

**Life processes** :The processes that are necessary for an organism to stay alive. Eg. Nutrition, respiration, etc.

**Criteria of life**- (i) Growth (ii) Movement

**Nutrition**- The process in which an organism takes in food, utilizes it to get energy, for growth, repair and maintenance, etc. and excretes the waste materials from the body

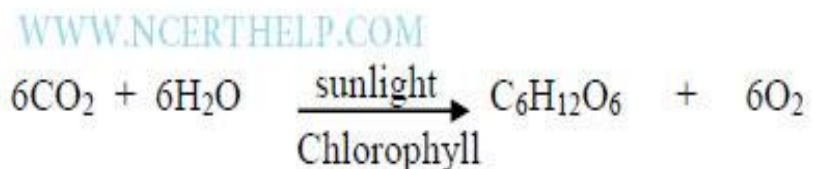
### Types of nutrition

**1. Autotrophic nutrition** (Auto =self: trophos = nourishment) E.g. Plants, Algae, blue green bacteria.

**Process** : Photosynthesis (Photo=light; Synthesis= to combine)

**Raw materials**- (i) Carbon dioxide (ii) Water

**Equation**-



Energy conversion- Light/Solar energy to Chemical energy

Role of Chlorophyll- To trap the sun's energy for photosynthesis

**Factors for Autotrophic nutrition** -

(i) Carbon dioxide (ii) Water (iii) Light (iv) Temperature

**Events/ Steps of photosynthesis**-

(i) Absorption of light energy by chlorophyll

(ii) Conversion of light energy to chemical energy & Splitting of water molecule into Hydrogen & oxygen

(iii) Reduction of Carbon dioxide to Carbohydrate

**Gaseous exchange**-

(i) Gas used- Carbon dioxide (ii) By product - Oxygen

**Source of raw materials**-

(i) Carbon dioxide -Land plants- Air, Aquatic plants- Water

(ii) Water & Minerals - Soil

**2. Heterotrophic nutrition** (Hetero =others: trophos =nourishment)

Eg. Animals, plants lacking chlorophyll like fungi.

(a) **Saprophytic nutrition**: Organisms feed on dead decaying plants or animals material. E.g. Fungi, Bacteria

(b) **Parasitic nutrition**: Organisms obtain food from the body of another living (host)

**Endoparasite** : Parasite lives inside the body of the host e.g. tapeworm, roundworm.

**Exoparasite** : Parasite lives on the body of the host. E.g. lice, leech.

Note- The parasite benefits while the host is usually harmed e.g. Cuscutta-plant parasite (amarbel), Plasmodium (malarial parasite).

(c) **Holozoic nutrition**: Organism (mostly animals) take in whole food and then digest it into smaller particles with enzyme.

Eg. Amoeba, Paramecium. Animals, human beings.

**Steps in Holozoic nutrition**

(i) Ingestion: taking in of food.

(ii) Digestion: breaking down of complex food into simpler, absorbable form.

(iii) Assimilation: Utilization of digested food from the body.

(iv) Egestion: Removing undigested food from the body

**Nutrition in human beings**

Alimentary canal-

Mouth-Oesophagus-Stomach- Small intestine- Large intestine

Important gland/juices:

Organ	Gland	Enzyme/Juice	Function
Mouth	Salivary glands	Salivary Amylase	Converts starch into sugar
Stomach	Gastric glands	Gastric juice- (i) Hydrochloric acid	(a) Kills harmful bacteria that enters with the food. (b) Makes the medium alkaline for the action of Pepsin

		(ii) Pepsin	Digests proteins
		(iii) Mucus	Protects the inner lining of the stomach from the corrosive action of Hydrochloric acid.
Small intestine	1) Liver	(i) Bile juice	(a) Makes the medium acidic for the action of Pancreatic enzymes. (b) Breaks down large fat molecules into smaller globules so that enzymes can act upon them.
	2) Pancreas	(ii) Pancreatic Juice Amylase	Converts Carbohydrates to glucose
		Trypsin	Converts Proteins to Amino acids
		Lipase	Converts Fats into Fatty acids & Glycerol

Aerobic respiration	Anaerobic respiration
1. Takes place in presence of Oxygen.	1. Takes place in absence of Oxygen.
2. End products- Carbon dioxide & Water	2. End products- Ethanol & Carbon dioxide
3. More energy is released.	3. Less energy is released.
4. Takes place in Cytoplasm & Mitochondria	4. Takes place in only in Cytoplasm.
5. Complete oxidation of glucose	5. Incomplete oxidation of glucose

takes place.  
6. It occurs in most organisms.

takes place.  
6. It occurs in certain bacteria, yeast & certain tissues of higher organisms. E.g. In humans during vigorous exercise, when the demand for Oxygen is more than the supply, muscle cells respire anaerobically for some time.

### Some common features of Respiratory organs-

- (i) Large surface area- for greater rate of diffusion of respiratory gases.
- (ii) Thin permeable walls to ensure easy diffusion & exchange of gases.
- (iii) Extensive blood supply- Respiratory organs are richly supplied with blood vessels for quick transport of gases.

### Gaseous exchange in plants-

Process - Diffusion

Direction of diffusion depends on-

- (i) Environmental conditions
- (ii) Requirement of the plant.

Day time- Carbon dioxide given out during respiration is used for photosynthesis. Therefore only Oxygen is released, which is a major activity during the day.

Night time Only respiration takes place. Therefore only Carbon dioxide is released, which is a major activity during the night.

### Gaseous exchange in animals-

Terrestrial animals- take Oxygen from the atmosphere.

Aquatic animals- take Oxygen dissolved in water. (Oxygen content is low in water, therefore they breathe faster.)

### Human Respiratory system-

External nostrils - Nasal cavity - Trachea - Bronchi - Bronchioles - Alveoli

Rings of cartilage present in the throat ensure that the trachea (air passage) does not collapse when there is less air in it

**Lungs**

- (i) Present in the thoracic cavity.
- (ii) They are spongy, elastic bags consisting of Bronchi, Bronchioles and Alveoli

**Respiration occurs in two phases-**

- (i) External-Breathing, which is a mechanical process.
- (ii) Internal - Cellular respiration

**Mechanism of breathing includes :**

- (i) Inhalation
- (ii) Exhalation

**Exchange of gases-**

Unicellular organisms- By Diffusion

Multicellular Animals-

- (i) As the body size is large, diffusion alone is not enough.
- (ii) Respiratory pigments also required.
- (iii) Respiratory pigment in human beings is Haemoglobin, which is present in red blood corpuscles.
- (iv) It has very high affinity for Oxygen.
- (iv) Carbon dioxide is more soluble in water than Oxygen, so it Gets dissolves in blood and is thus transported.

v )Transportation

**Transportation in human beings-**

**Blood-**

- (i) It is a fluid connective tissue.
- (ii) Components-
  - (1) Fluid medium- Plasma
  - (2) Red blood corpuscles
  - (3) White blood corpuscles
  - (4) Platelets suspended in plasma
- (iii) Plasma transports food, Oxygen, Carbon dioxide, Nitrogenous wastes, etc.

**Functions of blood-**

- (i) Transport of respiratory gases.
- (ii) Transport of nutrients.
- (iii) Transport of waste products.
- (iv) Defence against infection

**Blood vessels-** (i) Arteries (ii) Veins (iii) Capillaries

Arteries	Veins
1. Thick walled.	1.Thin walled.
2. Deep seated.	2.Superficial.
3. Carry blood away from the heart.	3. Carry blood to the heart.
4.Carry Oxygenated blood.	4. Carry Deoxygenated blood.
5. Valves absent.	5. Valves present

**Heart-**

- (i) It is a muscular organ, which works as a pump in the circulatory system.
- (ii) It is the size of our fist.
- (iii) It has two sides, which are separated by a partition so that the oxygenated and deoxygenated blood do not get mixed up.
- (iv) It has four chambers-
  - Two upper chambers called Atria.
  - Two lower chambers called Ventricles.

**Working of heart- Left side-**

- (i) Left atrium relaxes & the Oxygenated blood enters it from the lungs through the pulmonary vein.
- (ii) Left atrium contracts & the blood enters the left ventricle through the valve.
- (iii) Left Ventricle contracts and the blood is pumped into the largest artery ,Aorta and is carried to all parts of the body.

**Working of heart-Right side-**

- (i) Right atrium relaxes & the deoxygenated blood from the body enters it through superior and inferior Vena cava.
- (ii)Right atrium contracts & the blood enters the right Ventricle through the valve.
- (iii) Right Ventricle contracts and the blood is pumped into the Pulmonary artery and is carried to lungs.

Valves- Unidirectional to prevent the backward flow of blood.  
 Pulmonary vein is the only vein that carries Oxygenated blood.  
 Aorta is the only artery that carries Deoxygenated blood.

Double circulation in man- because the blood passes through the heart twice in one complete cycle of the circulation

### **.Capillaries-**

- (i) Form the connection between arteries & veins.
  - (ii) Walls are one cell thick only for easy exchange of blood.
- Platelets- Plug the leaks of arteries and veins by clotting the blood.

Lymph- Extracellular fluid similar to plasma but colourless with lesser protein.

Function of lymph-

- (i) Transportation of digested & absorbed fats from the small intestine.
- (ii) Drains excess fluid from the intercellular spaces back in the blood.

Higher animals- E.g., birds, mammals.

- (i) Oxygenated blood & Deoxygenated blood are completely separate for efficient Oxygen supply.
- (ii) This is to fulfil higher energy needs and to maintain body temperature (warm blooded animals).

Amphibians & reptiles- have 3 chambered heart where little mixing of Oxygenated blood & Deoxygenated blood takes place. Therefore their body temperature varies with the temperature of the environment.

(cold blooded animals)

### **Transportation in plants-**

Plants need less energy needs- because they do not move and therefore have a slow transport system

### **Transport of water-**

- (i) Takes place by xylem tissue present in roots, stem, leaves and is therefore interconnected.
- (ii) Root cells take up ions from the soil, which creates a concentration difference between root and soil. Column of water therefore rises upwards.

In very tall plants- transpiration creates a suction pressure, which

pulls the water upwards.

Importance of transpiration-

- (i) Helps in upward movement of water in plants.
- (ii) It regulates the temperature in plants.

### **Transport of food-**

- (i) Takes place by phloem tissue.
- (ii) Movement of prepared food in plants is called translocation.

### **Excretion in human beings.**

Excretion- The biological process of removal of harmful metabolic wastes in living organisms.

### **Organs of excretory system-**

- (i) Kidneys (iii) Urinary bladder
- (ii) Ureters (iv) Urethra

### **Kidneys-**

- (i) Two in number (ii) Bean shaped
- (iii) Present in abdomen on either side of the backbone
- (iv) Basic unit is nephron.

**a) Glomerulus-** Group of capillaries (cluster) present in Bowman's capsule to receive blood from renal artery and filters it.

**b) Bowman's capsule-** Cup shaped structure, which contains glomerulus.

**c) Convoluted tubule-** is long and reabsorbs vital nutrients like glucose, amino acids, salts, urea and water.

### **Note-Vital functions of kidneys-**

- (a) Filtration & removal of Nitrogenous wastes
- (b) Reabsorption of vital nutrients

Ureters- Transport the urine formed in the kidneys to the urinary bladder.

Urinary bladder- Muscular bag like structure to store urine.

Urethra- Helps in removal of urine when the Urinary bladder is full.

Artificial kidney- Principle: Dialysis

### **Excretion in plants-**

Gaseous wastes- CO<sub>2</sub> in respiration & O<sub>2</sub> in photosynthesis are

removed by the process of diffusion.

Excess water- is removed by transpiration.

Other wastes-

(i) Stored in cellular vacuoles or in leaves, which fall off or as gums, resins, etc. in old xylem.

(ii) Excreted in soil.

## CHAPTER 9 HEREDITY AND EVOLUTION JUNE

- **Genetics** : Branch of science that deals with Heredity and variation.
- **Heredity** : It means the transmission of features/ characters/ traits from one generation to the next generation.
- **Variation** : The differences among the individuals of a species/population are called variations. It takes place due to environment changes, crossing over, and recombination of genes and mutation.
- **Genotype**: The complete set of genes in an organism's genome is called genotype.
- **Phenotype**: The observable characters in an organism make the phenotype. Phenotype is a modified genotype and many of the phenotypes cannot be inherited.
- Clones are those organisms which are exact copies of each other.

### Mendel and His Work on Inheritance

- Gregor Johann Mendel (1822 & 1884) : Started his experiments on plant breeding and hybridisation. He proposed the laws of inheritance in living organisms.
- Law of Dominance, Law of segregation, Law of Independent Assortment.

### Mendel was known as Father of Genetics

- **Plant selected by Mendel** : *Pisum sativum* (garden pea). Mendel used a number of contrasting characters for garden pea.

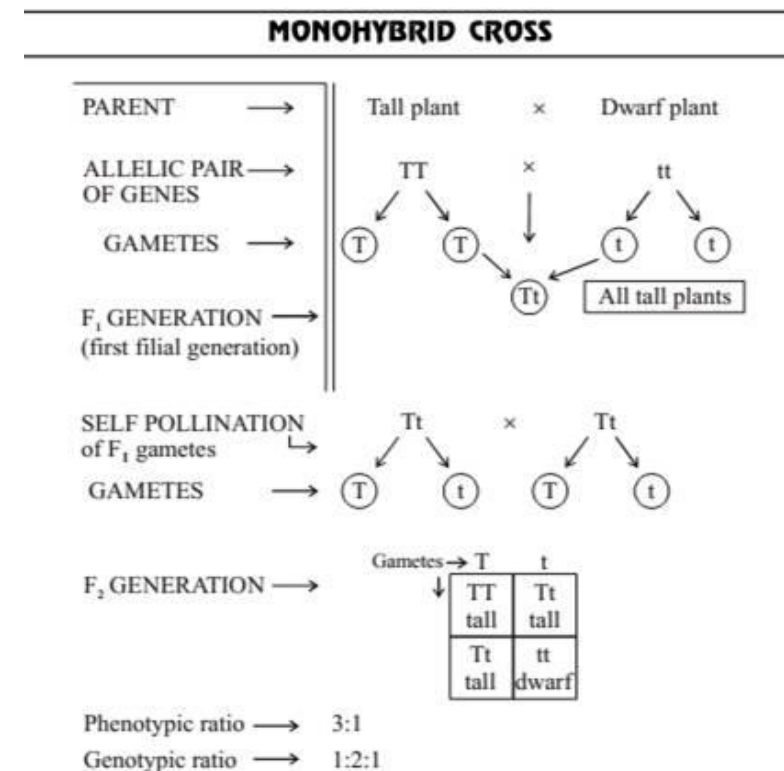
(TABLE OF CONTRASTING CHARACTERS. SEVEN PARTS)		
CHARACTER	DOMINANT TRAIT	RECESSIVE TRAIT
Flower colour	Violet	White
Flower position	Axial	Terminal
Seed colour	Yellow	Green
Seed shape	Round	Wrinkled
Pod shape	Inflated	Constricted
Pod colour	Green	Yellow
Height of plant	Tall	Dwarf/Short















Seven pairs of contrasting characters in Garden Pea.

- **Mendel's Experiments** : Mendel conducted a series of experiments in which he crossed the pollinated plants to study one character (at a time)

Cross between two pea plants with one pair of contrasting characters is called a monohybrid cross.

Cross between a tall and a dwarf plant (short).



CHARACTER	DOMINANT TRAIT	RECESSIVE TRAIT
Seed shape	 Round	 Wrinkled
Seed colour	 Yellow	 Green
Flower colour	 Violet	 White
Pod shape	 inflated/full	 Constricted
Pod colour	 Green	 Yellow
Flower position	 Axial	 Terminal
Stem height	 Tall	 Dwarf

TT ] → Both dominant traits ] Pure or homozygous  
 tt ] → Both recessive alleles ] condition

Tt ] → One dominant, one ] Hetrozygous  
 recessive trait ] condition - Hybrid

Phenotypic ratio : 3:1

Genotypic ratio : 1:2:1

Phenotype - Physical appearance [Tall or Short]

Genotype - Genetic appearance [Tall or short]

### Observations of Monohybrid Cross

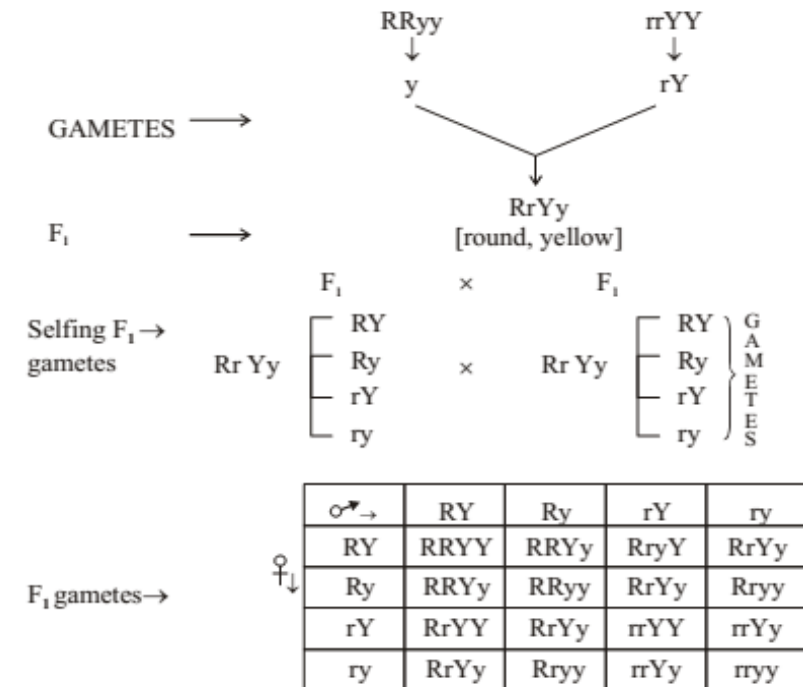
1. All F1 progeny were tall (no medium height plant (half way characteristic))
2. F2 progeny ¼ were short, 3/4 were tall
3. Phenotypic ratio F2 - 3 : 1 (3 tall : 1 short)  
Genotypic ratio F2 - 1:2:1

### Conclusions:

1. TT and Tt both are tall plants while tt is a short plant.
2. A single copy of T is enough to make the plant tall, while both copies have to be 't' for the plant to be short.
3. Characters/Traits like 'T' are called dominant trait (because it express itself) and 't' are recessive trait (because it remains suppressed)

From these observation, Mendel put forward the rules of inheritance  
 Law of Segregation: Every individual possesses a pair of alleles for a particular trait. During gamete formation, a gamete receives only one trait from the alleles. A particular trait can be dominant or recessive in a particular generation.

**DihybridCross** : A cross between two plants having two pairs of contrasting characters is called dihybrid cross.



### Phenotypic Ratio

Round, yellow : 9

Wrinkled, yellow : 3

Round, green : 3

Wrinkled, green : 1

## Observations

1. When **RRyy** was crossed with **rrYY** in F1 generation all were **RrYy** round and yellow seeds.
2. Self pollination of F plants gave parental phenotype and two mixtures(recombinants round yellow & wrinkled green) seeds plants in the ratio of 9:3:3:1

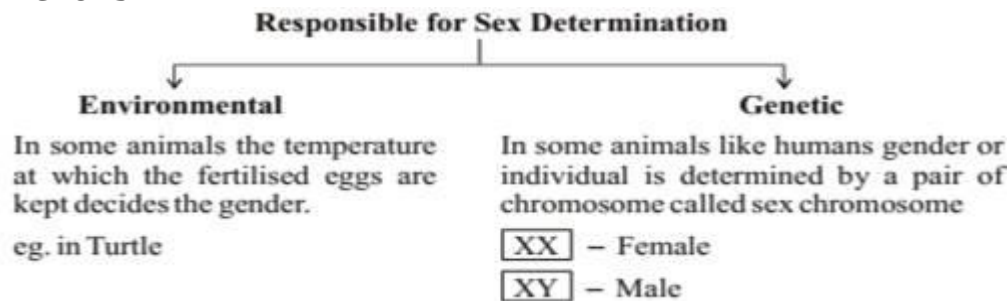
## Conclusions

1. Round and yellow seeds are **DOMINANT** characters
  2. Occurrence of new phenotypic combinations show that genes for round and yellow seeds are inherited independently of each other.
- Law of Independent Assortment: Alleles of different characters separate independent from each other during gamete formation.
- In the above example,alleles of texture were assorted independently from those of seed colour.

## SEX DETERMINATION

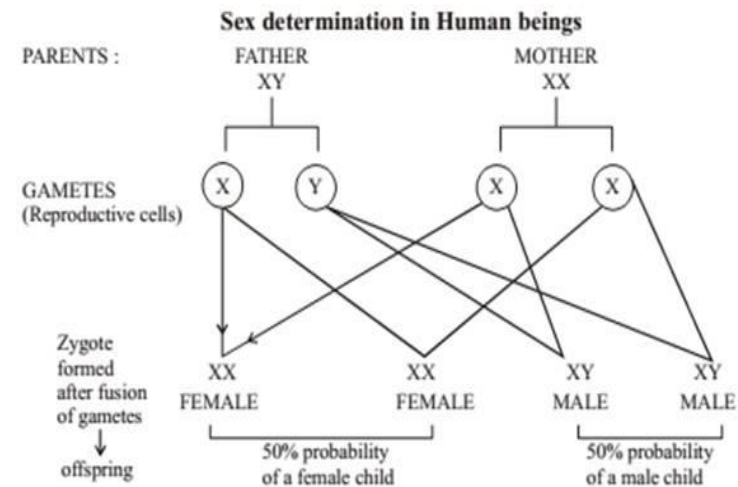
Determination of sex of an offspring.

### FACTORS



**Sex Chromosomes** :In human beings there are 23 pairs of chromosome. Out of these 22 chromosomes pairs are called autosomes and the last pair of chromosome that help in deciding gender of that individual is called sex chromosome.

XX – female                  XY – male

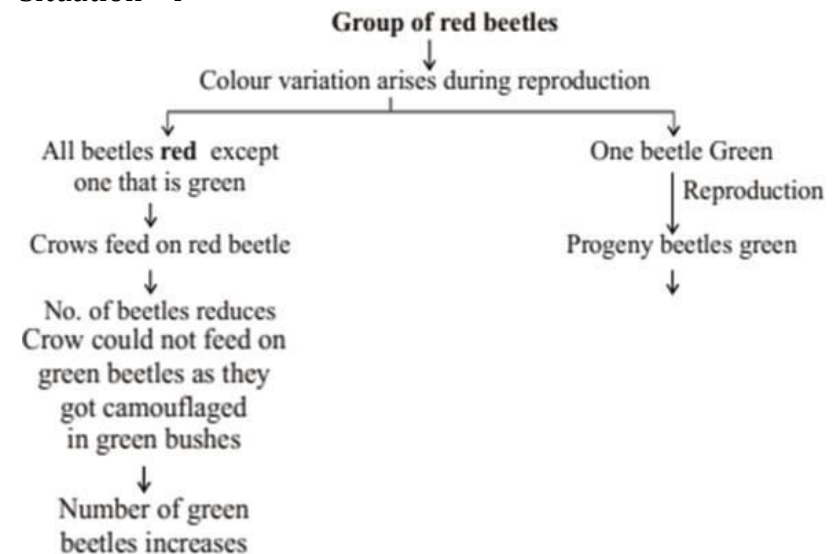


This shows that half the children will be boys and half will be girls. All children will inherit an X chromosome from their mother regardless whether they are boys or girls. Thus sex of children will be determined by what they inherit from their father, and not from their mother.

## EVOLUTION

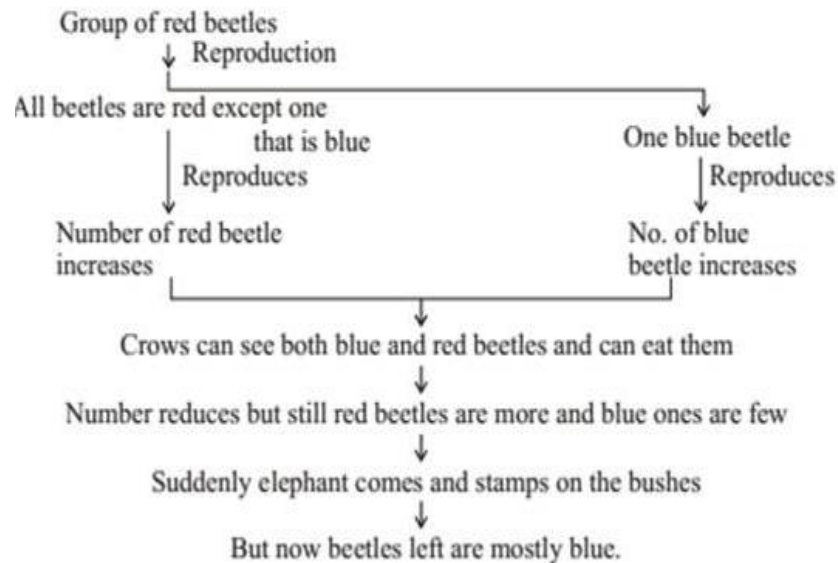
Evolution is the sequence of gradual changes which takes place in the primitive organisms, over millions of years, in which new species are produced.

Situation – I



**Situation 1 :** Green beetles got the survival advantage or they were naturally selected as they were not visible in green bushes. This natural selection is exerted by crows resulting in adaptations in the beetles to fit better in their environment

**Situation-II**



**Situation 2 :** Blue beetles did not get survival advantage. Elephant suddenly caused major havoc in beetle population otherwise their number would have been considerably large. From this we can conclude that accidents can change the frequency of some genes even if they do not get survival advantage: This is called genetic drift and it leads to variation.

**SITUATION-III**

Group of red beetles- Habitat of beetles (bushes)-Suffer from plant disease- Average weight of beetles decreases due to poor nourishment-.Number of beetles kept on reducing-Later plant disease gets eliminated-Number and average weight of the beetles increases again

**Situation 3 :** No genetic change has occurred in the population of beetle.The population gets affected for a short duration only due to environmental changes.

**ACQUIRED AND INHERITED TRAITS**

They get transferred to the progeny. Low weight of starving beetles. They are helpful in evolution.eg. Colour of eyes and hair

Acquired Traits	Inherited Traits
1. These are the traits which are developed in an individual due to special conditions	1. These are the traits which are passed from one generation to the next.
2. They cannot be transferred to the progeny	2. They can be transferred to the progeny.
3. They cannot direct evolution.	3. They direct evolution.
4. Eg :loss of weight, acquiring knowledge.	4. Eg: Skin colour, colour of the eye.

**SPECIATION**

**Micro Evolution :** It is the evolution which is on a small scale. e.g. change in body colour of beetles.

The process by which new species develop from the existing species is known as speciation.

**Speciation :** it is the process of formation of new species.

**Species :** A group of similar individuals within a population that can interbreed and produce fertile offspring.

Factors which lead to speciation : Geographical isolation, genetic drifts and variations.

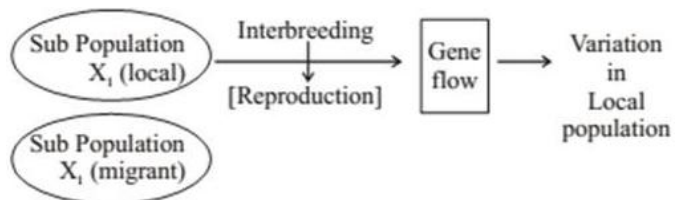
**Geneflow :** It is exchange of genetic material by interbreeding between populations of same species or individuals

**WAYS BY WHICH SPECIATION TAKES PLACE**

Speciation takes place when variation is combined with geographical isolation.

**Gene flow :** occurs between population that are partly but not completely separated.

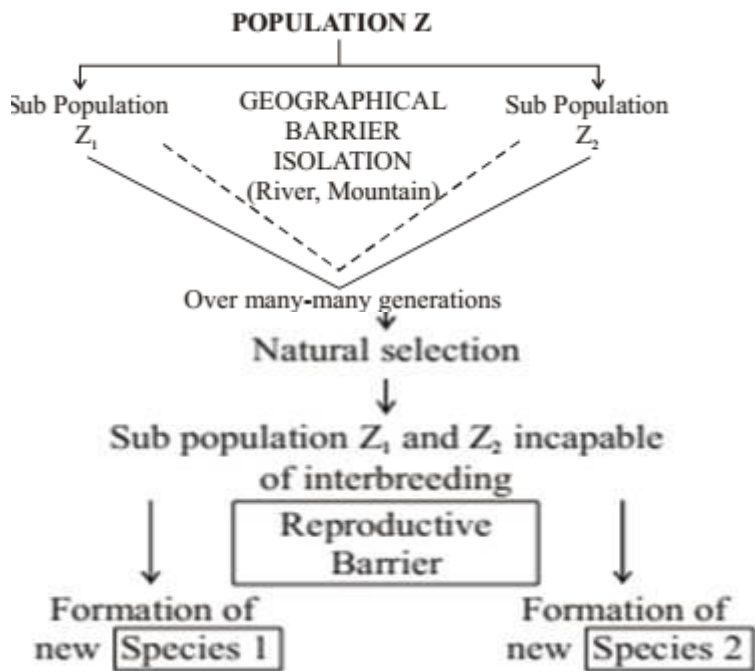




## GENETIC DRIFT

It is the random change in the frequency of alleles (gene pair) in a population over successive generations.

**\*Natural Selection :** The process by which nature selects and consolidate those organisms which are more suitably adapted and possesses favorable variations



Genetic drift takes place due to :

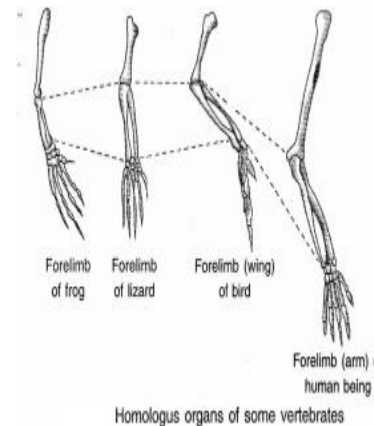
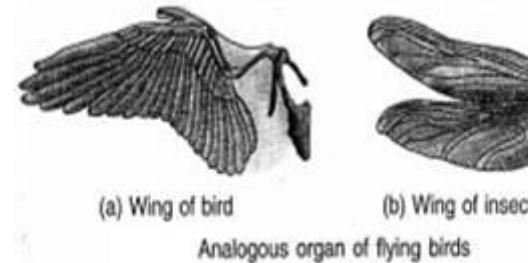
- (a) Severe changes in the DNA
- (b) Change in number of chromosomes

## Evolution and Classification

**EVOLUTION :** The process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth

Both evolution and classification are interlinked.

1. Classification of species is reflection of their evolutionary relationship.
2. The more characteristic two species have in common the more closely they are related.
3. The more closely they are related, the more recently they have a common ancestor.
4. Similarities among organisms allow us to group them together and to study their characteristic.



**TRACING EVOLUTIONARY RELATIONSHIPS : Jean Baptiste Lamarck gave the first theory of evolution. The accepted one is The Origin of Species by Charles Darwin.**

(Evidences of Evolution)

I. **Homologous Organs :** (Morphological and anatomical evidences. These are the organs that have same basic structural plan and origin but different functions.

Homologous organs provides evidence for evolution by telling us that they are derived from the same ancestor.

Example :

Forelimb of Horse	(Running)	Same basic structural plan, but different functions perform.
Wings of bat	(flying)	
Paw of a cat	(walk/scratch/attack)	

**II. Analogous Organs :** These are the organs that have different origin and structural plan but same function example :

**Example :** Analogous organs provide mechanism for evolution.

Wings of bat	Elongated fingers with skin folds	Different basic structure, but perform similar function i.e., flight.
Wings of bird	Feathery covering along the arm	

**III. Fossils: (Paleontological evidences)**

The remains and relics of dead organisms of the past.

**FOSSILS ARE PRESERVED TRACES OF LIVING ORGANISMS**

Fossil Archaeopteryx possess features of reptiles as well as birds.

This suggests that birds have evolved from reptiles.

**Examples of Fossils**

AMMONITE – Fossil-invertebrate

TRILOBITE – Fossil-invertebrate

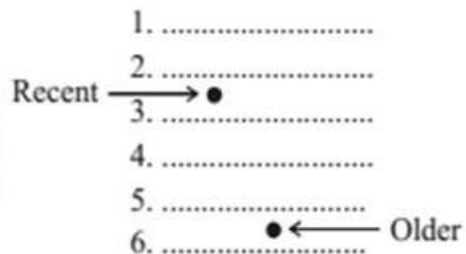
KNIGHTIA – Fossil-fish

RAJASOURUS – Fossil dinosaur skull

**AGE OF THE FOSSILS**

I. Deeper the fossil, older it is.

II. Detecting the ratios of difference of the same element in the fossil material i.e. **Radio-carbon dating** [C-(14) dating]

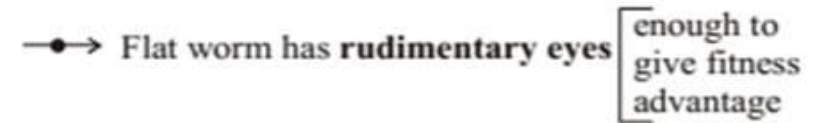


**Evolution by Stages**

Evolution takes place in stages i.e., bit by bit over generations.

**I. Fitness Advantage**

**Evolution of Eyes :** Evolution of complex organs is not sudden it occurs due to minor changes in DNA, however takes place bit by bit over generations.



Insects have compound eyes

Humans have binocular eyes

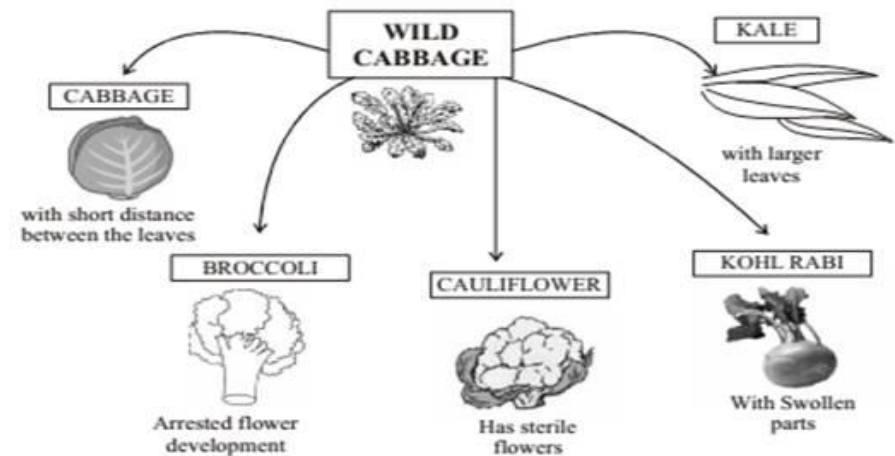
**II. Functional Advantage**

**Evolutions of Feathers**

Feathers to provide insulation in cold weather but later they might become useful for flight.

Example : Dinosaurs had feathers, but could not fly using feathers.

Birds seem to have later adapted the feathers to flight.



**Evolution by Artificial Selection :** Humans have been a powerful agent in modifying wild species to suit their own requirement through out ages by using artificial selection. e.g. (i) From wild cabbage many varieties like broccoli, cauliflower, red cabbage, kale, cabbage and

kohlrabi were obtained by artificial selection. (ii) Wheat (many varieties obtained due to artificial selection).

### Molecular Phylogeny

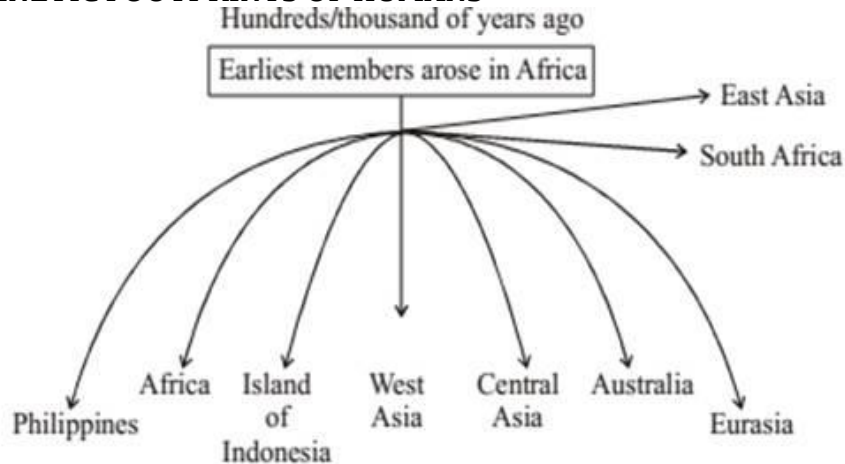
- It is based on the idea that changes in DNA during reproduction are the basic events in evolution
- Organisms which are more distantly related will accumulate greater differences in their DNA

### Tools to Study Human Evolutionary Relationship

- Excavating
- Time dating
- Fossils
- Determining
- DNA Sequences

Although there is great diversity of human forms all over the world get all humans are a single species

### GENETIC FOOTPRINTS OF HUMANS



- They did not go in a single line
- They went forward and backward
- Moved in and out of Africa

Sometimes came back to mix with each other.

### HOW DO ORGANISMS REPRODUCE?

- 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 (Deoxyribo Nucleic Acid) which is the heredity 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 as well as basis for evolution.

### Types of Reproduction

#### (a) Asexual Reproduction

- A single individual give rise to new individual.
- Gametes are not formed.
- New individual is identical to parent.
- It is extremely useful as a means of rapid multiplication.
- Adopted by lower organisms.

#### (b) 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.

#### (b) Modes of Asexual Reproduction

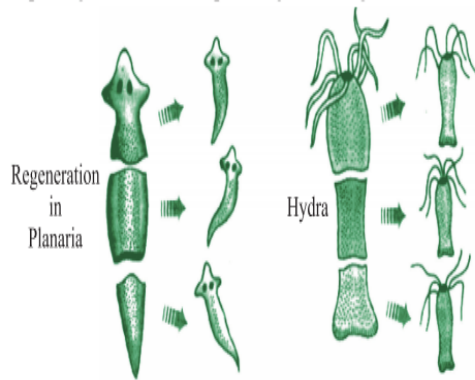
##### (c) (i) Fission : The parent cell divides into daughter cells.

- Binary fission : 2 cells are formed. E.g., amoeba.
  - Multiple fission : Many cells are formed. E.g., Plasmodium.
- Binary fission in Amoeba



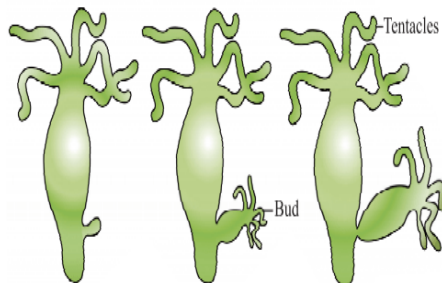
**(ii) Fragmentation** :The organism breaks-up into smaller pieces upon maturation, each piece develops into new individual. E.g., Spirogyra.

**(iii) Regeneration** : If organism is somehow cut or broken into many pieces, each piece grows into a complete organism. E.g., Planaria, Hydra.



Regeneration in Planaria and Hydra

**(iv) Budding** :A bud is formed which develops into tiny individual. It detaches from parent body upon maturation and develops into new individual. E.g., Hydra



Budding in Hydra

**(v) Vegetative Propagation** :In many plants, new plants develop from vegetative parts such as :  
 By roots : E.g., dahlias, sweet potato.  
 By stem : E.g., potato, ginger.  
 By leaves : E.g., bryophyllum (leaf notches bear buds which develop into plants).

**Artificial methods :**

**(a) Grafting** : E.g., Mango

**(b) Cutting** : E.g., Rose

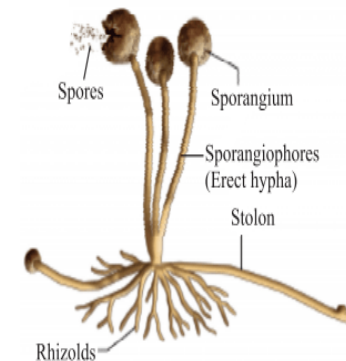
**(c) Layering** : E.g., Jasmine

**(d) Tissue culture** :New plants are grown by using growing tip of a plant. These growing cells are kept in a culture medium leads to the formation of callus. Callus is then transferred to hormone medium which causes growth and differentiation. E.g., ornamental plants, orchid.

**Benefits of tissue culture :**

- We can grow plants like banana, rose, jasmine etc. that have lost the capacity to produce seeds.
- New plants are genetically similar to parents.
- Helps in growing seedless fruits.

**(v) Spore Formation** :Spores are small bulb like structures which are covered by thick walls. Under favourable conditions, they germinate and produce new organism.



Spore formation in Rhizopus

## SEXUAL REPRODUCTION

When reproduction takes place as a result of the fusion of male and female gametes is called sexual reproduction.

Fusion of gametes is called **fertilization** which results in **variation**.

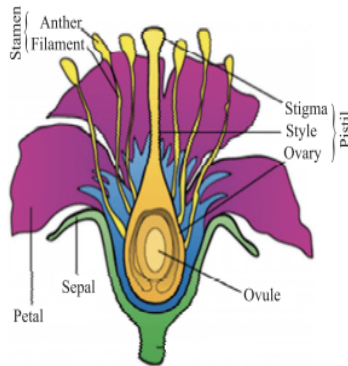
### Sexual Reproduction in Plants

- Flowers are the reproductive organs of plants.
- A typical flower consists of four main whorls namely sepals, petals, stamen and pistil.

#### Types of Flowers

- **Bisexual flower** : Both male and female reproductive parts are present. E.g., Hibiscus, mustard.
- **Unisexual flower** : Either male or female reproductive part is present. E.g., Papaya, watermelon

#### Structure of Flower :

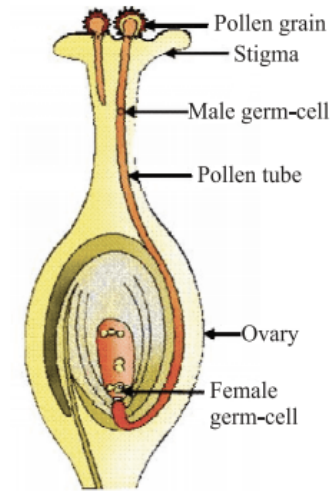


#### Process of Seed Formation

- Pollen grains, produced in the anther, are transferred to the stigma of same flower (self pollination) or stigma of another flower (**cross pollination**) through agents like air, water or animals.
- Pollen grains germinate and form pollen tubes which pass through style to reach upto the ovules present in ovary.
- The fusion of male and female gametes is called Fertilization. Zygote is produced inside the ovary.
- Zygote divides to form embryo. Ovule develops thick coat and

changes into seed gradually.

- Ovary changes into fruit and other parts of flower fall off.



Germination of pollen on stigma

- The seed germinates to form a plant under suitable conditions such as air, moisture etc.

### Reproduction in Human Beings

- Humans use sexual mode of reproduction.
- **Sexual maturation** : The period of life when production of germ cells i.e., ova (female) and sperm (male) start in the body. This period of sexual maturation is called puberty.

#### Changes at Puberty

##### (a) Common in male and female

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

##### (b) In girls

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

##### (c) In boys

- Thick hair growth on face.
- Voice begin 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.

- Male germ cell i.e., sperms are formed here.
- Testes release male sex hormone (testosterone).

Its function is :

**(i) Regulate production of sperms.**

**(ii) Bring changes at puberty.**

**(b) Vas deferens** : It passes sperms from testes upto urethra.

**(c) Urethra** : It is a common passage for both sperms and urine.

Its outer covering is called 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.
- One egg is produced every month by one of the ovaries.

**(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.

(c) **Uterus** : It is a bag-like structure where development of the baby takes place.

- Uterus opens into vagina through cervix

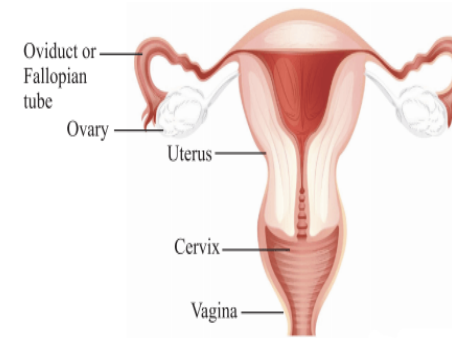


Fig. Human – female reproductive system

### When egg is fertilised :

- The fertilized egg called zygote is planted in uterus and develops into an embryo.
- The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. It provides a large surface area for the exchange of glucose, oxygen and waste material.
- The time period from fertilization upto the birth of the baby is called gestation period. It is about 9 months.

### When egg is not fertilised :

- The uterus prepares itself every month to receive fertilized egg.
- The lining of the uterus becomes thick and spongy, required to support the embryo.
- When fertilisation had not taken place, this lining is not needed any longer.
- This lining breaks and comes out through vagina as blood and mucus. This cycle takes around 28 days every month and called menstruation.

## Reproductive Health

Reproductive health means a total well-being in all aspects of reproduction i.e., physical, emotional, social and behavioural.

### SEXUALLY TRANSMITTED DISEASES (STDs)

- Many diseases can be sexually transmitted such as :

Bacterial : **Gonorrhoea and syphilis**

Viral : **Warts and HIV-AIDS**

- Use of condom prevents these infections to some extent.

### Contraception

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

### Methods of contraception

#### (a) Physical barrier

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

#### (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**.

### Female Foeticide

- The practice of killing a female child inside the womb is called female foeticide.
- For a healthy society, a balanced sex ratio is needed that can be achieved by educating people to avoid malpractices like female foeticide and prenatal sex determination.
- Prenatal sex determination is a legal offence in our country so as to maintain a balanced sex ratio.