CHAPTER-7
REPRODUCTION

Topic-1 Asexual Reproduction and Vegetative Propagation.

Concepts Covered • Reproduction and its type, • Various Types of Asexual reproduction

Revision Notes

- Reproduction is the process by which living organisms produce new individuals similar to themselves. It ensures continuity of life on earth.
- Nucleus of the cell contains DNA (Deoxyribonucleic acid), which is the hereditary material.
- DNA replicates and forms new cells causing variation. So, these new cells will be similar but may not be identical to original cell.
- Variations are useful for the survival of the individual and species over time. It is the base of evolution.
- **Types of Reproduction**

I Asexual Reproduction

- A single individual give rise to new individual.
- Gametes are not formed.
- New individuals are identical to their parents.
- Asexual reproduction is seen in most of the lower organisms and plants as well.

II Sexual Reproduction

- Two individuals i.e., one male and one female are needed to give rise to new individual.
- Gametes are formed.
- New individual is genetically similar but not identical to parents.
- It is useful to generate more variations in species.
- Adopted by higher organisms.

I. Asexual reproduction takes place through fission, fragmentation, regeneration, budding, vegetative propagation, and spore formation. These modes of reproduction depend on the body design of the organisms.

(a) Fission: It is of two types - Binary fission and Multiple fission.

(i) **Binary fission:** It i**s** the division of one cell into two similar or identical cells. The nucleus first divides amitotically into two, followed by the division of the cytoplasm. The cell finally splits into two daughter cells. e.g., *Amoeba*

(ii) Multiple fission: In multiple fission, many individuals are formed from a single individual. e.g., *Plasmodium.*The nucleus divides repeatedly, producing many nuclei and many daughter cells are formed.

(b) Fragmentation: It takes place in multicellular organisms with simple body organisation such as in *Spirogyra*. In this, the body breaks up into two or more small pieces of fragments upon maturation. These fragments grow into new individuals.

(c) Regeneration: It is the ability of a fully differentiated organism to give rise to new individual organisms from its body parts. Small cut or broken parts of the organism's body grow or regenerate into separate individuals. For example: *Planaria* and *Hydra*.

(d) Budding: In budding, a small part of the body of the parent grows out as a bud which then detaches and becomes a new organism. *Hydra* reproduces by budding using the regenerative cells.

(e) Vegetative Propagation: In many plants, new plantlets develops from vegetative parts of a plant's body such as stem, roots, leaves, etc.

- **Methods of vegetative propagation:**

(i) Natural methods are:

(a) By roots: e.g., *Dahlia*, sweet potato.
(b) By stems: e.g., Potato, ginger.
(c) By leaves: e.g., *Bryophyllum* (leaf margins bear buds which develop into plants).

(ii) Artificial methods:

(a) Grafting: e.g., Mango
(b) Cutting: e.g., Rose
(c) Layering: e.g., Jasmine
(d) Tissue culture: e.g., Ornamental plants, orchid.

Mnemonics

Concept: Vegetative Reproduction
Mnemonics: **P**ositive **E**xample **B**ased **L**earning
Interpretation:
P - Potato
E - Eyes
B - *Bryophyllum*
L - Leaf buds

Key Word

Vegetative propagation is a mode of asexual reproduction in which new plants are obtained from the vegetative parts of plants such as roots, stem, and leaves.

(f) **Spore Formation:** Spores are small bulb like structures which are covered by thick walls. Under favourable conditions, they germinate and produce new organisms. e.g., *Rhizopus.*

Key Fact

Tissue culture: It is the production or propagation of new plants from isolated plant cells or small pieces of plant tissue in a nutrient medium. This technique is also known as **micro-propagation,** and *in vitro* culture because it takes place outside the body of the parent plant in a test tube in an artificial environment.

Topic-2 Sexual Reproduction in Plants

Concepts Covered • Flower and its various parts • Pollination • Process of fertilization • Double fertilization.

Revision Notes

- **Parts of Flower**
  - Flowers are main reproductive part of a plant. The main parts of a flower are: sepals, petals, stamens and carpels.
  - Stamens and carpels are the reproductive parts of a flower which contain the germ cells. The male organ of a flower called '**stamen**' makes the male gamete which are present in the pollen grain. The female organ of a flower called '**carpel**' makes the female gamete, which are present in ovules of the plant.
  - Flowers may be unisexual (e.g., papaya and watermelon) or bisexual (e.g., *Hibiscus* and mustard).
- **Pollination:** It is the transfer of pollen grains from the anther of a stamen to the stigma of a carpel. Pollination is of two types: Self pollination and Cross pollination.

Mnemonics

Concept: Reproductive parts of a Flower
Mnemonics: a **CAR** belongs to **W**omen but **ST**eering belongs to **Men**
Interpretation:
CARpel : Female organ of the plant.
STaMEN : Male part of the plant

- Self Pollination is the transfer of pollen in the same flower. In cross pollination, pollen is transferred from one flower to another.
- Cross-pollination introduces variations in plants because of the mixing of different genes. These variations further increase the adaptability of plants towards the environment or surroundings.
- The transfer of pollens takes place by agents like wind, water or animals.

- After pollination, a pollen tube grows out of pollen grains, through which male germ cell reaches the ovary and fuses with the female germ cell.
- Fertilisation is the process of fusion of male and female gamete to produce zygote. It occurs inside the ovary.

Post fertilization Changes :

- The outer layers of the ovule become impervious and hard and function as a seed coat.
- An ovule with an embryo inside is called a seed.
- The ovary enlarges and ripens to become a fruit.
- Other floral parts such as sepals, petals, stamens, styles and stigma may fall off. However, in some cases, they remain degenerated persistent in the fruit.

Double fertilisation:

- It is a characteristic feature of flowering plants. In this process, out of the two sperm nuclei, one sperm nucleus fuses with the egg nucleus to form an embryo (process is called syngamy) and another fuses with the secondary nucleus to form an endosperm (process is called triple fusion). Because two kinds of fusion, syngamy and triple fusion take place, the process is known as double fertilisation.
- Seed is the final (last) product of sexual reproduction in angiosperms. It is the fertilised ovule that is developed inside a fruit.
- Seed protects the future plant i.e., embryo.
- A seed consists of seed coat(s), cotyledon(s) and an embryonal axis.
- **Embryo axis has two parts :** Plumule and radical. Plumule develops into shoot and radicle develops into root.
- The process of development of seedling from the embryo under suitable conditions such as air, moisture etc., is known as germination.

Topic-3 Reproduction in Human Beings

Concepts Covered • Puberty • Male and female reproductive system • Process of fertilisation • Menstrual cycle • Sexually Transmitted Diseases • Methods of contraception.

Revision Notes

Humans have sexual mode of reproduction.

It needs sexual maturation, which is the period of life when production of germ cells i.e., ova (female) and sperm (male) start in the body. This period of sexual maturity is called **puberty**.

Changes at Puberty are:

Common in male and female

- Thick hair growth in armpits and genital area.
- Skin becomes oily, may result in pimples.

(a) In girls:

- Breast size begins to increase.
- Girls begin to menstruate.

(b) In boys:

- Thick hair grows on face.
- Voice begins to crack.
- These changes signals that sexual maturity is taking place.

Male Reproductive System

(a) Testes: A pair of testes are located inside scrotum which is present outside the abdominal cavity. Scrotum has a relatively lower temperature needed for the production of sperms.

Functions of testes:

- Produce male germ cells i.e., sperms are formed here.
- Testes release male sex hormone (testosterone). Its function is to:
  - **(i)** Regulate production of sperms.
  - **(ii)** Bring changes at puberty.

Mnemonics

Concept 1: Parts of Male Reproductive System
Mnemonics: SEVEn **UP**
Interpretation:
S: Seminiferous tubules, **E:** Epididymis, **V:** Vas deferens, **E:** Ejaculatory duct, **U:** Urethra, **P:** Penis

Concept 1: Accessory glands in Males
Mnemonics: Saint **P**eters
Interpretation:
S: Seminal vesicle, **P:** Prostate gland

Concept 3: Accessory Ducts in Females
Mnemonics: Our **U**nited **V**illages
Interpretation:
Oviduct, Uterus, Vagina

(b) Vas deferens: It passes sperms from testes towards the urethra.

(c) Urethra: It is a common passage for both sperms and urine. Its outer covering is called **penis**. It is like a fibromuscular long tube which travels through penis.

(d) Associated glands: Seminal vesicles and prostate gland add their secretion to the sperms. This fluid provide nourishment to sperms and make their transport easy. Sperm along with secretion of glands form semen.

- **Female Reproductive System**

(a) Ovary: A pair of ovary is located in both sides of abdomen.
- Female germ cells i.e., eggs are produced here.
- At the time of birth of a girl, thousands of immature eggs are present in the ovary.
- At the onset of puberty, some of these eggs start maturing.

(b) Oviduct or Fallopian tube
- Receives the egg produced by the ovary and transfer it to the uterus.
- Fertilisation i.e., fusion of gametes takes place here.

Key Words

Embryo: It is the stage of development between the zygote or fertilised egg and the newly formed offspring.

Fertilisation : The process of fusion of sperm and the ovum to from a single cell called zygote is called fertilisation. It occurs in fallopian tube (oviduct).

Zygote: The cell which is formed by the fusion of a male gamete and female gamete is called zygote, i.e., it is a 'fertilised ovum' or 'fertilised egg.'

Contraception: It is the avoidance of pregnancy, which can be achieved by preventing the fertilisation of ova.

(c) Uterus: It is a bag-like structure where development of the foetus takes place.
- Uterus opens into vagina through cervix.
- The embryo moves down to reach the uterus. The embedding of the embryo in the thick inner lining of the uterus is called **implantation**.

- The time period from the development of foetus inside the uterus till birth is called **gestation period**. The act of giving birth to the fully developed foetus at the end of gestation period is termed as **parturition**.

  Placenta is a specialised tissue embedded in the uterine wall. It contains villi on the embryo's side and blood spaces on the mother's side.
- The breakdown and removal of the inner, thick and soft lining of the uterus along with its blood vessels in the form of vaginal bleeding is called **menstrual flow** or **menstruation**.
- **Reproductive Health;**

  Reproductive health is all those aspects of general health which help a person to lead a normal, safe and satisfying reproductive life.
- **Sexually Transmitted Diseases (STDs)** are the diseases which spread by sexual contact from an infected person to a healthy person. Some common STDs are Gonorrhoea, syphilis, warts, HIV-AIDS.
- **Birth Control Methods:** There are different methods which are developed to prevent and control pregnancy such as mechanical methods, chemical methods, oral pills and surgical methods. These are also known as methods of **contraception**.

Methods of contraception

(a) Physical barrier

- To prevent union of egg and sperm.
- Use of condoms, cervical caps and diaphragm.

Mnemonics

Concept 1: Birth control Methods

Mnemonics: SON Is Born

Interpretations:
S: Surgical; **O: O**ral contraceptive; **N: N**atural; **I: I**UD; **B: B**arrier

Concept 2: Barrier Methods

Mnemonics: CDC Volunteered **S**tudent's **J**unior **F**ellowship

Interpretation:
Condoms, **D**iaphragm, **C**ervical caps, **V**aults, **S**permicidal creams, **J**ellies, **F**oams

(b) Chemical methods

- Use of oral pills.
- These change hormonal balance of body so that eggs are not released.
- May have side effects.

(c) Intrauterine contraceptive device (IUCD)

- Copper-T or loop is placed in uterus to prevent pregnancy.

(d) Surgical methods

- In males the vas deferens is blocked to prevent sperm transfer called **vasectomy**.
- In females, the fallopian tube is blocked to prevent egg transfer called **tubectomy**.