

CHAPTER 14:-

REPRODUCTION

REPRODUCTION:-

Reproduction is a biological process by which an organism reproduce new ones.

- There are two types of reproduction:-
- i. Asexual Reproduction → Involves in one parent
 - ii. Sexual Reproduction → Involves both parents

METHODS OF ASEYUAL REPRODUCTION:-

→ There are different methods of asexual reproduction:-

- i. Binary Fission
- ii. Budding
- iii. Multiple Fission
- iv. Fragmentation
- v. Spore Formation
- vi. Vegetative propagation
- vii. Parthenogenesis

i. BINARY FISSION:-

Binary fission is a type of asexual reproduction in which a parental body is divided into two parts and each part will developed into new organism.

- Example:- Amoeba and bacteria reproduce by this method.

ii. BUDDING:-

Budding is a type of asexual reproduction. In this method, a 'bud' (projection) is formed on the parental body, after some time, it will detach from parental body and develop into new ones.

- Example:- Hydra and yeast are reproduce by this method.

ASEXUAL REPRODUCTION:-

• METHODS OF ASEXUAL REPRODUCTION:-

iii. MULTIPLE FISSION:-

Multiple fission is a type of Asexual reproduction in which many spores formed inside a protective covering called cyst. When it gets favourable conditions, the cyst become replete and the spores comes out and develop into new organism.

- Example:- Ameoba and bacteria reproduce by this method.

iv. FRAGMENTATION:-

Fragmentation is a method of asexual reproduction in which a parental body is divided into many fragments (pieces) and each fragment is develop into new ones.

- Example:- Planaria reproduce by this method.

v. PARTHENOGENESIS:-

Parthenogenesis is the development of an unfertilized egg into a new individual.

- Example :- Fish, honey bees, frogs.

VEGETATIVE PROPAGATION IN PLANTS:-

Asexual reproduction in plants where new plants are produced from vegetative parts of the parent plant.

TYPES OF PROPAGATION

NATURAL VEGETATIVE
PROPAGATION

ARTIFICIAL VEGETATIVE
PROPAGATION

i. NATURAL VEGETATIVE PROPAGATION:-

- Occurs through stems, leaves and roots.

1. CREeping STEMS:-

Horizontal crawling stem above ground.

i. RUNNER:-

- Long, thin and weak.
- Produce adventitious roots and lateral buds at the roots.
- In case internodes die off



Adventitious roots and buds form new plant.

- If internodes don't degrade

↓
Genes of plants linked together by runner.

ii. SUCKERS:-

- Mostly underground stems
- Produce short lateral branches with terminal buds.
- Terminal buds produce adventitious roots and shoots

• Example:- Mint, bananas, pineapple etc...

b. UNDERGROUND STEM:-

- Stems and shoots → contains stored foods
- Buds grow into new plant by stored food.

• Example:-

- Ginger → Rhizome
- Potato → Stem tuber
- Onion → Bulb

c. LEAVES:-

- In many plants like Bryophyllum
- Series of adventitious buds develop on leaf at leaf margins.
- When leaf falls on ground.
- Buds develop into new plants.

ii. ARTIFICIAL VEGETATIVE PROPAGATION:-

- Artificially assisting plants to reproduce using parts of the parent plant.

→ These are two types:-

- Cutting
- Grafting

1. CUTTING:-

- Stems are obliquely cut.
- Cut stems must have nodes and buds.
- Cutting stems must have minimum two nodes close to end that is inserted into ground.
- Leaves must be removed to control the transpiration.
- Example:- Rose , sugar cane

2. GRAFTING:-

Piece of shoot from one plant is inserted on the stem of another closely related plant.

- i. STOCK:- The root system onto which another plant is grafted.
- ii. SCION:- Part of plant shoot to be grafted.

→ PROCESS:-

- The scion is inserted onto stock and tied in proper manner.
- Scion grows and retain its qualities.
- Stock supports the growing scion.
- ↳ Example:- Guava , peach , apricot , plum etc

SEXUAL REPRODUCTION IN PLANTS:-

Flowering plants have four main parts (whorls) :-

i. OUTERMOST WHORLS / CALYX:-

- Green leafy structures → sepals] calyze
- Protect the inside of flower

ii. 2nd WHORL / COROLLA:-

Coloured petals] Corolla

iii. 3rd WHORL / ANDROECIUM:-

- Male reproductive structure
- ∴ Consist of :-
 - Stamen
 - Filament
 - Anther

iv. INNERMOST WHORL / GYNOCECIUM:-

- Female reproductive structure
- ∴ Consist of :-
 - Carpel
 - Carpel
 - Stigma
 - Stigma
 - Style
 - Ovary
 - Ovary
 - Style
 - Ovules
 - Ovules

LIFE CYCLE OF FLOWERING PLANT:-

- a. Sporophyte
- b. Gametophyte
- c.

a. SPOROPHYTE:-

- Plant body of the flowering plant is called sporophyte.
- Diploid phase ($2n$)
- ↳ Produce spores through meiosis ;
 - i. Male spores = microspores (anther)
 - ii. Female spores = megaspores (ovule)

b. GAMETOPHYTE:-

- Plant part that produce gametes
- Haploid phase (n)
- Spores divide mitotically
↓
produce gametes
 - i. Male gametophyte
 - ii. Female gametophyte

SEXUAL REPRODUCTION IN PLANTS :-

→ MALE GAMETOPHYTES :-

- Anther contain pollen sacs
- Pollen sacs consist of micropores.
- When micropores / pollen grain falls on stigma, they start to grow

MICROPORE NUCLEUS

TUBE NUCLEUS

GENERATIVE NUCLEUS

- Controls formation of pollen tube.

- A tube through which micropores passes to ovary through style.

Sperm
Nucleus

Sperm
Nucleus

∴ MALE GAMETOPHYTE CONSIST OF :-

- i. Microspore body
- ii. Pollen tube
- iii. Tube Nucleus
- iv. Two sperm nuclei

SEXUAL REPRODUCTION IN PLANTS:-

FEMALE GAMETOPHYTE:-

- Ovary contains ovule



Ovule contains one spore mother cell



Only one megaspore survives

- Megaspore nucleus (centre of ovule)



divides 3 times
through mitosis

8 - nuclei

- Initially → 3 nuclei out of 8



move towards bottom end of ovule

∴ centre one become egg

∴ two side ones — synergids

- 3 - other nuclei



move towards top end of ovule called Antipodals.

→ Remaining 2-nuclei;

Stay in centre = polar nuclei

In some cases these 2 nuclei fuse together to form — fusion nucleus / secondary nucleus

i. Megaspore body

ii. 2-antipodal

iii. 1-synergids

iv. 2-polar nuclei

v. 1-egg

} Female Gametophyte

FERTILIZATION AND ZYGOTE FORMATION:-

• When pollen tube penetrates ovule.

→ 1st event = 1st sperm nucleus + egg

Diploid zygote (embryo)

→ 2nd event = 2nd sperm nucleus + polar nucleus

Triploid endosperm nucleus
(provides nutrients to developing embryo)

∴ These two events are collectively called double fertilization.

• Because 1-male gametophyte provide 2nd sperm nucleus for fertilization.

- Rest of nucleus ;
synergids + antipodals



controls process of fertilization

- Zygote develops in embryo

→ Embryo consists of :-



Radicle



Plumule



Cotyledon

POLLINATION:-

Transfer of pollen from anther to stigma of a flower.

TYPES OF POLLINATION

SELF-POLLINATION

- Transfer of pollen from anther to stigma of the same flower or another flower of the same plant.

CROSS-POLLINATION

- Transfer of pollen from one plant to the flower of another plant of the same species.

→ SOURCES OF POLLINATION:-

- i. Wind
- ii. Insect
- iii. Water

• STRUCTURE OF SEED:-

After fertilization ;

- Ovule → seed (embryo + endosperm)
- Embryo consists of :-
- Radicle → convert to root

∴ Plumule → convert to shoot

∴ Cotyledon → convert to leaves

↳ Food is deposited inside  cotyledon
endosperm

i. INTEGUMENT:-

Membrane that surrounds the embryo becomes thick with time and form a protective coat called testa.

ii. HILUM:-

Mark / scar on the seed coat.

iii. MICROPHYL:-

Tiny pore on hilum.

- Water is absorbed during germination.

iv. EPICOTYL:-

Embryonic stem above attachment point on cotyledon.

- Mostly water is withdrawn from seed.



making it hard



Resistance to cold and adverse conditions

SEED:-

→ GERMINATION OF A SEED:-

Process by which seeds begin to grow and develop into seedling.

TYPES OF GERMINATION

EPIGEAL GERMINATION

- When cotyledon are brought above surface of soil by growth by hypocotyl.

↳ E.g: Beans, Caster seeds

HYPOGEAL GERMINATION

- When cotyledon remains below the soil surface during the germination.

↳ E.g: Maize, Gram etc...

→ CONDITIONS FOR SEED GERMINATION:-

i. WATER:-

Initially excess water is needed for germination to activate cells and enzymes.

- Absorbs water through micropyle.
- Water soften seed coat which bursts



Facilitate formation of root & shoot

ii.

AIR:-

O_2 is crucial for the respiration and also germination.

iii.

TEMPERATURE:-

Suitable temperature range

→ Average / optimum temperature — $25^{\circ}C - 30^{\circ}C$

∴ Below $0^{\circ}C$ to Above $45^{\circ}C$

cannot grow properly

SEXUAL REPRODUCTION IN ANIMALS:-

- Formation of male and female gametes.
- Fusion of male + female gametes

fertilization

TYPES OF SEXUAL REPRODUCTION

EXTERNAL FERTILIZATION

- Male & female release gametes

→ Source:- Water

- Fertilization takes place in water — develop into larva baby animal

→ E.g; Fish, Frog

INTERNAL FERTILIZATION

- Sperm are passed to female reproductive tract.
- Development may take out body {lizard, birds}
- It also takes place inside the body. {mammals}

SEXUAL REPRODUCTION IN ANIMALS:-

GAMETOGENESIS:-

Formation and development of male and female gametes.

- Male Gametes → Sperms
- Female Gametes → Eggs / ova

i. SPERMATOGENESIS:-

- The process of production of the sperms.
- Diploid cells (spermatogonia)

↓ mitosis

Primary spermatocytes

↓ meiosis - I

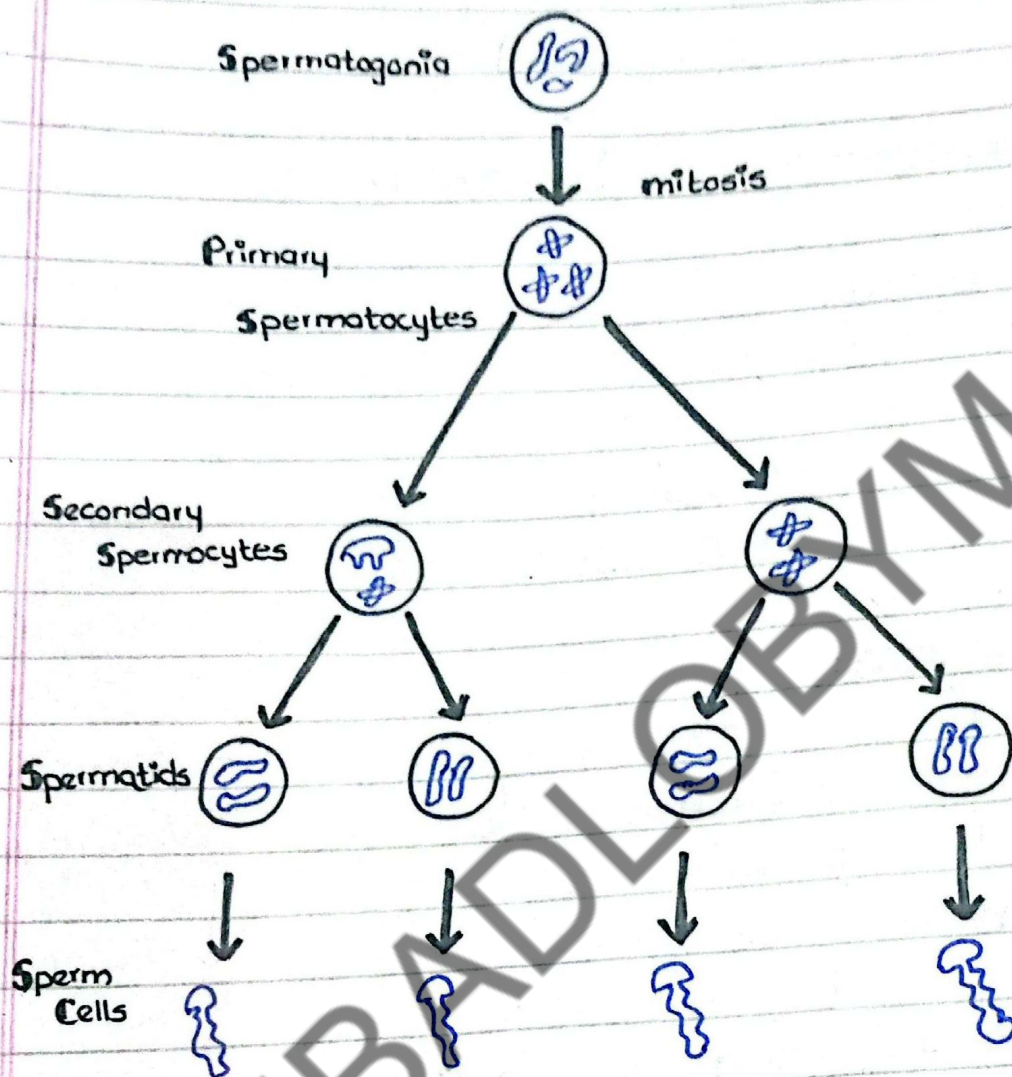
2 - haploid secondary spermatocytes

↓ meiosis - II

4 - spermatides

↓ morphological information

Sperms / spermatozoa



ii. Oogenesis:-

The process of production of eggs / ova is called Oogenesis.

Oogenia



Primary Oocytes



Two cells of different sizes

∴ Secondary oocyte → large cell

∴ First polar body → smaller non-functional

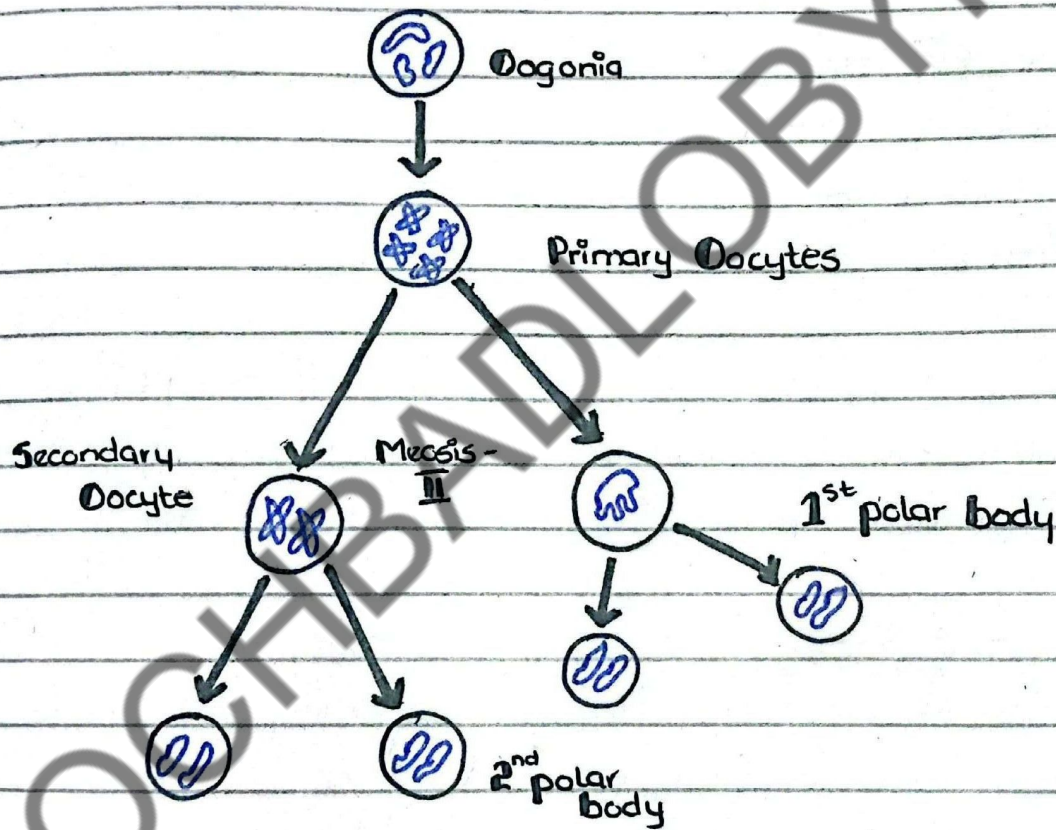
↓ meiosis - II

Two cells

i. Egg / ovum

ii. 2nd polar body

• Polar bodies are non-functional and degenerate.



• REPRODUCTION IN RABBIT:-

→ Reproduction in rabbit is divided into two parts;

i. Male reproductive system

ii. Female reproductive system

MALE REPRODUCTIVE SYSTEM:-

→ Male reproductive system of rabbits consist of following main parts:-

- | | |
|----------------------|------------------|
| i. Pair of testies | ii. Scrotal sac |
| iii. Epididymis | iv. Vas deferens |
| v. Urthra | vi. Penis |
| vii. Accessory gland | |

i. PAIR OF TESTIES:-

- Pink oval bodies
- Situated in lower part of the body
- Testes are divided into tubules



highly coiled tubules (seminiferous) tubules

- Lining of these tubules is called germinal epithorium (produces sperms).

ii. SCROTAL SACS:-

- Pair of sacs lie on each side of penis.
- Each sac contain testies.

iii. EPIDIDYMIS:-

- Highly coiled tubule structure.
- Semiferous tubules are united to form highly coiled tubular structure.
- Store sperms

iv. VAS DEFERENCE:-

- Narrow tubes
- Connect epididymis to uterine.

v. URETHRA:-

- Ejaculating duct
- This duct passes into penis and through penis sperms are ejaculated.

vi. PENIS:-

- Cylindrical rod shaped erectile organ.

vii. ACCESSORY GLANDS:-

- Prostate gland (secretion that neutralize acidity of semen).
 - Seminal vesicle (secretion provides nutrients for sperms).
 - Cowper's gland (secretion that lubricate the duct).
 - After sperm formation → pass down to vas deference secretion are added milky fluid (semen).
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• FEMALE REPRODUCTIVE SYSTEM:-

→ Female reproductive system of rabbits consists of following main parts:-

- | | |
|---------------------|--------------|
| i. Pair of ovaries | ii. Oviducts |
| iii. Vagina | iv. Vulva |
| v. Accessory glands | |

i. PAIR OF OVARIES:-

- White small bag like body.
- Located behind the kidneys
- Projections on surface of ovary → follicles
- These follicles contain ovum.

ii. OVIDUCT:-

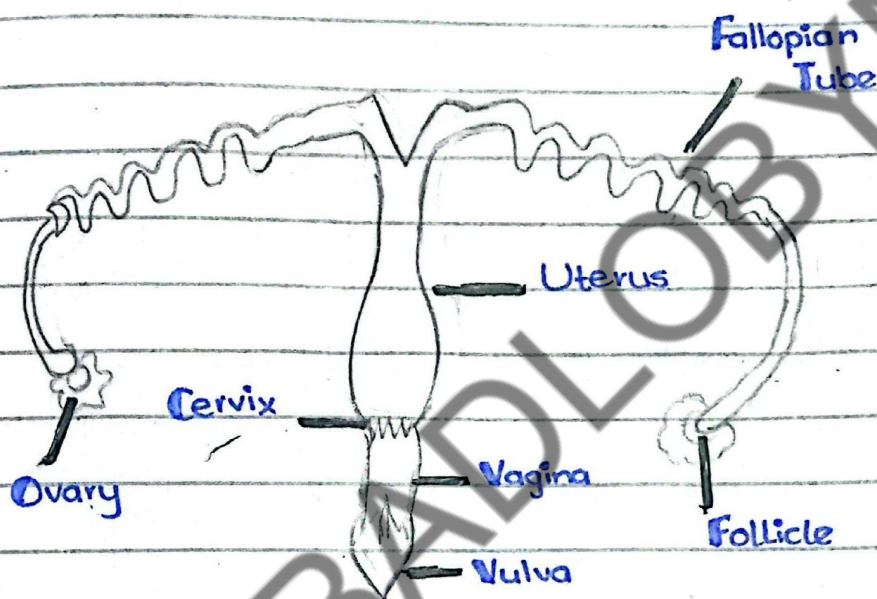
- Long tube
- ↳ Consists of three parts;
 - Fallopian funnel
 - Fallopian Tube (Fertilization space)
 - Uterus
- After Fertilization in fallopian tube, the zygote attaches to the wall of uterus called endometrium.

iii. VAGINA:-

- Muscular, elastic, tubular structure
- Also called birth canal.

iv. VULVA:-

- External genital area.



→ SEXUALLY TRANSMITTED INFECTIONS (STI's):-

- Group of diseases which can be transmitted sexually.

• EXAMPLE:-

i. Syphilis:- • Bacterial infections

- Rashes on palms, fever, headaches etc...

ii. AID's:- • Aquired immuno-deficiency syndrome.

- Caused by human immuno-deficiency virus (HIV).
- Immune system weakness, unable to fight infections.

❖ SYMPTOMS:-

- i. Weight loss
- ii. Recurring fever
- iii. Skin rashes
- iv. Diarrhea

❖ SOURCES:-

- i. Blood
- ii. Saliva
- iii. Body fluids (semen)
- iv. Infected blades
- v. Blood transfusions