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CBSE

CLASS 12TH

THE CENTRAL BOARD OF SECONDARY EDUCATION

PART – III

BIOLOGY

SIERRA INNOVATIONS

BIOLOGY

CHAPTER-1 REPRODUCTION IN ORGANISMS

TOPICS

- Introduction
- Reproduction
- Asexual Reproduction
- Sexual Reproduction
- Pollination
- Fertilisation
- Embryogenesis
- Points to remember
- Important questions

Introduction

1. **Reproduction**is an important process of giving rise to young ones from their parents and this process varies among organisms.
2. Reproduction is an energy consuming process as lots of energy is utilized in creating more organisms.
3. Genetic information about the inheritance of characteristics is present within the chromosomes of the nucleus of a cell which is passed on to the next generation in the form of **DNA** (Deoxyribonucleic Acid).

Asexual reproduction is common in simple single celled organisms like monerans, protests, some of the asexual modes of reproduction are as follows: -

1. **Binary fission**- Asexual reproduction in which formation of two offspring occurs by the splitting of the parent organism is called binary fission. Ex: - Amoeba and Paramecium.
2. **Multiple fission**- It is similar to binary fission but the only difference is that it produces more than 2 daughter cells. Ex: - malarial parasite (Plasmodium)
3. **Budding**– In buddings, bulges or outgrowths (buds) form due to repeated cell divisions at a particular site which eventually detach from the parent and grow into a new individual. Ex: - Hydra and Yeast.

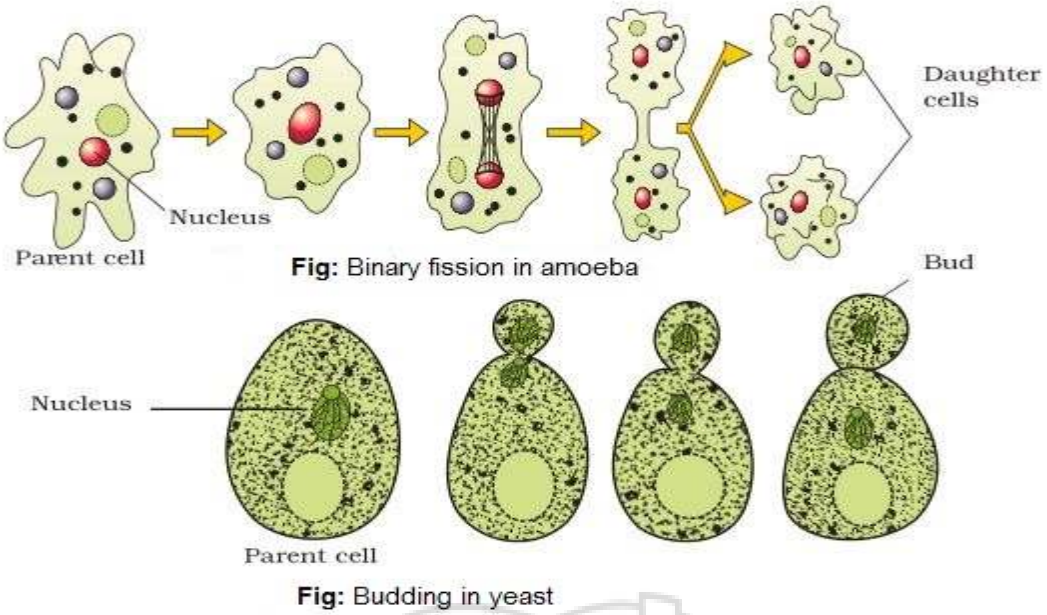


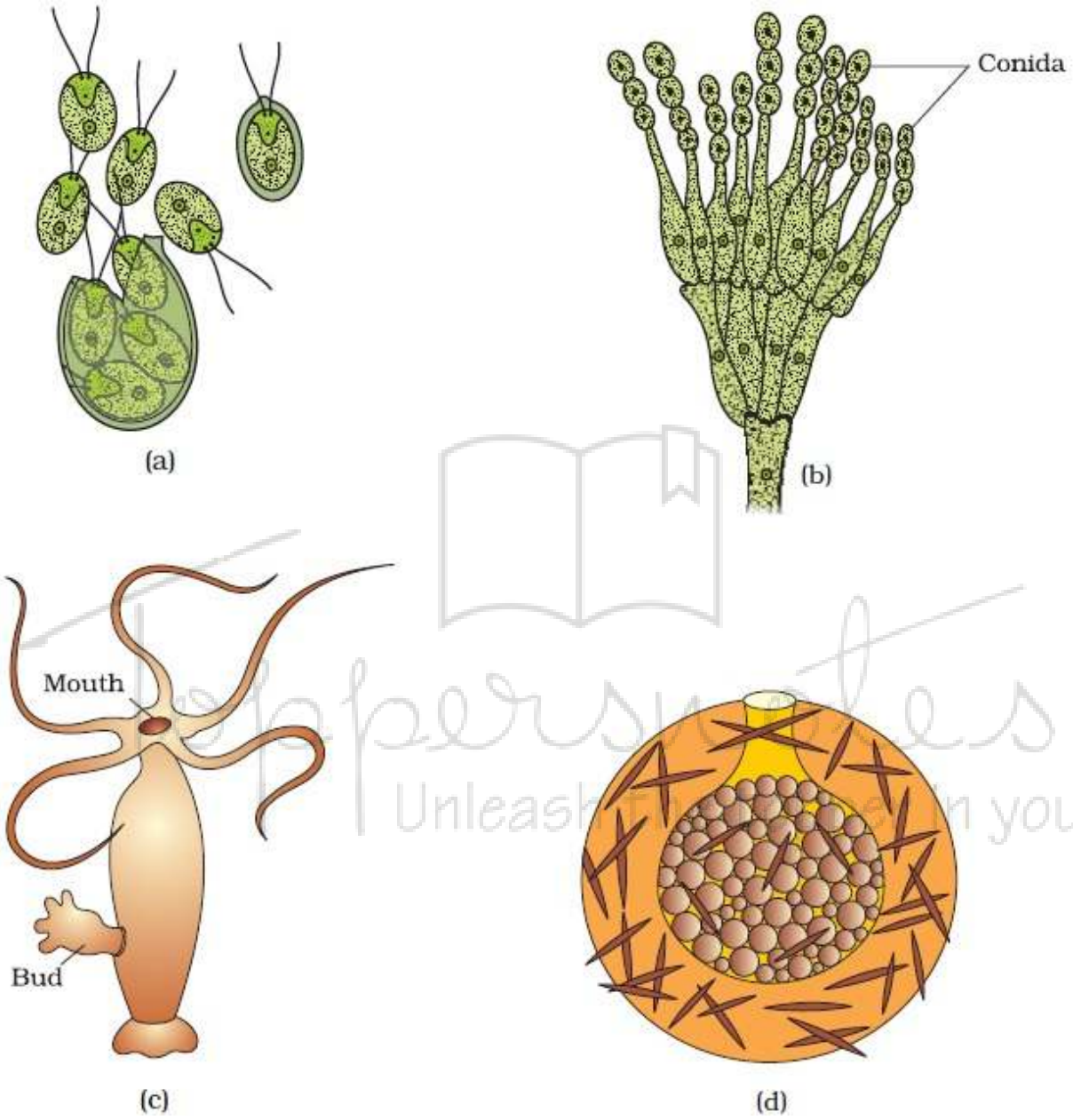
Figure 1.2 Cell division in unicellular organism: (b) Budding in yeast; (a) Binary fission in *Amoeba*

6 **Sporulation**- Encystation occurs under unfavourable conditions when pseudopodia of amoeba withdraws and forms a three-layered cyst around itself. When the suitable conditions return, the amoeba divides by multiple fission and form pseudo podiospores or minute amoeba which are released into the surrounding after bursting of hard cyst wall. This release of spores which eventually develop into an adult and is termed as sporulation.

4. **Vegetative Propagation**- In vegetative propagation, the development of new plants occurs from the **runner, rhizome, sucker, tuber, offset, and bulb** parts of its parent plant.
    - Such structures are called vegetative propagules.
    - Plants emerge from rhizomes of ginger and banana and buds of potato tuber.
    - Nodes are present on the modified stem which grows into new plants when it comes in contact with water and damp soil. Notches in the leaves of *Bryophyllum*contains adventitious buds which give rise to new plant.

6 **Fragmentation**- After maturation, the organisms with simple body organisation like spirogyra split into smaller fragments. These individual pieces or fragments

develop into new individuals. This kind of reproduction is called fragmentation. Ex: - spirogyra



Asexual reproductive structures: (a) Zoospores of *Chlamydomonas*; (b) Conidia of *Penicillium;* (c) Buds in *Hydra*; (d) Gemmules in sponge

Sexual reproduction

- Zygote forms after fusion of male and female gamete which may be from same individual or individuals of opposite sex. It eventually develops into a new organism.
- It is a complex and slow process.
- The process of copying DNA adds some variations to it.
- The period before sexual maturity is called **juvenilephase** while the period after sexual maturity is called **reproductive phase**.
- **Senescent phase** is the end of reproductive phase which is complimented by slowing metabolism and initiates the old age leading to death. Hormones are the regulators of these phase changes.
- These phases are defined in annual and biennial types of plants and not defined in perennial species.
- Bamboo species flower only once in 50-100 years (life time) to produce large number of fruits before they die. Another plant, *Strobilanthus kunthiana*(neelakuranji) flowers once in 12 years. Reproductive phase changes with different organisms.
- **Gametogenesis**is the process of formation of gametes in both males and females and are haploid.
- When the gametes are similar in appearance in both males and females then they are called homogametes or isogametes while those gametes which are different in appearance are termed as heterogametes.
- Male gametes are called **anthrozoid or sperm**while female gametes are **egg or ovum**.
- Organisms like earthworms, leech, tapeworm and sponge contain both male and female reproductive parts. Such bisexual organisms are also called **hermaphrodites**.
- During gamete formation, the parent plant body can be haploid or diploid but the gamete is always **haploid**.
- Haploid parental body is present in Monera, fungi, algae and bryophytes while diploid parental body belongs to pteridophytes, gymnosperms, angiosperms and animals.

- Diploid organisms produce haploid gametes by meiosis (reduction division) while haploid organisms undergo mitosis to produce gametes.
- Gamete mother cells or meiocytes are specialised cells in diploid organisms which develops into haploid gametes containing one set of chromosomes in each gamete.
- **Gamete transfer**is involved as motile male gametes has to reach the stationary female gamete. Sometimes both male and female gametes are motile.
- Water, air and other organisms are the medium through which gametes are transferred. Several algae, bryophytes, pteridophytes and other animals like frogs and fishes use water as the medium for the transfer of gametes.
- In flowering plants, the anther contains pollen grain which carries the male gamete while the female gametes are present in the ovary in the form of egg or ovule.

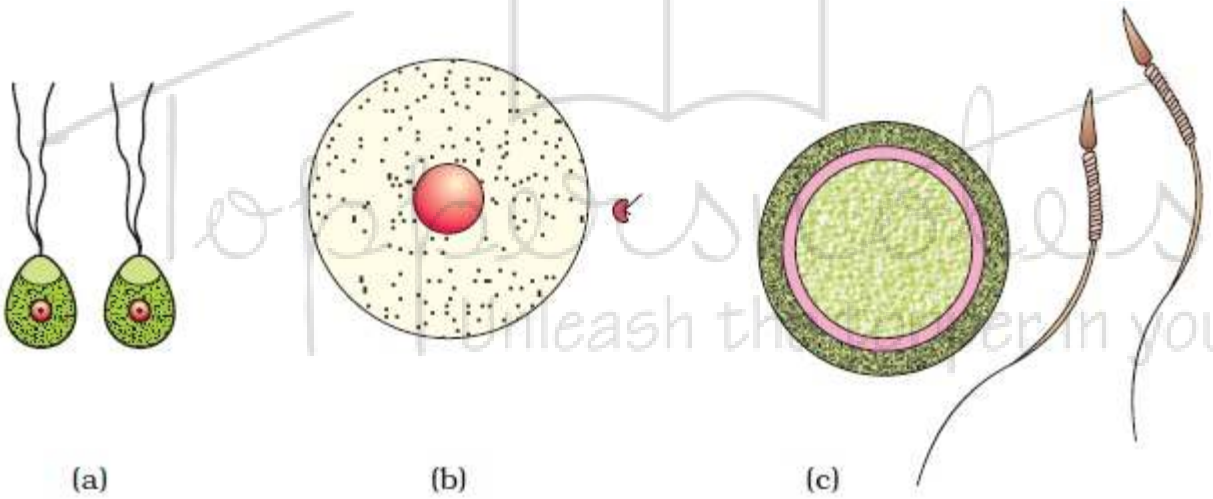


Figure 1.5 Types of gametes: (a) Isogametes of *Cladophora* (an alga); (b) Heterogametes of *Fucus* (an alga); (c) Heterogametes of *Homo sapiens* (Human beings)

Pollination

- **It** is the process of dispersion of the pollen grains into the surroundings so that they can land on the stigma of the female flower of a plant of the same species leading to fertilisation.
- Pollination can be done through wind, water or insects like bees.

- In self-pollination, the pollen from the anther gets transferred to the stigma of the same flower (**Autogamy**).
- In cross pollination, the pollen grain from the anther of a flower is transferred to the stigma of a flower on the same plant (**Geitonogamy**) or different plant of the same species (**Xenogamy**). The factors which facilitate pollination are wind, water, insects and in some cases animals.

Fertilisation

- It is the process of fusion (syngamy) of male and female gamete to form a zygote which later develops into an individual.
- Fertilisation can be divided into two types: - **Internal** (fertilisation inside female body)**and External fertilisation** (fertilisation outside female body). Internal fertilisation is shown by organisms like humans, mammals, plants (bryophytes, pteridophytes, gymnosperms), reptiles and birds.
- External fertilisation is possible in some algae, fishes and amphibians like frogs., the
- Female gametes develop into new individuals without fertilisation which is known as **parthenogenesis**. When there are higher number of male gametes, there is greater chance of fertilisation.

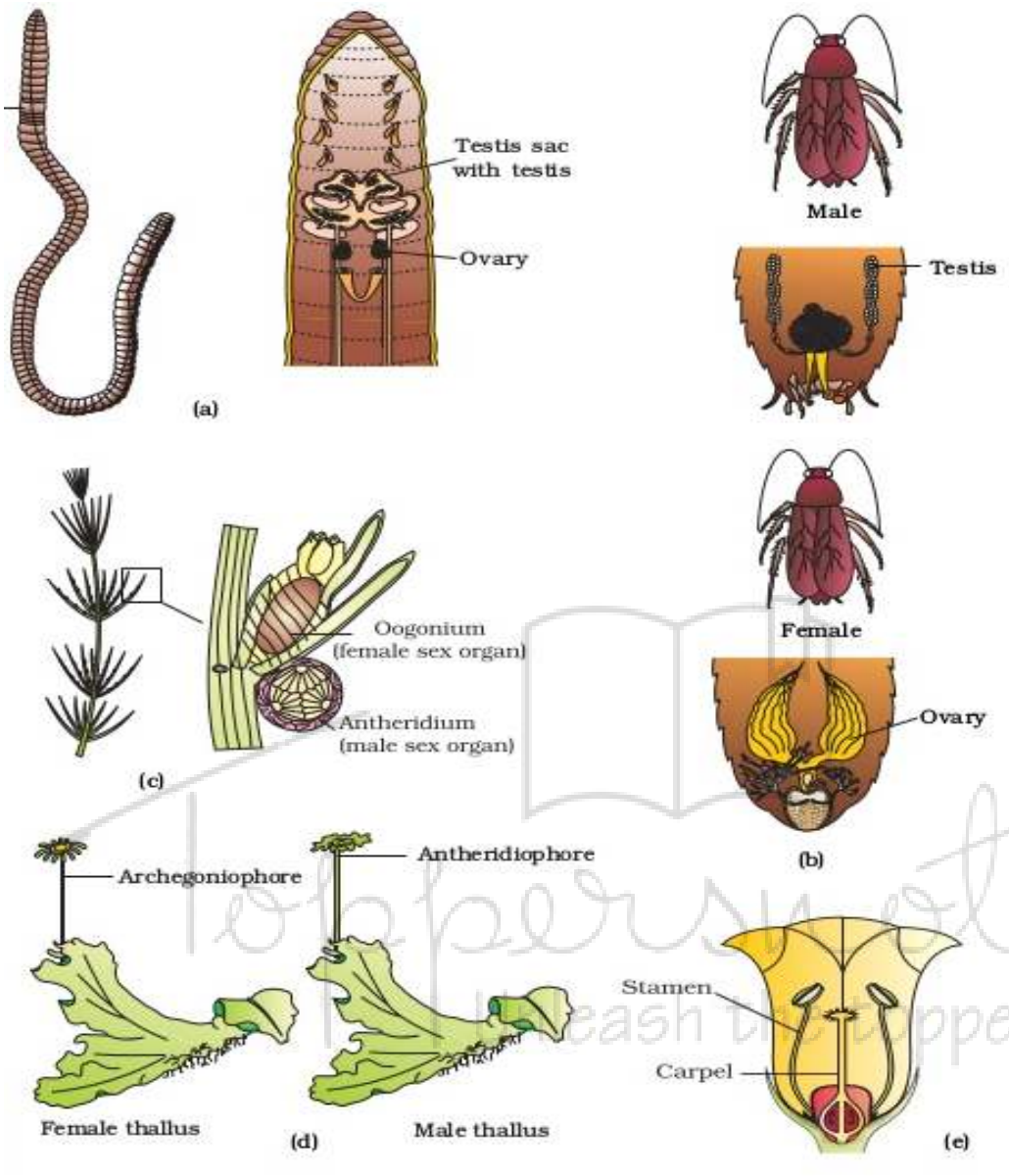


Figure 1.6 Diversity of sexuality in organisms (a) Bisexual animal (Earthworm); (b) Unisexual animal (Cockroach); (c) Monoecious plant *(Chara)*; (d) Dioecious plant *(Marchantia)*; (e) Bisexual flower (sweet potato)

Embryogenesis

- It is the process of formation of embryo from the zygote.

- Cell division (increases the number of cells) and cell differentiation (modify cells to form specialised tissues and organs) are involved in embryo formation from a zygote.
- The development of the egg occurs inside the protective layer of hard shell outside the female body.
- Examples are birds, some reptiles like snakes, some amphibians like frogs, fishes etc. Animals which **give birth to the young ones** are termed as **Viviparous**. Most of the development occurs within the mother and young ones are born, protected and raised by parents until they are fit to live independently.
- After fertilisation, the **ovary** develops into a **fruit** which carries the seed within it. This **seed** is developed from the fertilised **ovule**which initially forms a zygote and later develops into an embryo.
- **Pericarp**is the outer layering of fruit which can be hard as in coconut and soft as in an apple.

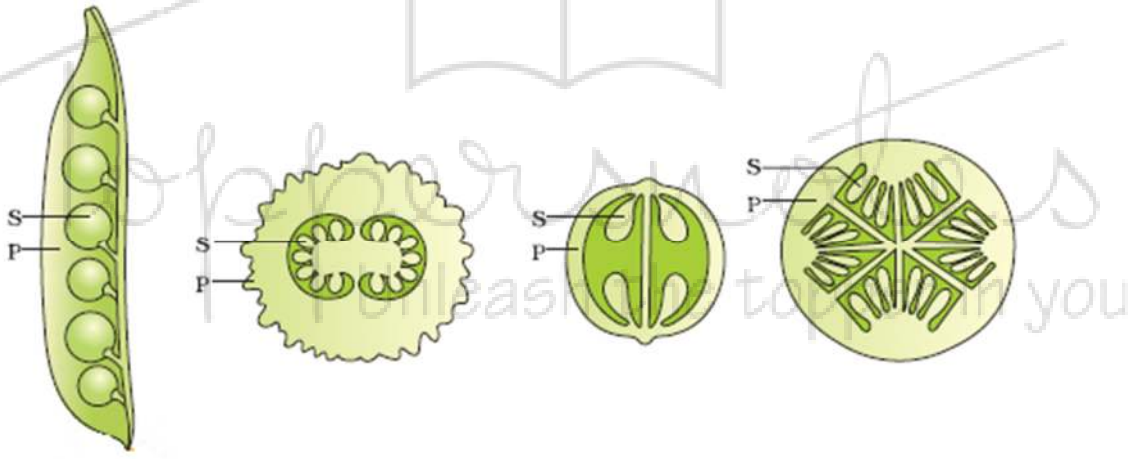


Figure 1.8 A few kinds of fruit showing seeds (S) and protective pericarp (P)

Points to remember

- The time period between the birth and the death of an organism is defined as the **lifespan**.
- Life in itself involves birth, growth and death.
- Reproduction are usually of two types- **Sexual and Asexual reproduction**. Sexual reproduction **involves two parents** and the fusion of male and female gametes occurs to form a zygote. This allows genes to combine and form an offspring.

While in Asexual reproduction, **only one parent is involved** and gamete formation may or may not occur. The young ones are born from their single parent which are morphologically and genetically similar (**clone)**

- **Water hyacinthis also known as Terror of Bengal, is an invasive weed which grows in stagnant water and depletes it of oxygen which is necessary for fishes to survive.**
- Some fungi and algae contain zoosporeswhich are motile structure. Conidia (Penicillium) and gemmules (sponges) are also specialised structures in asexual reproduction
- During the reproductive phase, placental female mammals show cyclical changes in hormones, ovaries and accessory ducts. In case of primates like monkeys and humans, these cyclical changes are called menstrual cycle and in non-primates like cow, sheep and tiger, it is known as oestrus cycle.
- THE cyclical changes in wild mammals rely on the suitable seasons and hence they are termed as **seasonal breeder** while **continuous breeders** are those which are reproductively active throughout their reproductive phase
- Bisexual condition is denoted by terms like homothallic and monoecious in plants and fungi while the unisexual condition is denoted by terms like heterothallic and dioecious.
- In unisexual flowering plants, the male flowers are termed staminate while the female flowers are termed pistillate.
- Zygote is formed after the fusion of male and the female gamete. It is a single cell and can form both internally and externally. Further development varies with organisms, in case of fungi and algae, zygote forms a damage and desiccation resistant wall which rests until germination. Haploid spores develop when zygote undergoes meiosis in organisms with haplontic life cycle.
- The term clone is used to describe such morphologically and genetically similar individuals.

Important Questions

1 Mark Questions

Q) What is the full form of DNA?

Ans: - Deoxyribonucleic Acid

Q) What are the different types of reproduction?

Ans: - Sexual and Asexual reproduction

Q) Which form of reproduction does not require two parents?

Ans: - Asexual reproduction

Q) What is known as Terror of Bengal?

Ans: - Water hyacinth

Q) Give examples for binary fission.

Ans: - Amoeba and paramecium

Q) Give an example for fragmentation.

Ans: - Spirogyra

Q) What is parthenogenesis?

Ans: - Sometimes female gametes develop into new individuals without fertilisation which is known as parthenogenesis.

Q) What are the events in sexual reproduction?

Ans: - Events involved in the sexual reproduction can be divided as pre fertilisation, fertilisation and post fertilisation.

Q) What are the mediums used in gamete transfer?

Ans: - factors which facilitate gamete transfer are wind, water, insects and in some cases animals.

Q) Name the types of cross pollination.

Ans: - Geitonogamy and Xenogamy

2 Mark Questions

Q) What is lifespan?

Ans: - The time period between the birth and the death of an organism is defined as the **lifespan**.

Q) What is reproduction?

Ans: - **Reproduction**is an important process of giving rise to young ones from their parents.

Q) When does encystation occur?

Ans: - Encystation occurs under unfavourable conditions when pseudopodia of amoeba withdraw and forms a three-layered cyst around itself.

Q) What are vegetative propagules?

Ans: - vegetative propagules are structures like runner, rhizome, sucker, tuber, offset, and bulb parts of its parent plant.

3 Mark Questions

Q) How are the characteristics inherited?

Ans: - Genetic information about the inheritance of characteristics is present within the chromosomes of the nucleus of a cell which is passed on to the next generation in the form of DNA (Deoxyribose Nucleic Acid). Copying of this DNA adds some variations to the offspring or new born which distinguish it from the parent. In case of asexual reproduction, there are lesser variations as there is involvement only single parent and hence the morphology and physiology are similar. In sexual reproduction, the genes from the two parents combine leading to addition of variations.

Q) What is sexual reproduction?

Ans: - Sexual reproduction**involves two parents**and the fusion of male and female gametes occurs to form a zygote. This allows genes to combine and form an offspring. It involves gamete formation and transfer of gametes as gamete can be motile or non-motile. Male gametes are produced in a higher number than female gametes so that there is a greater chance of fertilisation. The process of sexual reproduction can also be divided into stages – pre fertilisation, fertilisation and post fertilisation.

Q) What is asexual reproduction?

Ans: - In Asexual reproduction, **only one parent is involved**and gamete formation may or may not occur. The young ones are born from their single parent and are morphologically and genetically similar (clone). Modes of asexual reproduction and the structures involved varies with organisms and are as follows: - vegetative propagation, budding, fragmentation, sporu Q) Differentiate between binary fission and multiple fission.

Ans: - Asexual reproduction in which formation of two offspring occurs by the splitting of the parent organism is called binaryfission. Ex: - Amoeba and Paramecium. Multiple fission is similar to binary fission but the only difference is that it produces more than 2 daughter cells. Ex: - malarial parasite (Plasmodium)

Q) What is fragmentation?

Ans: - After maturation, the organisms with simple body organisation like spirogyra split into smaller fragments. These individual pieces or fragments develop into new individuals. This kind of reproduction is called fragmentation.

lation, binary and multiple fission etc.

5 Mark Questions

Q) Explain reproduction and its types.

Ans: - **Reproduction**is an important process of giving rise to young ones from their parents and this process varies among organisms. There are several mechanisms of reproduction as it varies with organisms and their habitat, physiology and other factors. Reproduction are usually of two types- **Sexual and Asexual reproduction**. Sexual reproduction**involves two parents**and the fusion of male and female gametes occurs to form a zygote. This allows genes to combine and form an offspring. While in Asexual reproduction, **only one parent is involved**and gamete formation may or may not occur. The young ones are born from their single parent and are morphologically and genetically similar (clone).

Q) Explain sporulation in amoeba.

Ans: - Encystation occurs under unfavourable conditions when pseudopodia of amoeba withdraw and forms a three-layered cyst around itself. When the suitable conditions return, the amoeba divides by multiple fission and form pseudopodiospores or minute amoeba which are released into the surrounding after bursting of hard cyst wall. This release of spores which eventually develop into an adult in termed as sporulation.

Q) Explain the vegetative reproduction mode of asexual reproduction.

Ans: - - In vegetative propagation, the development of new plants occurs from the runner, rhizome, sucker, tuber, offset, and bulb parts of its parent plant. Such structures are called vegetative propagules. Plants emerge from rhizomes of ginger and banana and buds of potato tuber. Nodes are present on the modified stem which grows into new plants when it comes in contact with water and damp soil. Notches in the leaves of *Bryophyllum*contains adventitious buds which give rise to new plant.