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BIO 102 Assignment

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

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?

1 Algae are important as food for fish. Certain species are harvested for food and cosmetics in the far East.

2 It serves as food for people and livestock, thickening agents in ice cream and shampoo, drugs to ward off diseases. Algae are considered nutritious because of their high protein content and high concentrations of minerals, trace elements and vitamins.

3 Algae have high iodine content therefore prevent goitre.

4 Seaweeds are source of three chemical extracts used extensively in the food, pharmaceutical, textile and cosmetic industries.

5 Brown algae yield alginic acid which is used to stabilize emulsions and suspensions; found in products such as syrup, ice cream and paint. Different specie of red algae provide agar and carrageen used for the preparation of various gels used in scientific research.

6 Algae have been used for centuries, especially Asian countries, for their purported powers to cure or prevent illnesses e.g cough, gout, gallstones, goiter, hypertension, and diarrhoea.

3 Describe a unicellular form of algae

Chlamydomonas represents the unicellular and motile forms of green algae. Found in stagnant water usually along with ~~other~~ Other forms.

Flagella are the structures for mobility

The cell is bounded by a cellulose wall; contains organelles e.g nucleus, mitochondria, stigma (eyespot), cup-shaped chloroplast, pyrenoid e.t.c.

The nucleus carries the 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 production of daughter cells in which the amount and quality of genetic material in the nucleus of the mother cell is maintained in the daughter cells. Thus, if the amount of genetic material in the mother cell nucleus is n, the daughter cells also have n quantity of genetic material.

The kind of cell division which maintains the quantity and quality of genetic material is called mitotic divisions. It is responsible for increase in size in multicellular organisms. In Chlamydomonas, a cell about to divide loses its flagella. The cell undergoes mitotic division leading to two nuclei, cell walls are elaborated which ~~demeri~~ 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.

In sexual reproduction, certain environmental conditions, e.g. lack of nutrients or moisture may trigger the haploid daughter cells to undergo sexual reproduction. Instead of forming into spores, the haploid daughter cells form gametes that have two different mating strains which are

structurally similar and are positive and negative strains. Opposite mating strains fuse in a process called isogamy to form a diploid zygote, which contains two sets of chromosomes. After a period of domancy, the zygote undergoes meiosis, a type of cell division that reduces the genetic content of a cell by half. This cell division (i.e. meiosis) produces four genetically unique haploid cells that eventually grow into mature cells.

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); ~~fusion of~~ this situation is essentially a fertilization process so that a zygote is formed. In other words, 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 sometime.

After karyogamy sometime, the zygote undergoes two successive cell divisions, the first division restores the

haploid condition by halfing 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 four products of meiosis are released as haploid zoospores.

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

	Pandorina	Volvox
1	The colony consists of 16 cells attached to one another	There are more cells in the colony, number may run into thousands and connected with cytoplasmic strands that run through the cells
2	Each of the 16 cells form new colonies	Not all the cells form new colonies; but the larger cells ~~athe~~ at the posterior ends (gonidia) are the only ones that divide to form new colonies. Other cells remain vegetative throughout the life of the colony.
3	Sexual reproduction is achieved by anisogamous pairing	Sexual reproduction is oogamous

6 Describe a named complex form of alga

FUCUS

A genus of brown algae whose species are often found on rocks in the interticdal 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 chamber on different plant bodies.

Sexual reproduction oogamous, sex cells are produced in conceptacles which have openings (ostioles) on the surface of the thallus.

In 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 situation in 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 antheridial and oogonial outgrowths and at the entrance into the conceptacles.

The diploid zygote germinates into a new diploid Fucus plant making the diploid the dominant generation.