
#424313

Topic: Algae

Find out what do the terms algal bloom and red-tides signify.

Solution

Algal bloom refers to the vigorous growth of algae or blue-green algae in the water, due to the enrichment of water body with mineral nutrients coming from fields, resulting in discoloration of the water body. This causes an increase in the biological oxygen demand (BOD), resulting in the death of fishes and other aquatic animals, due to suffocation.

Red-tide is a phenomenon caused by algal blooms during which algae become so numerous that they discolour coastal waters (hence, the name "red tide").

#424327

Topic: Algae

What is the basis of classification of algae?

Solution

The presence or absence of pigments is the main basis of classification of algae.

Chlorophyceae: Chlorophyll a and b are present in them and impart the green colour. Chlorophyceae are also called as 'blue-green algae'.

Phaeophyceae: Chlorophyll a and c and fucoxanthin are present. Fucoxanthin imparts the brown colour. Phaeophyceae are also called as 'brown algae'.

Rhodophyceae: Chlorophyll a and d and phycoerythrin are present. Phycoerythrin imparts red colour. Rhodophyceae are also called as 'red algae'.

#424328

Topic: Pteridophyta

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

Liverwort – In liverworts, the main plant body is haploid (gametophytic). It bears the male and female sex organs which produce gametes. These gametes fuse to form a zygote. The zygote develops on the gametophytic plant body to form a sporophyte. The sporophyte is differentiated into the foot, seta, and capsule. Many haploid spores are produced as a result of the reduction division taking place inside the capsule.

Moss – In mosses, the primary protonema (developed in the first stage) develops into the secondary protonema. Both these stages are haploid or gametophytic. The secondary protonema bears the sex organs which produce gametes. These gametes fuse to form a zygote. The zygote develops into a sporophyte. Many spores are formed as a result of the reduction division taking place in the capsule of this sporophyte.

Fern – In ferns, the main plant body is sporophytic. Its leaves are known as sporophylls and these bear the sporangia. Reduction division takes place in these sporangia, thereby producing many spores.

Gymnosperm – In gymnosperms, the main plant body is sporophytic. They bear two types of leaves : microsporophylls and megasporophylls. Reduction division takes place in the microsporangia present on the microsporophylls (producing pollen grains) and on the megasporangia present on the megasporophylls (producing megaspores).

Angiosperm – In angiosperms, the main plant body is sporophytic and bears flowers. The male sex organ in the flower is the stamen, while the female sex organ is the pistil.

Reduction division takes place in the anthers of the stamen (producing haploid pollen grains) and in the ovary of the pistil (producing eggs).

#424329

Topic: Bryophyta

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

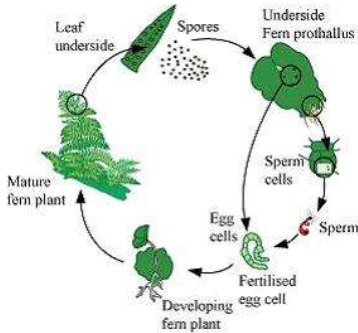
Solution

Archegonium is the female sex organ that produces the female gamete or egg. It is present in the life cycles of bryophytes, pteridophytes, and gymnosperms.

Life cycle of a fern (*Dryopteris*) :

Dryopteris is a common fern with pinnately-compound leaves. The main plant-body is sporophytic. Many sporangia are borne on the lower surfaces of its mature leaves. Each sporangium has spore mother cells which undergo meiosis to produce haploid spores. On maturing, these spores dehisce and germinate to give rise to a heart-shaped gametophyte called as prothallus.

The prothallus bears the male and female sex organs called antheridia and archegonia respectively. The antheridia produce sperms that swim in water to reach the archegonia. The egg is produced by the archegonia. As a result of fertilisation, a zygote is formed. The zygote forms an embryo, which in turn develops into a new sporophyte. The young plant comes out of the archegonium of the parent gametophyte.



#424336

Topic: Algae

Write a note on economic importance of algae?

Solution

Algae have diverse economic uses. They perform half of the total carbon dioxide-fixation on earth by photosynthesis, acting as the primary producers in aquatic habitats.

(a) Food source: Many species of marine algae such as *Porphyra*, *Sargassum*, and *Laminaria* are edible. *Chlorella* and *Spirulina* are rich in proteins. Thus, they are used as food supplements.

(b) Commercial importance: Agar is used in the preparation of jellies and ice-cream. It is obtained from *Gelidium* and *Gracilaria*. Carrageenin is used as an emulsifier in chocolates, paints, and toothpaste. It is obtained from the red algae.

(c) Medicines: Many red algae such as *Corallina* are used in treating worm infections.

#424339

Topic: Gymnosperms

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

Solution

Gymnosperms and angiosperms are seed-producing plants with diplontic life cycles.

In gymnosperms, the sporophylls are aggregated to form compact cones. The microsporophylls are broad and are not distinguished into filaments and anthers. The megasporophylls are woody and lack the ovary, style, and stigma, because of which the ovules lie exposed. The female gametophyte consists of archegonia. The fertilisation process involves the fusion of a male gamete with the female gamete. Their endosperm is haploid. The produced seeds are naked as there is no fruit formation.

Angiosperms are also known as flowering plants. They have sporophylls that aggregate to form flowers with the perianth. The microsporophylls consist of stamens containing pollen sacs. These sacs bear the male gametes called as pollen grains. The megasporophylls are delicate and rolled, forming carpels that contain the ovary, style, and stigma. The ovules are present inside the ovary. The archegonium is replaced by an egg apparatus. Two male gametes enter the egg apparatus at the time of fertilisation. One male gamete fertilises the egg and the other fuses with the diploid secondary nucleus to form an endosperm. The resulting endosperm is thus, triploid. In addition, in angiosperms, the development of seeds takes place inside the fruits.

#424343

Topic: Bryophyta

Explain briefly the following terms with suitable examples :

- (i) Protonema
- (ii) Antheridium
- (iii) Archegonium
- (iv) Diplontic
- (v) Sporophyll
- (vi) Isogamy

Solution

- (i) Protonema – It is the first stage in the life cycle of a moss, developing directly from the spore. It consists of creeping, green, branched, and often filamentous structures.
- (ii) Antheridium – It is the male sex organ present in bryophytes and pteridophytes and is surrounded by a jacket of sterile cells. It encloses the sperm mother cells, which give rise to the male gametes.
- (iii) Archegonium – It is the female sex organ present in bryophytes, pteridophytes, and gymnosperms. In bryophytes and pteridophytes, it generally has a swollen venter and a tubular neck and contains the female gamete called the egg.
- (iv) Diplontic – It is the term used for the life cycles of seed-bearing plants (gymnosperms and angiosperms). In these plants, the diploid sporophyte is dominant, photosynthetic and independent. The gametophyte is represented by a single-celled (or a few-celled) structure.
- (v) Sporophyll – In pteridophytes, the sporophytic plant body bears sporangia. These sporangia are subtended by leaf-like appendages known as sporophylls. In gymnosperms, microsporophylls and megasporophylls are found. These bear microspores and megaspores respectively.
- (vi) Isogamy – It is a type of sexual reproduction involving the fusion of morphologically similar gametes. This means that the gametes are of the same size, but perform different functions. This type of reproduction is commonly observed in *Spirogyra*.

#424344

Topic: Algae

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

(i)

Red Algae	Brown algae
Red algae are grouped under the class Rhodophyceae.	Brown algae are grouped under the class Phaeophyceae.
They contain floridean starch as stored food.	They contain mannitol or laminarin as stored food.
They contain the photosynthetic pigments chlorophylls a and d, and phycoerythrin.	They contain the photosynthetic pigments chlorophylls a and c, and fucoxanthin.
Their cell walls are composed of cellulose, pectin, and phycocolloids.	Their cell walls are composed of cellulose and algin.
Flagella are absent.	Two flagella are present.

(ii)

Liverworts	Moss
They have unicellular rhizoids.	They have multicellular rhizoids.
Scales are present very often.	Scales are absent.
They are generally thalloid, with dichotomous branching.	They are foliage, with lateral branching.
Gemma cups are present.	Gemma cups are absent.
Sporophyte has a very little photosynthetic tissue.	Sporophyte has an abundant photosynthetic tissue.

(iii)

Homosporous	Heterosporous
They bear spores that are of the same type.	They bear two kinds of spores – microspores and megaspores, differing in size.
They produce bisexual gametophytes.	They produce unisexual gametophytes.

(iv)

Syngamy	Triple fusion
It is the process of fusion of the male gamete with the egg in an angiosperm.	It is the process of fusion of the male gamete with the diploid secondary nucleus in an angiosperm.
A diploid zygote is formed as a result of syngamy.	A triploid primary endosperm is formed as a result of triple fusion.

#424346

Topic: Angiosperms

How would you distinguish monocots from dicots?

Solution

Monocots	Dicots
1. Embryo with single cotyledon	1. Embryo with two cotyledons
2. Pollen with single furrow or pore	2. Pollen with three furrows or pores
3. Flower parts in multiples of three	3. Flower parts in multiples of four or five
4. Major leaf veins parallel	4. Major leaf veins reticulated
5. Stem vascular bundles scattered	5. Stem vascular bundles in a ring
6. Roots are adventitious	6. Roots develop from radicle
7. Secondary growth absent	7. Secondary growth often present

#424348

Topic: Pteridophyta

Match the following (column I with column II).

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

Solution

The correct match is as follows:

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

#424350

Topic: Gymnosperms

Describe the important characteristics of gymnosperms?

Solution

Important features of gymnosperms :

1. The term gymnosperm refers to plants with naked seeds (gymnos – naked, sperma – seeds), i.e., the seeds of these plants are not enclosed in fruits.

2. The plant body ranges from medium to tall trees and shrubs. The giant redwood tree Sequoia is one of the tallest trees in the world.

3. The root system consists of tap roots. The coralloid roots present in *Cycas* are associated with nitrogen-fixing cyanobacteria.

4. The stem can be branched (as in *Pinus* and *Cedrus*) or unbranched (as in *Cycas*).

5. The leaves can be simple (as in *Pinus*) or compound (pinnate in *Cycas*). The leaves are needle-like, with a thick cuticle and sunken stomata. These help in preventing water loss.

6. Gymnosperms are heterosporous. They bear two kinds of spores – microspores and megaspores.

7. Flowers are absent. The microsporophylls and megasporophylls are arranged to form compact male and female cones.

8. Pollination occurs mostly through wind and pollen grains reach the pollen chamber of the ovule through the micropyle.

9. The male and female gametophytes are dependent on the sporophyte.

10. The seeds contain haploid endosperms and remain uncovered.

#464858

Topic: Fertilization

The anther contains

A Sepals

B Ovules

C Carpel

D

 Pollen grains

Solution

Stamen is the male reproductive organ that consists of long slender filament and broad knob like anther; each anther lobes of anther contains two long and cylindrical microsporangia. Pollen grain is the immature male gametophyte that precociously develops into mature male gametophyte through microgametogenesis in microsporangia. This makes option D correct. Carpel represents the unit structure female reproductive whorl and consists of stigma, style and ovary. This makes option C incorrect. Option B is incorrect as ovule, present in ovary, serves as site for megaspore formation and is the female reproductive part of flower. Option A is incorrect as sepals are the greenish leaf like structures that form the outermost whorl of flower.

#526010

Topic: Fertilization

What is triple fusion? Where and how does it take place? Name the nuclei involved in triple fusion.

Solution

Fusion of male gamete with diploid secondary nucleus/central cell to form triploid primary endosperm nucleus is called as triple fusion as it involves three nuclei. It takes place in embryo sac during double fertilization. Two polar nuclei and male gamete are involved in it.