophytes, and Gymnosperms are the plants that bear archegonia.

The life cycle of Bryophytes

- Bryophytes are haploid, and they produce gametes. Sex organs in bryophytes are multicellular.
- The male sex organ is antheridium, which produces biflagellate antherozoids. Female sex organs are called archegonium which produces single egg.
- Antheridium releases antherozoids into the water which comes in contact with archegonium.
- An antherozoid fuses with the egg to produce the zygote.
- The zygote undergoes reduction division to produce a multicellular body called a sporophyte.
- Saprophytes undergo reduction division to produce haploid spores.
- These spores germinate to produce gametophyte.

4. Mention the ploidy of the following:

protonemal cell of a moss; primary endosperm nucleus in dicot, leaf cell of a moss; prothallus cell of a fern; gemma cell in Marchantia; meristem cell of monocot, ovum of a liverwort, and zygote of a fern.

Solution:

Cell	Type of Ploidy
Protonemal cell of a moss	Haploid
Primary endosperm nucleus in dicot	Triploid
leaf cell of a moss	Haploid
prothallus cell of a fern	Haploid
gemma cell in Marchantia	Haploid
meristem cell of monocot	Diploid
ovum of a liverwort	Haploid
zygote of a fern.	Diploid.

5. Write a note on economic importance of algae and gymnosperms.

Solution:

Importance of Algae

- Algae fixes Carbon dioxide with the help of photosynthesis

- It increases the level of dissolved oxygen in their immediate environment
- They produce rich compounds that serve as food for aquatic animals.
- Marine algae are used as food ex: Laminaria and Sargassum
- Certain algae are used as hydrocolloids
- Agar is used in growing microorganisms and in preparation of jellies.
- Chlorella is used as food by space travellers.

Importance of Gymnosperms

- Gymnosperms plants are used as ornamentals. Some are features in formal gardens – used for bonsai
- Their fibers are used in the preparation of paper pulp.
- Turpentine and resins are obtained from confers resin
- Useful oils are extracted from gymnosperms like junipers, pines, hemlock, fir, spruces, and arborvitae.
- Gymnosperm seeds are used as food products like bakery items.
- Occassionaly used to create silk and other textiles

6. Both gymnosperms and angiosperms bear seeds, then why are they classified separately?

Solution:

Following are the reasons for classifying Angiosperms and Gymnosperms separately.

- In gymnosperms, ovules are naked whereas they are enclosed inside the ovary in angiosperms.
- In Gymnosperms endospore is haploid and produced before fertilization whereas in Angiosperms endosperm is triploid and formed after double fertilization.
- In Gymnosperms double fertilization does not occur, but in Angiosperms, double fertilization occurs.
- In gymnosperms, wood is nonporous and in angiosperms wood is porous.

7. What is heterospory? Briefly comment on its significance. Give two examples

Solution:

The phenomenon of producing two different kinds of spores in the same plant is known as heterospory.

Significance of heterospory:

- Heterospory leads to the development of seeds in gymnosperms and angiosperms.
- It is required in the differentiation of male and female gametophytes.
Examples: *Salvinia*, *Selaginella*

8. Explain briefly the following terms with suitable examples:-

- (i) protonema
- (ii) antheridium
- (iii) archegonium
- (iv) diplontic
- (v) sporophyll
- (vi) isogamy

Solution:

- i) Protonema is the haploid stage in the bryophyte lifecycle where thread-like chain of cells are formed
Ex: In mosses protonema develops directly from a spore.
- ii) Antheridium - The male sex organ, producing male gametes in bryophyte and pteridophytes is called antheridium. Ex: many fungi and algae have antheridia during their reproductive phases.
- iii) Archegonium is a female reproductive organ of bryophytes which is flask-shaped and produces a single egg. Observed in pteridiophytes, gymnosperms, bryophytes, they are jacketed and multicellular, possessing a neck and a swollen venter.
- iv) Diplontic - Life cycle in which dominant free living phase is diploid, generating haploid gametes.
Ex: Sargassum
- v) A leaf which bears sporangia is called as sporophyll, which may be microsporophyll or megasporophyll. These structures combine to form strobini(cones) Ex: Pinus
- vi) Isogamy - Sexual reproduction that takes place through fusion of two gametes which can be flagellated and similar in size or non-flagellated (non-motile) but similar in size. Such reproduction is called isogamy. Ex: Ectocarpus

9. Differentiate between the following:-

- (i) red algae and brown algae
- (ii) liverworts and moss
- (iii) homosporous and heterosporous pteridophyte
- (iv) syngamy and triple fusion

Solution:

Following are the differences:

i)

- In red algae chlorophyll a and chlorophyll d are present whereas in brown algae chlorophyll a and c are present.
- In red algae, Phycobilins are present whereas in brown algae phycobilins are absent.
- Red algae have reserved food material in the form of Floridian starch whereas in brown algae it is laminarin.
- Red algae are non-flagellated, and brown algae are flagellated.

ii) In liverworts protonema stage is absent and in moss lifecycle begins with protonema. In liverworts plant body is dorsoventral whereas in moss plant body is differentiated into a stem-axis.

iii) Homosporous possesses only one type of spores whereas heterosporous possesses morphologically distinct spores in a different sporangia

iv) Syngamy is the fusion of the male gamete with the ovum whereas triple fusion is the fusion of another male gamete with two polar nuclei.

10. How would you distinguish monocots from dicots?

Solution:

Monocots	Dicots
Have single cotyledon seed	Seeds having two cotyledons
Venation in leaves is parallel.	Have reticulate venations in leaves
Flowers are trimerous	Flowers are tetramerous or pentamerous
Primary root replaced by adventitious roots and are short-lived	Primary roots occur in a few cases. Primary root is long-lived
Vascular bundle is scattered	Vascular bundle are organized in a ring
Absence of vascular cambium	Presence of vascular cambium

11. Match the following (column I with column II)

Column I	Column II
(a) Chlamydomonas	(i) Moss

(b) Cycas	(ii) Pteridophyte
(c) Selaginella	(iii) Algae
(d) Sphagnum	(iv) Gymnosperm

Solution:

Column I	Column II
(a) Chlamydomonas	(iii) Algae
(b) Cycas	(iv) Gymnosperm
(c) Selaginella	(ii) Pteridophyte
(d) Sphagnum	(i) Moss

12. Describe the important characteristics of gymnosperms.

Solution:

Important characteristics of gymnosperms are as follows

- In Gymnosperm ovules are not enclosed by the ovary. They remain exposed before and after fertilization.
- Seeds are naked
- Gymnosperms include medium-sized trees or tall trees and shrubs.
- Roots are taproots
- Stems are branched or unbranched
- Leaves are simple and compound
- Plant body is distinguished into root, stem and leaves and is a sporophyte
- They produce two kinds of spores hence they are termed as heterosporous
- Fertilization takes place in the absence of external water by syphonogamy