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Assignment

1. Classify plants according to Eichler's grouping of 1883.

THE PLANT KINGDOM

DIVISION	CLASS
Thallophyta	Phycotinae (Algae) Mycotinae (Fungi)
Bryophyta	Hepaticae (Liverworts) Musci (Mosses)
Pteridophyta	Psilotinate (Psilotum) Lycopodinae (Lycopodium, Selaginella) Equisetinae (Horsetails) Filicinae (Ferns)
Spermatophyta	Gymnospermae (Gymnosperms) Angiospermae (Angiosperms)

2. How are Algae of importance to man?

- Algae are considered nutritious because of their high protein content and high concentrations of minerals, trace elements and vitamins therefore serves as food for man.
- It's serves as thickening agents in icecream and shampoo, drugs to ward off diseases.
- Algae has high iodine content therefore prevents goiter.
- Brown algae yields alginic acid which is used to stabilise emulsions and suspensions found in products like syrup, icecream and paint.
- Different species of red algae provide agar and carrageen used for the preparation of various gels used in scientific research.
- Agar is also used in the food industry to stabilise pie fillings and preserve canned meat and fish.
- Carrageenan is Al's used as a thickening and stabilising agent in products e.g. puddings, syrups and shampoos.
- Algae have been used for centuries, especially Asian countries, for their purported powers to cure or prevent illness e.g. cough, gout, gallstones, goiter, hypertension, and diarrhoea.
- Algae have been surveyed for anticancer compounds, with several cyanobacteria appearing to contain promising candidates.
- Diatoms have been used in forensic medicine, as their presence in the lungs can indicate if a person died due to drowning.

3. Describe a unicellular form of algae.

Chlamydomonas represents the unicellular and motile forms of green algae. They are found in stagnant water usually along with other forms. Flagella are the structures for mobility. The cell is bounded by a cellulose cell wall; contains organelles e.g. nucleus, mitochondria, stigma (eyespot), cup-shaped chloroplast, paranoïd etc. The nucleus carries genetic programme of the cell. The stigma is for photoreception. The mitochondria mediate the elaboration of energy molecules. Manufactured sugar is processed into starch on the pyrenoid.

4. How does this unicellular alga described in question 3 carry out its reproduction?

In chlamydomonas, reproduction can either be vegetative (asexual) or sexual.

Vegetative reproduction results in the production of daughter cells in which the amount and quality of genetic materials in the nucleus of the mother cell is maintained in the daughter cells. Thus, if the amount of genetic materials in the mother cell is n , the daughter cells also have n quantity of genetic material. In chlamydomonas, a cell about to divide loses its flagella. The cell undergoes mitotic division leading to two nuclei, cell walls are elaborated which delimit cytoplasm around each nucleus i.e. two daughter cells (zoospores) are released. Increase in the population of cells in a colony is achieved by repeated mitotic divisions.

Sexual reproduction involves union of sex cells (gametes). In chlamydomonas, aggregation of cells (clumping) in a colony occurs under favourable conditions. These cells pair by their posterior (flagellated) ends. This pairing is said to be isogamous because the pairing cells (gametes) are morphologically identical. The cytoplasm of the pairing cells fuse (plasmogamy) and the flagella are lost. The two nuclei fuse (karyogamy); this situation is essentially a fertilization process so that a zygote is formed. In other word, two cells each with n quantity of genetic (nuclear) material (i.e. haploid nuclear material) undergo karyogamy (fusion of nuclei) to produce a single cell with $2n$ (diploid) nuclear material. The zygote secretes a thick cell wall called a zygospore and may remain dormant in that state for sometimes. After karyogamy sometimes, the zygote undergoes two successive cell divisions. The first division restores the haploid condition by halving the nuclear material in the two resulting nuclei (reduction division) while in the second division, each haploid nucleus undergoes a normal mitotic division. These two divisions which end up with four cells and with n quantity of nuclear material are together known as meiosis. The product of meiosis are released as haploid zoospores.

5. Differentiate between the two types of colonial form of algae

Pandorina usually occurs in water bloom. The colony consists of 16 cells attached to one another. Vegetative reproduction is achieved through 4 successive mitotic divisions of each of the 16 cells in the colony therefore producing 16 daughter colonies. Sexual reproduction is achieved by anisogamous pairing (pairing by the flagella ends). While the genus volvox shows more complex form than pandorina. There are more cells in the colony, number may run into thousands and connected with cytoplasmic strands that run through the cells. Sexual reproduction is oogamous i.e. the male gamete is motile while the female gamete (egg) is not motile. Volvox is concluded to be more evolutionarily more advanced than pandorina with the departures between them especially as the cells show greater levels of differentiation and specialization.

6. Describe a named complex form of alga.

Fucus: A genus of brown algae whose species are often found on rocks in the intertidal zones of the sea shores. The plant body is flattened, dichotomously-branched thallus with a mid rib, a vegetative apex, a reproductive apex at maturity and a multicellular disk (hold fast) with which plant is attached to rock surface. The plant body also has air bladders which is believed to aid the plant to float on the water. Various species of fucus exist; vary in size from a few centimetres to about 2 metres in length. They also vary in terms of whether the sex cells are found in the same sexual chamber or in different sexual chambers on different plant bodies. Sexual reproduction is oogamous, sex cells are produced in conceptacles which have openings (ostioles) on the surface of the thallus. In the male conceptacles, one of the diploid cells from outgrowth of the wall of the conceptacles undergoes meiosis, the meiotic product undergo many mitotic divisions to produce antheridium having 64 cells of which each cell develops into a biflagellate sperm that swims out of the conceptacle through the ostiole. In the female conceptacle, similar to the male conceptacle, leads to the production of an 8 celled oogonium - each becomes an egg which is the female sex cell. Motile sperm cell from the antheridium move through the ostiole into the female conceptacle where the eggs are fertilised and diploid zygote are produced. Apart from the antheridia and oogonia, sterile multicellular filaments (paraphyses) are also produced in the conceptacles which are dispersed among the antheridal and oogonial outgrowths and at the entrance into the conceptacles. The diploid zygote germinates into a diploid fucus plant making the diploid the dominant generation.