

" UNIT - I "

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Reproduction in organisms :-

★ Life span :-> The duration b/w birth to death is called life span. It is also called longevity.

It includes five stages :-

1. Juvenility :-> It is the period b/w birth to the start of reproduction.

2. Maturity :-> Reproduction starts.

3. Ageing :-> Gradually body starts deterioration.

4. Senescence :-> Deterioration becomes irreversible.

5. Death :-> Senescence leads to death.

Reproduction => It is a process by which species is continued.

Types of reproduction are :-

Mainly reproduction is of two types :-

- | | |
|-----------------------------|--------------------------|
| (i) It is uniparental. | (i) It is biparental. |
| (ii) No gametes are formed. | (ii) Gametes are formed. |
| (iii) No syngamy occurs. | (iii) Syngamy occurs. |

- | | |
|---|--|
| <p>(iv) No meiosis</p> <p>(v) No zygote is formed.</p> <p>(vi) No variation occurs</p> <p>(vii) It is rapid method of multiplication.</p> | <p>(iv) Meiosis occur.</p> <p>(v) Zygote is formed.</p> <p>(vi) Variations occur.</p> <p>(vii) It is not the rapid method of multiplication.</p> |
|---|--|

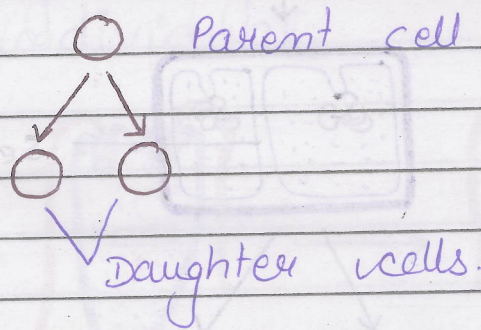
[A] Asexual reproduction \Rightarrow It is a kind of reproduction involving only one parent in which meiosis, gametes, fertilization transfer of genetic material b/w two individual and Parthenogenesis does not occurs.

Parthenogenesis \Rightarrow The formation of complete individual from unfertilized egg is called parthenogenesis. It occurs in Honey Bee. Asexual reproduction produce identical offsprings called CLONE.

CLONE \Rightarrow Genetically identical population is called CLONE. And each member of a clone is called RAME. Asexual reproduction is also called Agamogenesis or Agam or somatogenic reproduction. Asexual reproduction mostly occurs in unicell organisms such as -
Mammexams, Protists & in plants and certain animals. It is absent in higher non-vertebrates and all vertebrates.

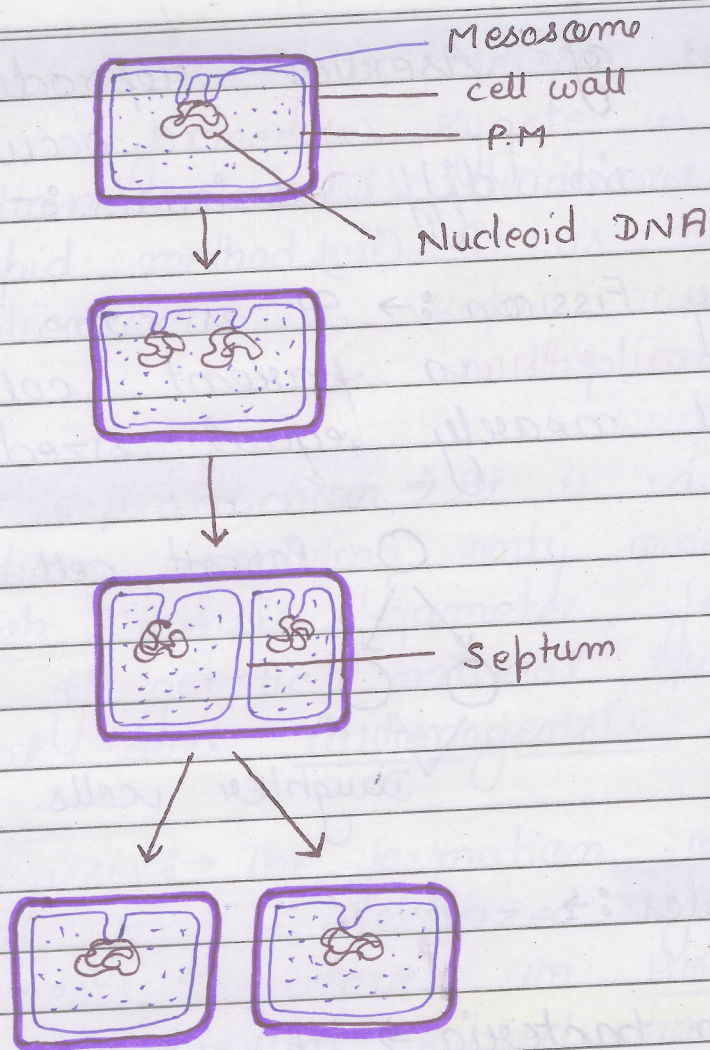
Types of Asexual reproduction :- It occurs in diff. ways in diff. animals :-

1. **Binary Fission :-** It is the division of a parent cell into two small nearly equal sized daughter cells.



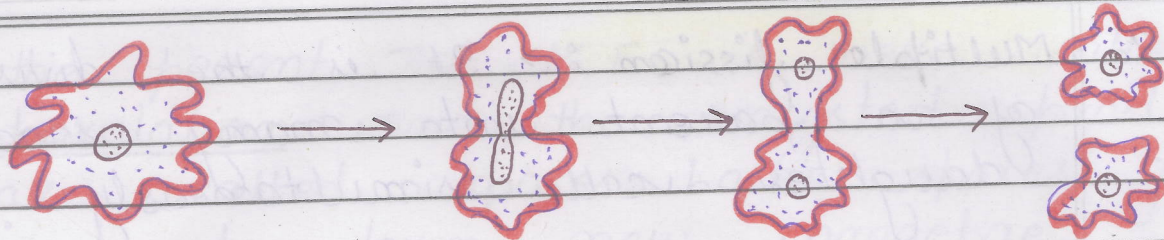
Examples :-

(i) **B.F. in bacteria** \Rightarrow It is the most common method of bacterial multiplication. The cytoplasm and nucleoid divide equally into two, without mitosis. During the division of nucleoid the DNA replicates while attached to the mesosomes. A new mesosome develops which gets attached to the daughter chromosome. Meanwhile the dividing septum originates and separates the parent cell into two daughter cells.

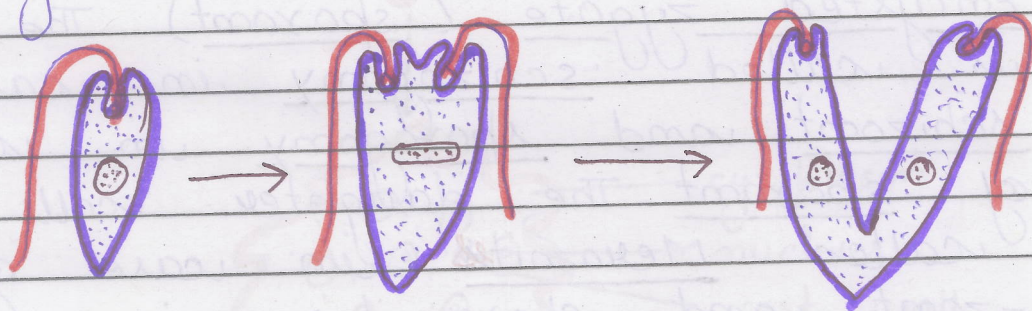


20 **Binary Fission in Protozoan Protists** \Rightarrow Here the chromosome are separated by intranuclear divisions i.e. the nuclear envelope remain intact. Binary fission is of three main kinds (with regard to the plane of division)

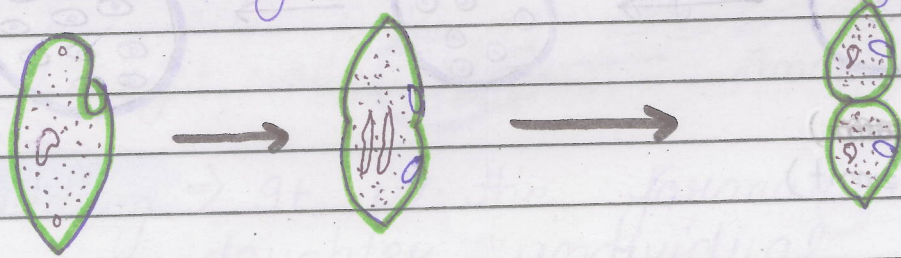
(i) **Irregular Binary Fission** \Rightarrow It occurs in amoebae. Plane of division of cytoplasm is variable is always at right angles to elongated dividing nucleus.



2. Longitudinal B.o.F. \Rightarrow It occurs in flagellates such as *Euglena*. The cytoplasm splits lengthwise forming two similar daughter individuals.



3. Transverse B.o.F. \Rightarrow It occurs in ciliates such as *Paramecium*. The cytoplasm divides transversely b/w two sets of nuclei.

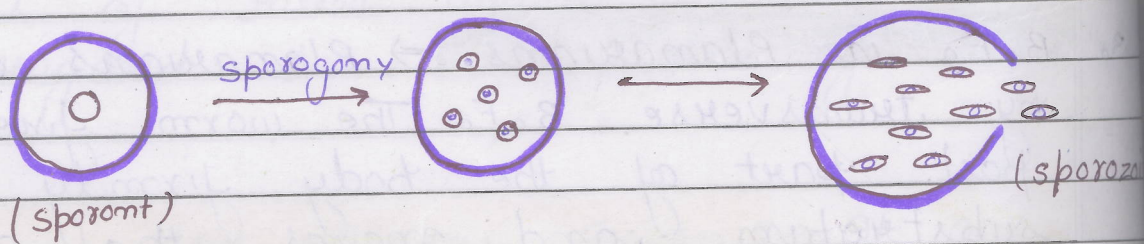
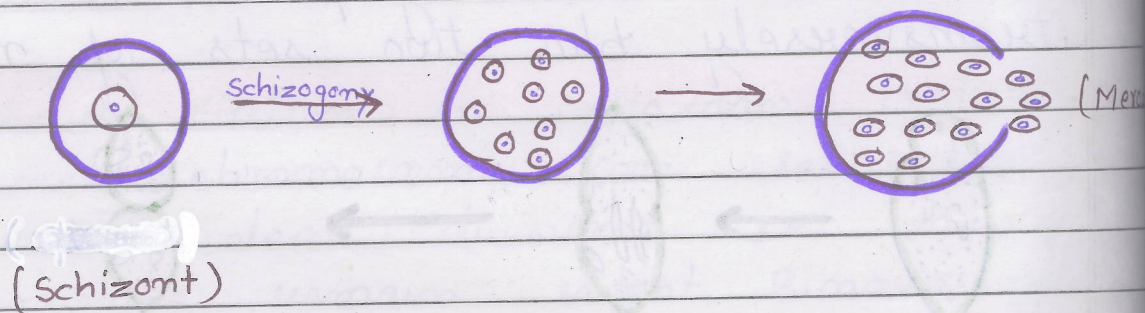


- * 3. B.o.F. in Planarians \Rightarrow Planarians divide by transverse B.o.F. The worm fixes the post. part of the body firmly to the substratum and moves the anterior part forward. Thus the ant. part exerts a pull over the post. part which holds on. Due to the pull, the middle part is stretched, constricts & finally breaks

20 Multiple fission \Rightarrow It is the division of a parent into many small daughter cells simultaneously.

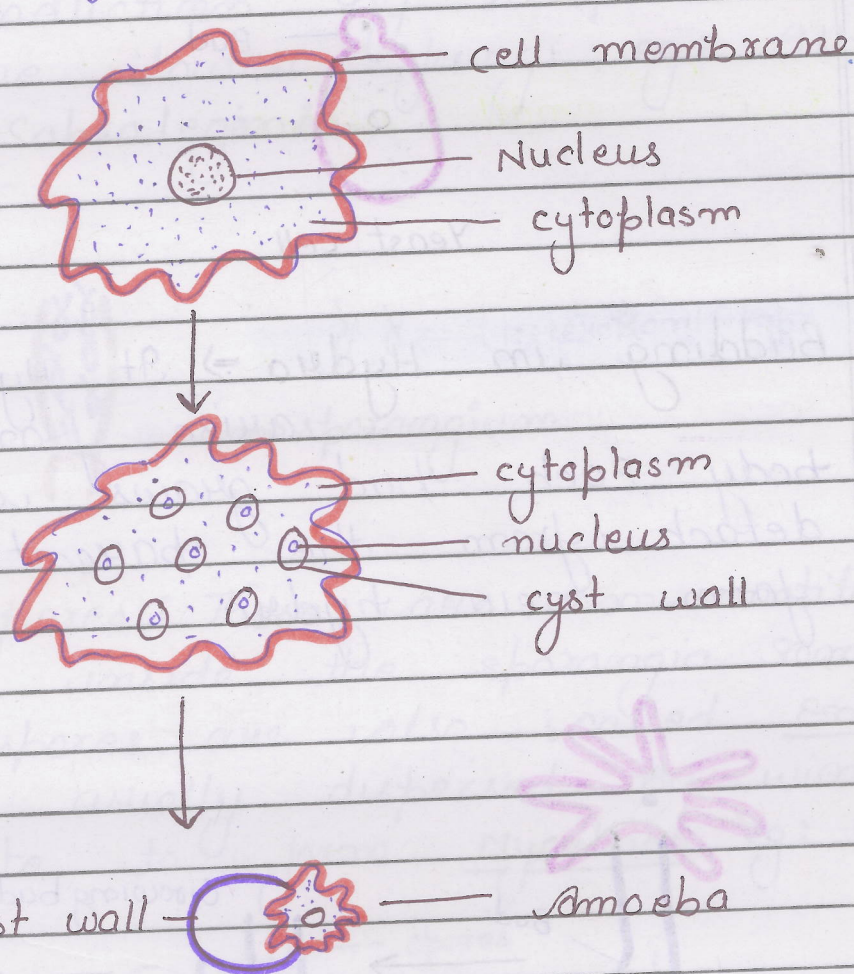
Examples \Rightarrow

(i) M.F in Plasmodium \Rightarrow In plasmodium, multiple fission occur in the active adult (schizont) as well as in the encysted zygote (sporont). The process is called schizogony in case of schizont and sporogony in case of sporont. The daughter cells are called merozoites in case of schizont and sporozoites in case of sporont.



(ii) Multiple fission in Amoeba \Rightarrow In amoeba the products of multiple fission are surrounded by cyst, before their release from

the parent. The M.F is here called Sporulation and the encysted products are called spores. Later spores germinate to form new amoebae

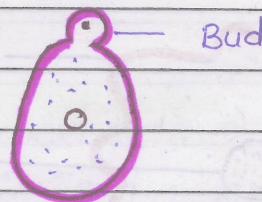


3. Budding \Rightarrow It is the formation of daughter individual from an outgrowth called Bud. This process is called Budding

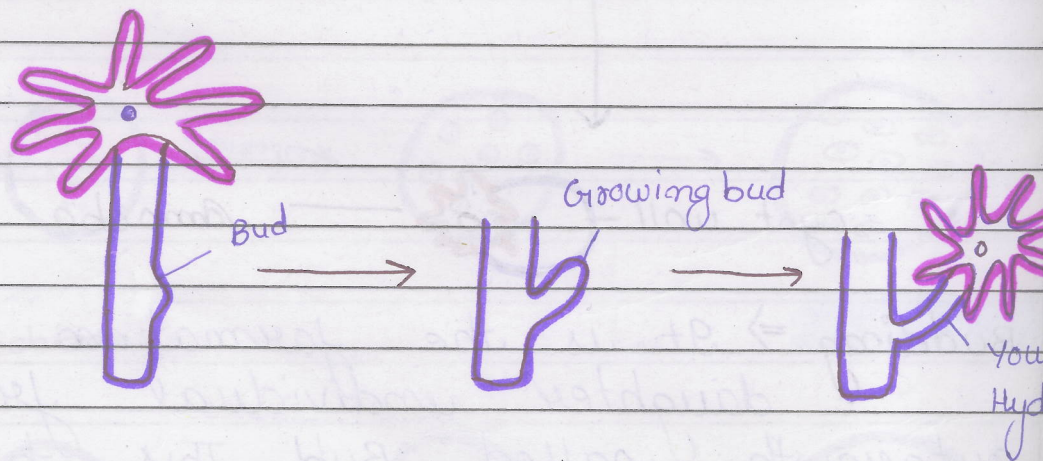
Examples :-

1. Budding in yeast \Rightarrow Yeast is a unicellular fungus. It forms outgrowth on its body. The outgrowth

contains a small portion of nucleus along with the cytoplasm, which later attached to form bud.

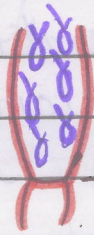


2. Budding in Hydra \Rightarrow It Hydra buds arise from the body. Each bud grows and gradually detach from the parent cell to form new hydra.



★★ Spore Formation \Rightarrow spores are the -gules which germinate to produce new individuals. These are of following types \Rightarrow

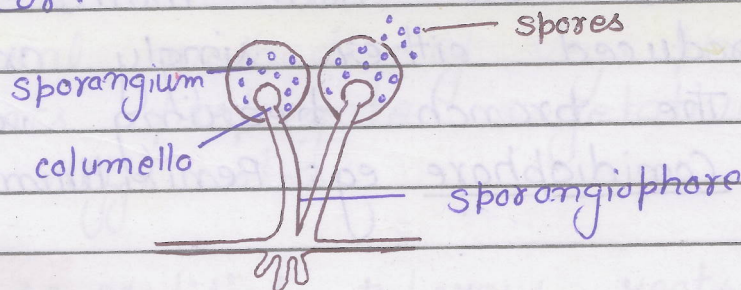
- (i) **Zoospores** : Zoospores are special kind of motile and flagellated spores produced inside the zoosporangia. They are usually naked (without cell wall). The reproduction by zoospores occur in some lower fungi eg: *Allbugo*, *Achlya*, *Saprolegenia*.



♂♂ ← (Heterokont type flagellates)

zoosporangium

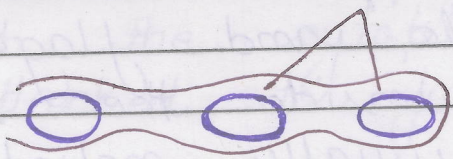
- (ii) **Sporeangiospores** : These are non-motile spores produced inside the sporangia. Sometimes, these spores are also called Endospores. They are usually dispersed by wind & germinate to form Mycelium. eg: *Rhizopus*, *Mucor*.



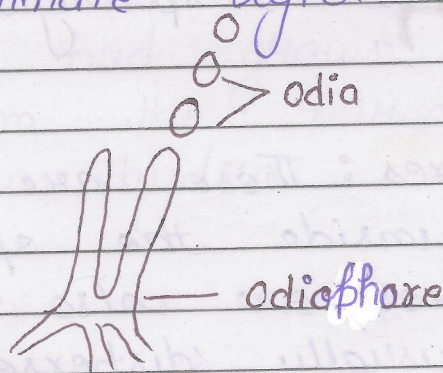
- (iii) **Chlamydo spores** : These are thick walled, resting spores produced from hyphal cells. They store reserved food material & are capable of withstanding long unfavourable conditions.

eg: Chlamydomonas

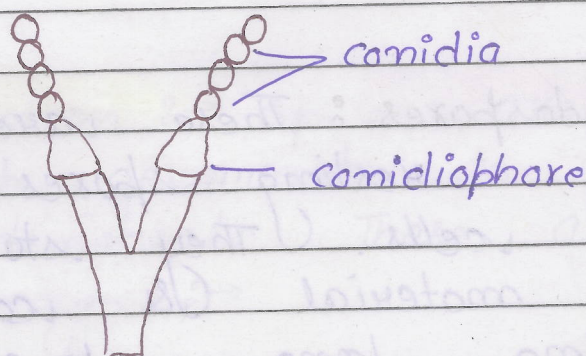
Chlamydozoospores



(iv) **Oidiospores**: The hypha breaks up into small pieces which behave like spores. These are thin walled & do not store reserve food material. The oidia are formed under conditions of excess water, sugar and certain salts. They soon germinate after liberation.



(v) **Conidia**: These are non-motile spores produced either singly or in chains. The branch bearing conidia called Conidiophore eg: Penicillium.



☆☆ Gemmule Formation \Rightarrow These are dormant str. produced asexually by the formation of specialized endogenous buds in a few marine species.

Gemmules are resistant to desiccation, freezing & anoxia (lack of O_2) under suitable environmental conditions. The living cells leave the gemmule through a narrow opening & differentiate to form sponge.

[B] Vegetative Propagation \Rightarrow It is the process in which a part of plant body become detach and regenerate into a new independent plant.

It is useful in those plants which do not produce seeds. Veg. prop. is of two types \Rightarrow

(i) Natural methods of veg. prop. \Rightarrow A no. of plants propagate vegetatively in nature by diff. str.

(a) Roots \Rightarrow Modified tuberous roots of sweet-potato, Tapioca, Yam, Dahlia & Dioscorea etc. can be propagated vegetatively when planted in soil. The buds present on the roots grow into leafy shoots above ground. Each slip gives rise to a new plant. eg: Populus, Guava, Murraya etc.

(b) **Underground stems** \Rightarrow Underground stems are suckers, rhizome, corms which grow into new plants -

(i) Suckers \Rightarrow of mint and chrysanthemum arise from the base of the erect shoot, grow horizontally in the soil & then come out to form new aerial shoots.

(ii) Rhizomes \Rightarrow serves as means of vegetative propagation by perennating under unfavourable conditions & producing new aerial shoots during the favourable season. Typha, Camm

(iii) Corms \Rightarrow are highly condensed and specialized underground stems which bear many buds. They penetrate the unfavourable conditions & produce new plants in favourable cond

(iv) Bulbs \Rightarrow of onion, lilies, garlic etc. serve as means of vegetative propagation by producing new plants

(v) Tubers \Rightarrow are modified underground stem branches having several buds each eye of potato tuber is a bud which grows into a new potato plant when planted with a portion of the swollen tuber.

(c) **Creeping stems** \div

(i) Runners \rightarrow are creeping modified stems which

produce advent roots at nodes. Each node gives rise to aerial shoot which becomes a new plant.

(ii) Stolons → are arched runners which cross over small obstacles & develop small plant-lets at their nodes.

(iii) Offsets → are one internode long runners which develop tuft of leaves at the apex.

(iv) Aerial stems → Aerial modified stems of cacti develop new plants when stem segments fall on ground & act as means of veg. prop.

(e) Leaves → Some plants develop advent buds on their leaves which get detach.

(f) Bulbils → These are fleshy bud.

(g) Turions → These are special type of fleshy bud.

2. Artificial methods of propagation → These are man made methods.

These are of following types:

(a) Cuttings: The small piece of plant organ i.e. stem, root or leaf is used for propagation is called cutting. Leaf cutting is used to propagate Bryophyllum, Kalanchoe, Begonia. Root cutting are used

to propagate Citron, Tamarind. Stem cuttings are most commonly used for veg. prop.

(b) **Layering**: In this method roots are artificially induced on the intact stem branches. It is of two types:

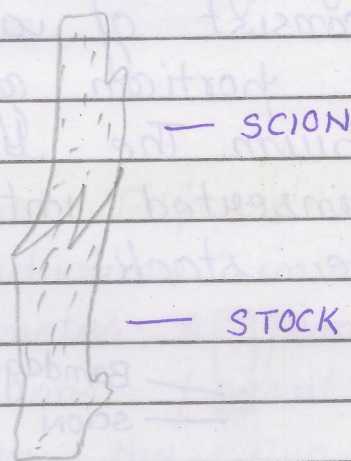
(i) **Mound layering** → It is the most common method in herbaceous plants. In this method the lower branch of stem is bent down and partially defoliated, an injury is made in the defoliated part which is covered with moist soil in such a way that the growing tip of branch remains above the soil surface. After a few days the pegged part develops adventitious roots. The rooted branch is then cut from the parent plant and grows into a new plant. eg: Jasmine, Grape vine, strawberry.

(ii) **Air layering or Gootee** → It is commonly used in case of shrubs & trees which do not possess branches near the ground. In this method a ring of bark is removed (girdled). The girdled portion is then covered with moist soil, cow dung, some

pieces of hay (मूसा), cotton & H_2O & wrapped with a polythene sheet. The wrapped portion is called Gootee. This portion develops roots & detach from the parent plant & planted elsewhere. eg: Pomegranate, litchi, Bougainvillea.

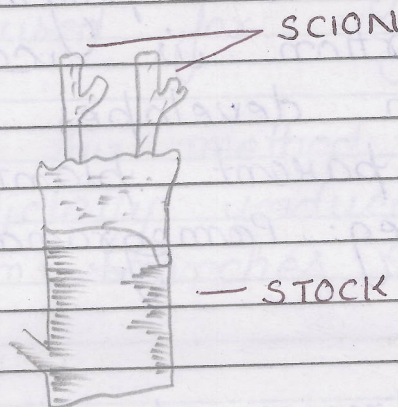
(iv) Grafting: The process of joining together parts of 2 different plants in such a way that they live as one plant is called grafting. Off the 2 plants, one is rooted in the soil called STOCK and other part consist of smaller shoot bearing one or more buds is called SCION. Grafting is of four types:-

(i) Tongue or Whip grafting \Rightarrow Both the stock & scion are cut obliquely at about the same angle.



(ii) Wedge grafting \Rightarrow A V-shaped notch is made

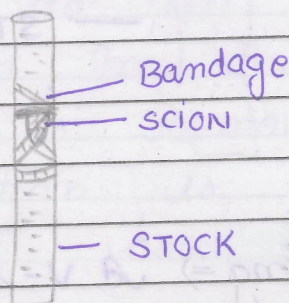
on stock & a wedge shaped cut is made on scion.



(iii) **Crown grafting** ⇒ several scions having wedge shaped cut are grafted on the slits at top of stock.

(iv) **side grafting** ⇒ single scion having wedge shaped cut is inserted into a lateral slit of a stock. eg: Mango, roses, apples, rubber, citrus, pear, Plum, pe etc.

(d) **Bud Grafting**: This method is similar to this case except that scion in this case consist of a bud along with a small portion of bark having intact cambium. The living tissue of scion bud inserted into an incision made in the stock.



(e) Propagation by tissue culture \rightarrow (micropropagation) - (am)

This method includes propagation of plants by tissue culture technique. The plant part used in tissue culture is called EXPLANT. Initially, the culturing of cells form an undifferentiated mass of cell is called callus. Later callus differentiate into embryo and a new plant generated by this method.

★★ Importance of vegetative propagation \rightarrow

- (i) It is a rapid method of multiplication
- (ii) Plants which produce small quantities of viable seeds are mostly propagated vegetatively.
- (iii) Disease free ^{plant} can be produced.
- (iv) Mutations can be done easily
- (v) The plants can retain their original combination, so there are no chances of variation.

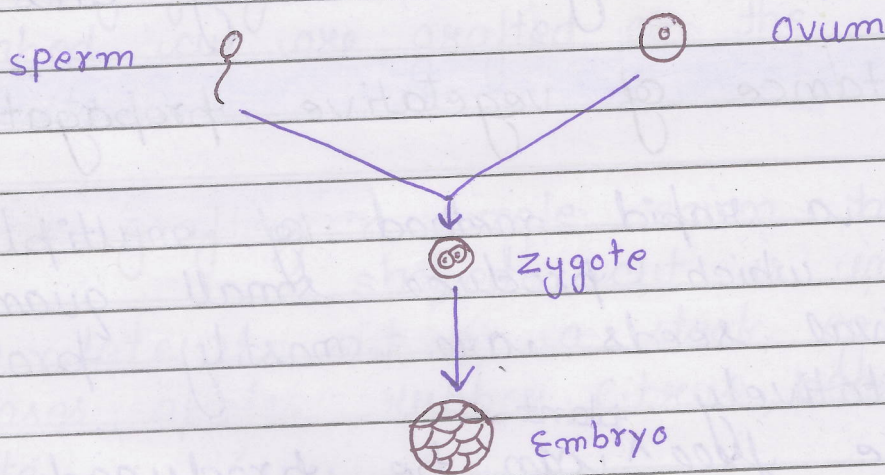
Sexual Reproduction

Sexual reproduction involves the production of male gametes & female gametes either by the same parent or by diff. parents. When the two opposite gametes are produced by same individual, it is regarded as Bisexual. When the gametes are formed in diff. called unisexual.

Events in sexual reproduction :->

1. Prefertilization events :-

- (a) Gametogenesis \Rightarrow Formation of two types of gametes - male and female, inside the gametangia, is called gametogenesis. The reproductive units in sexual reproduction are specialized cells called Gametes.



I Reproductive Patterns \Rightarrow

- (i) External fert. & external developement :-> Here fert. & devel. both occur outside the body. eg: Fishes, Frog.
- (ii) Internal fert. & external developement :-> In this case fert. occur inside the body and developement occur outside the body. eg: Birds.
- (iii) Internal fert. & internal developement :->

Here fert. & devel. both occur inside the body. eg: Mammals.

★ Syngamy \Rightarrow It is the fusion of 2 entire gametes to form a zygote

★ Fertilization \Rightarrow It includes all the events that ultimately lead to syngamy

★ Endogamy \Rightarrow It involves self fert. i.e. the fusion of 2 gametes of the same parent. It is uniparental. It is not common and occur in Hermaphrodite organisms eg: Tapeworm.

★ Exogamy \Rightarrow It involves cross fert. i.e. the fusion of 2 gametes from diff. parents. It is biparental & is very common. It is found in frog, rabbit & man.

★ Parthenogenesis \Rightarrow It is the formation of complete individual from an unfertilized egg. It is of 2 types:

① Natural Parthenogenesis \Rightarrow It is of three types \Rightarrow

i) Complete or obligatory Parthenogenesis \Rightarrow It occur in individuals where there are no males

Paedogenesis - larval stage

Pedogenesis - soil formation

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and hence there is no biparental sexual reproduction.

-enogenetically. eg: Lacerta (Rock lizard)
Typhlina brahmiana (Snake)

(ii) Incomplete or cyclic parthenogenesis \Rightarrow Some individuals have both sexual and parthenogenetic individual which may alternate depending upon the environmental conditions.
eg: Daphnia.

(iii) Paedogenetic Parthenogenesis \Rightarrow Certain insect larvae reproduce by laying eggs, which develop parthenogenetically into new generation of larvae. Parthenogenesis by larvae is called Paedogenesis.

(B) Artificial Parthenogenesis \Rightarrow Eggs of certain animals such as annelids, frogs, rabbit etc. can be artificially induced to develop parthenogenetically. The artificial stimuli may be physical, electric shock, change in temp or chemical addition of urea, fatty acids.

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Post fertilization events \Rightarrow All the events that occur after syngamy.

are known as Post fertilization events.

★ **Embryogenesis**: The process of formation of multicellular embryo from unicellular zygote is called Embryogenesis.

Oviparous animals ⇒ These animals lay eggs. eg: Reptiles & birds.

Viviparous animals ⇒ They gave birth to young ones.

★★ **Terms related to Parthenogenesis** ⇒

1. **Axhenotoky**: Males develop parthenogenetically
eg: Honey Bee

2. **Thelytoky**: Females develop parthenogenetically
eg: Comorian Rock lizard

3. **Amphitoky**: Parthenogenesis may result into many sex.
eg: Aphids.