

# Reproduction

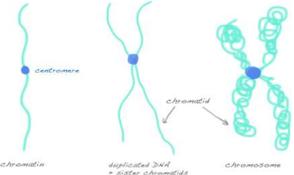
**Definition=Reproduction is the process of formation of new young ones of similar type by the grown up individual**

### Importance and features of reproduction

importance

- 1.Continuation of life
- 2.Perpetuation of life
- 3.Replacement
- 4. Variation
- 5. transfer of variation

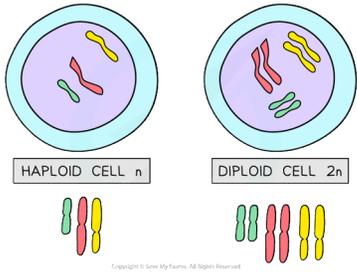
Gametes are haploid(n) reproductive cell which has to be fertilized



↑  
chromosome and chromatids

Features

- 1. Replication of DNA
- 2. Cell division
- 3. Development of special reproductive structure



In a dividing cell chromosomes are paired and a set of chromosome is known as diploid(2n) and a single chromosome is known as haploid which is present in gamete(n). So in normal human cell number of chromosomes is 2n=46 and in gamete n=23

# Do organisms create exact copies of themselves

DNA functions as blue print of life as it is a store house of all information . It acts as master copy. It produces working copies in the form of RNA. Prior to cell division DNA replicates (coping)to form two copies which remain attached in the form of two chromatids of a chromosome. But replication is not error proof. For this copies are not identical . Errors give variation. These variations are may be beneficial, neutral or harmful. If the variation is drastic then the daughter cell will die.

### Importance of variation

1. Pre adaptation
2. Providing individuality
3. Struggle for existence
4. Improvement of varieties
5. Help in evolution

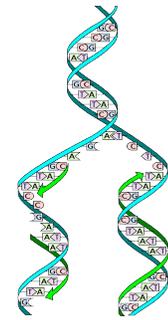
( variation is helpful for a population and not for an individual)

### causes of variation

1. faulty DNA replication
2. cross
3. chance separation of chromosome

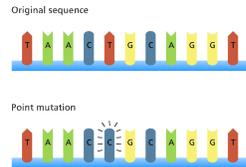


variation may be due to the structural changes of the chromosomes .



↑  
diagram of replication

Mutation is the changes take place in a gene ,resulting a variant and transmitted to subsequent generations. Mutation is the source of genetic variation.



Variation is also due to the change in number of chromosome. Ex Down syndrome

## Types of reproduction

Sexual reproduction	asexual reproduction
Uni parental	Bi parental
Gametes are formed	Gametes are not formed
Fertilization takes place	Fertilization doesn't take place
Variations occur	Variations doesn't occur
Has evolutionary importance	Has less evolutionary importance
Take place in higher organisms	Take place in lower organisms
Human beings, higher plants etc	amoeba, yeast etc

Male gamete of higher plant and Male gamete of human	Female gamete of plant and Female gamete of human	male gonad of higher plant and Male gonad of human	Female gonad of higher plant and Female gonad of human	Sex hormones of human male and female human
Pollen grain(n) Sperm (n)(300 to400 million)	Egg or ovum(n) Egg or ovum (n) ( one in each month	Anther (2n) Testes(2n)	Ovary(2n) Ovary(2n)	Testosterone Oestrogen progesterone

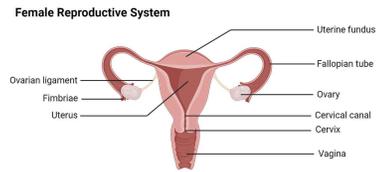
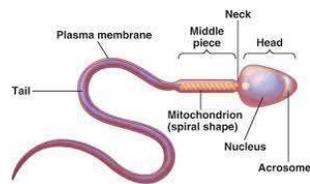
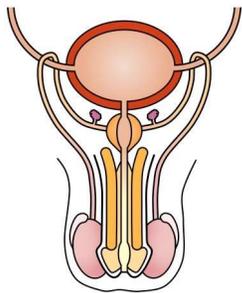
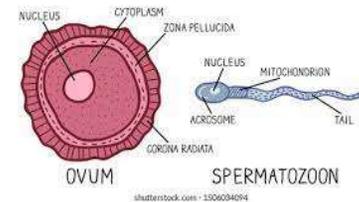


Figure: Structure of Female Reproductive System Designed By: Sagar Aryal. Created with biovender.com



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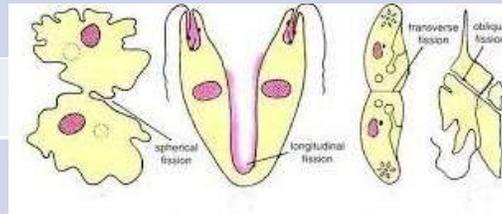
## Structure of human gonad and gametes

# Asexual reproduction

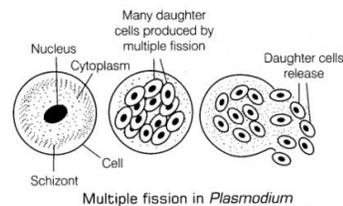
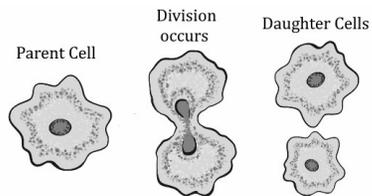
## Types of asexual reproduction

- 1. **fission**=one cell splitting into two or more daughter cells. It is of two types

Binary fission	Multiple fission
One cell is divided into two daughter cells	One cell is divided into many daughter cells
Under favourable condition	Under unfavourable condition
No residual cytoplasm is left	Residual cytoplasm is left
cyst is not formed ex amoeba	Cyst is formed ex plasmodium

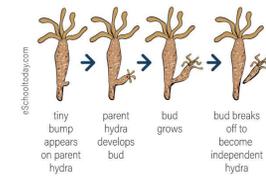


different planes of cleavage

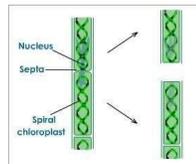


## Types of asexual reproduction

2. **budding**= budding is the formation of outgrowth from an organism which separate to produce a new organism. Ex hydra



3. **fragmentation**= one organism is splitting into many parts and develop into new organisms. Ex spirogyra



4. **regeneration**=it is the ability to repair injured parts and replace the ones lost through accident . Ex planaria

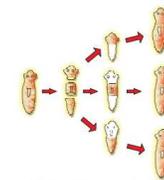
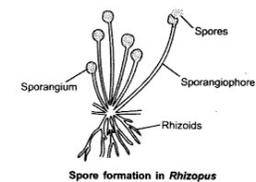


Figure 8.3 Regeneration in Planaria

(Simple organisms can reproduce by regeneration like planaria and hydra. But complex organisms can develop only few body parts but not the whole organism. Ex tail of house lizard, arm of star fish. In complex organisms development is under neuro hormonal control. To develop a complex body )



5. **spores formation**=spores are the tiny asexual reproductive structure which germinate into a new organism. Ex= fungus



## vegetative propagation

**Definition**—It is a process of new plants from the vegetative parts of the plants like leaves, roots and stems etc. it may be natural or artificial

### Natural methods

- Roots= sweet potato
- Stems=banana, potato
- Leaves= Bryophyllum

### Artificial methods

- Cutting = a small part of stem or leaf is cut and planted under soil to get a new plant. Ex rose
- Layering= a soft old basal branch is pegged down and covered with soil. After few days roots are developed and new plants developed. Ex = Jasmine
- Grafting= it is a technique of joining shoot system of one plant over the other plant having roots. Ex mango, apple
- Tissue culture= it is a method of raising new plants from small pieces of plant over a culture under aseptic conditions.

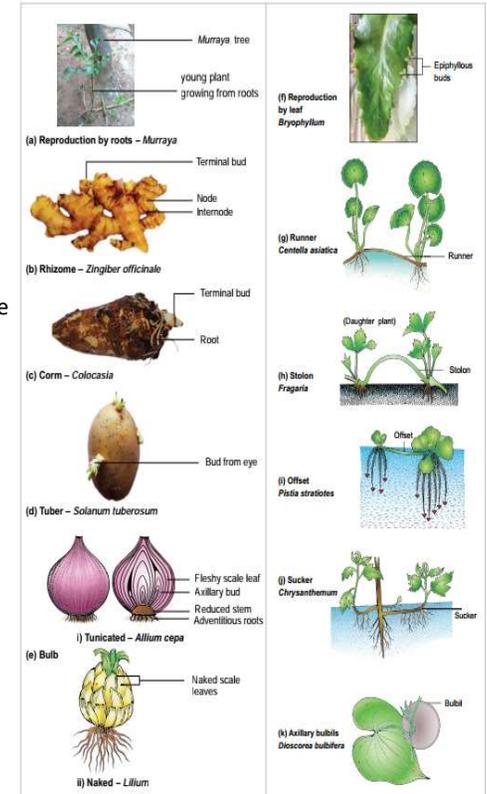
### **Advantages of vegetative propagation**

1. Multiplication of seed less plants
2. Uniform yield
3. Quicker method
4. Survival rate is high

### **Disadvantages of vegetative propagation**

1. Over crowding
2. Diseases are spread rapidly
3. Absence of variation
4. Undesirable character cant be eliminated

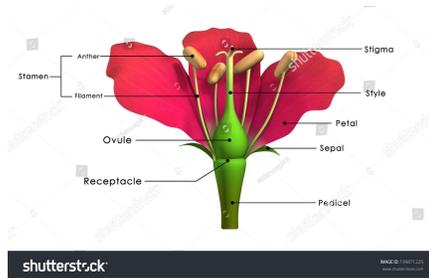
Different types of vegetative propagation



a-k: Natural methods of vegetative reproduction in plants.

## Sexual reproduction in flowering plants

- Flower is a condensed shoot which is specialized for sexual reproduction. A complete flower has the following parts

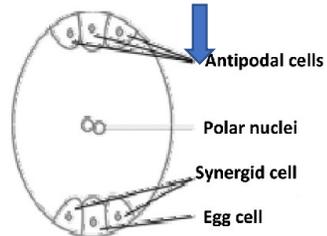


1. stalk is called pedicel
2. broad base is called thalamus
3. sepals are leaf like structure protect buds ( outermost part)
4. petals are coloured fragrant part help in pollination
5. stamen is the male part having a long stalk called filament and anther to contains pollen grains
6. carpel or pistil is the female part having a stigma, a style and an ovary. Inside the ovary ovule (s) present and inside ovule ovum or egg is present along with some other cells . There is a small opening in the ovule called micropyle.

anther and pollen grain



embryo sac



**pollination**= transfer of pollen grain from anther to stigma is called pollination. Its of two types. Self pollination and cross pollination. Different agencies of pollination are insects, birds, air ,water etc.

*Monoecious plant*=a plant is having both male and female reproductive organs in the same

body. hermaphrodite. Example corn, Hibiscus etc.

*Dioecious plant*= plants having distinct male and female reproductive parts in different plants. ex Cucurbita , papaya

*Unisexual flower*= the flower is having either male or female reproductive part is called unisexual flower. Ex= papaya, watermelon

*Bisexual flower*= the flower is having both male and female reproductive part is called bisexual flower. Ex= mustard, hibiscus

## Steps of Sexual reproduction in flowering plants

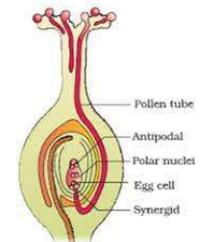
- After pollination the pollen grain absorbs water and develop a pollen tube. In the pollen tube there are two male nuclei.
- The pollen tube is grown through the oviduct towards the ovary (chemotropism) and enters into the ovary through the micropyle.
- The male gamete fuses with the egg and produces zygote ( $n+n=2n$ ) is called double fusion
- The second male gamete fuses with the polar nucleus and forms triploid cells endosperm. ( $n+n+n=3n$ ) is called triple fusion
- So in the flowering plants double and triple fusion take together so it is called **double fertilization**.
- Zygote is converted into embryo and is surrounded by the endosperm. Endosperm supplies nutrients to the growing embryo.
- After fertilization stigma ,style shade off. Ovary converts into fruit, ovule converts into seed and ovum converts into embryo.

### Importance of seeds

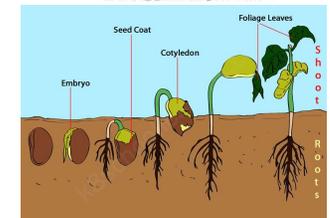
- Seed has a dormant embryo and can pass through the unfavourable condition.
- Seeds can be dispersed to a long distance

### Structure of a seed

- Seed is a ripened ovule having two seed coats for protection , and embryo surrounded by endosperm.
- One end of the axis bears radicle or future root and the other end is the future shoot called plumule.
- The distance between the node and radicle is called hypocotyl . And the distance between the node and plumule is called epicotyl.
- Under the favourable condition seed absorbs water and germinates.



Longitudinal section of a flower showing growth of pollen tube



## Human reproductive system

- **Human beings show sexual dimorphisms they are unisexual**

### male human reproductive system consists of

- Testes= a pair of testes produce sperms and male sex hormone testosterone. Testes lie outside the body in muscular pouch is called scrotum. Sperms need 1 to 3 degree less than body temperature.
- Epididymes = each testis opens into a long coiled tubule is called epididymis.
- Sperm duct= epididymis opens into a tube is called vas deferens. It receives secretions of prostate gland.
- Seminal vesicles= they are a pair of glands produce semen having fructose, proteins and other chemicals for nourishing and stimulating sperms.
- Prostate glands=it is a single gland to secrete a chemical essential for the mobility of sperms.
- Penis= male erectile organ to release sperms

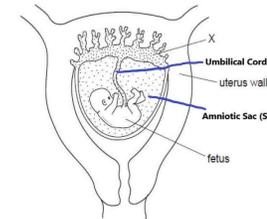
(In male there is a single opening for releasing sperms and urine through urethra so it is called urinogenital system.)

### Female human reproductive system consists of

- ovaries=there are a pair of ovaries to produce egg and female hormones oestrogen and progesterone.
- Fallopian tube or oviducts= they are a pair of curved tube which is the site for fertilization.
- Uterus= a muscular thick walled organ to hold the foetus and providing nourishment. Uterus tapers to lower end to form cervix.
- Vagina= it is the female copulatory organ ,birth canal and passage for menstrual flow.
- Fertilization is internal fertilization and they are viviparous

## Fertilization and development of embryo

- Sperms remain active for 24 to 48 hours.
- After fertilization zygote (2n) is formed and further divided to form embryo. Embryo moves to the uterus and fix to the uterine wall called placenta by the process of implantation.
- Inside the uterus embryo divides to form foetus.
- Uterus provide nourishment and providing life supporting gas and helps in excretion.
- An umbilical cord attaches the growing foetus with the placenta through which these substances are exchanged.
- The total period of embryonic development is called **gestation** period.



**If the egg is not fertilised it lives for one day and is expelled. It is a series of cyclic change that occurs in the reproductive system of human females with a periodicity of 28 days. The cycle begins with puberty is called menarche and it stops at the age of 45 to 50 years. Stopping of menstruation is called menopause.**

### **Reproductive health**

It is a state of physical, social and mental fitness to lead a responsible safe and satisfying reproductive life.

#### **Importance**

- It provides information about fertility regulating methods
- Reduction the number of children
- Prevent from STDs
- Prevention from pregnancy is called contraceptive method.

### **Different contraceptive methods**

- **Mechanical method**= prevent sperms to enter into the vagina. The only way to prevent STDs too. Ex male condom, female diaphragm
- **IUCD**= intra uterine contraceptive device. Temporary surgical method. Prevent implantation

## Sexually transmitted diseases

- Hormonal methods= suppression of production of eggs. Taken as oral pills
- Chemical methods= they are creams, tablets etc to kill sperms
- Surgical method= they are of two types

vasectomy	tubectomy
Remove a small piece of sperm duct and cut ends are tied up	Remove a small piece of oviduct and cut ends are tied up
It prevents the passage of sperms from testes	It prevents the passage of ova from ovaries to uterus

### STDs( sexually transmitted diseases)

- Gonorrhoea= bacterial disease( curable)
- Syphilis= bacterial disease ( curable)
- Warts= viral disease ( curable)
- AIDS= viral disease (incurable)

AIDS( acquired immune deficiency syndrome) caused by HIV( human immune deficiency virus) transmitted by

1. sexual contact
  2. infected syringe
  3. blood and organ transplantation
- Infected mother to foetus