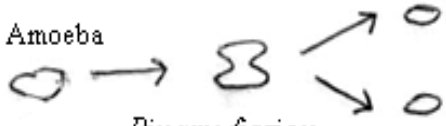
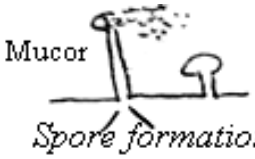
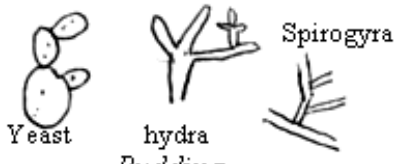
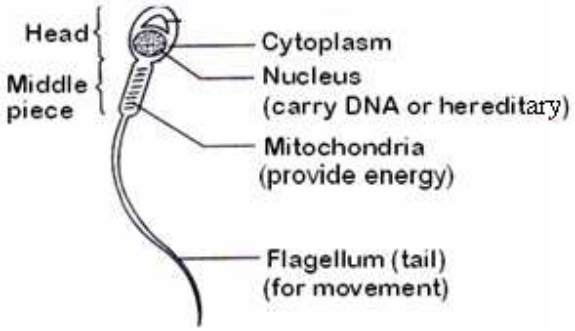
1. **Reproduction**
   - To produce a new individual.
   - To ensure continuation of species or to increase population.

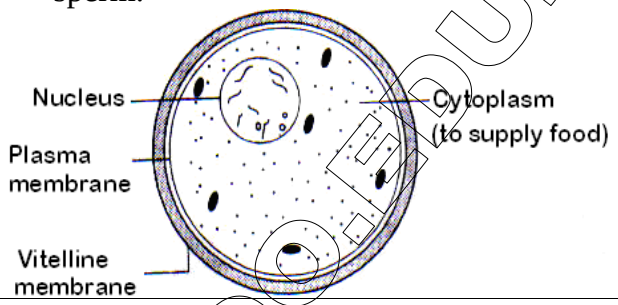
2.

Reproduction	
Sexual	**Asexual**
- Involving fusion of male and female gametes. **Human** **Male** (testes) → **Sperm** (male gamete) **Female** (ovary) → **Ovum** (female gamete) **fertilization** ↓ **Zygote** → sperm fuses with ovum (fertilization) ↓ **Embryo** → division of zygote ↓ Gestation period (38-40 weeks): **Foetus** (2-9 months) - has complete body shape ↓ **Baby** (foetus that is born)	i. Carried out by **lower** organisms ii. Involving **one parent** and **without fusion** of gametes. iii. It is a **quick** reproduction process. a. **Binary fission –** split into two - such as amoeba, paramecium, euglena, chlamydomonas and bacteria. b. **Budding** - such as yeast and hydra and spirogyra. c. **Spore formation** - such as ferns, moss, mucour, fungi, lichen, mushroom. d. **Rejuvenation** - such as starfish, fluke, flatworm, tapeworm e. **Vegetative reproduction** - grow from specific vegetative part such as leave, stem or root.  *Binary fission*  *Spore formation*  *Budding*
Plant **Male / Stamen** (anther) → **pollen grain** (male gamete) **Female / Pistil** (ovary) → **Ovule** (female gamete) **fertilization** ↓ **Zygote** ↓ **Embryo** ↓ Seed	

3. **Human Gamete** (are produce after puberty)

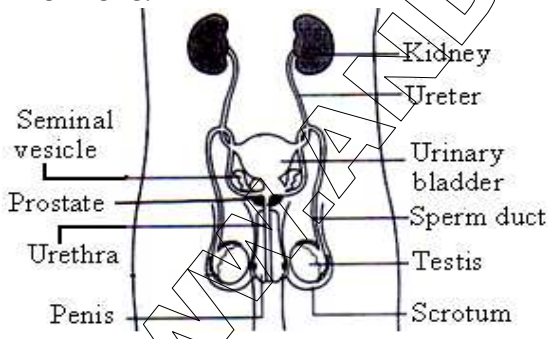
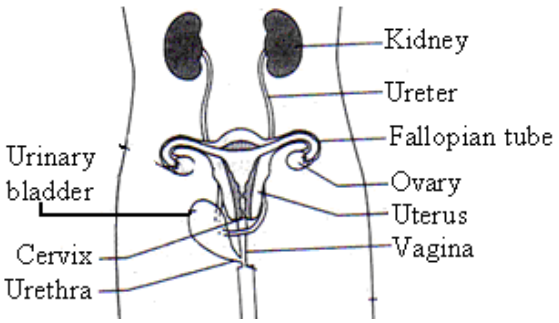
a. **Sperm** (smallest cell in men body)	b. **Ovum** (biggest cell in female body)
i. Able to swim / move / tadpole shape ii. Contain mitochondria which provide energy. iii. Contain a nucleus with DNA / male genetic iv. Alive less than 72 hours in uterus	i. Unable to swim / spherical shape ii. Contain abundant cytoplasm to supply food and a large nucleus./ female genetic / DNA. iii. Ovaries take turns to release the ovum every month (28 days). iv. Die in 24 hours if it is not fertilize by sperm.





4.

Reproduction

a. **Male reproduction system**	b. **Female reproduction system**
i. **Scrotal** - Protect the testes. - To lower temperature for the testes ii. **Seminal Vesicle.** - Secretes a slippery fluid to nourish the sperms. - Activated the sperms and to store sperms. iii. **Testes** - Produce sperms and male testosterone hormone.  iv. **Prostate gland** - Control the flow of urine and sperms. v. **Urethra** - Release urine / sperms out of the body. vi. **Sperm duct** - Channel sperms from the testis to the urethra.	i. **Ovaries** produce ovum and female hormones (estrogen and progesterone). ii. **Fallopian Tube / Oviduct** - Place of fertilisation iii. **Uterus** - Place where the foetus develops - Help to push the baby out. iv. **Cervix** - Secrete slippery fluid to active the sperms - Help to push the baby out during labour (widen during childbirth). v. **Vagina** - Receive sperms 

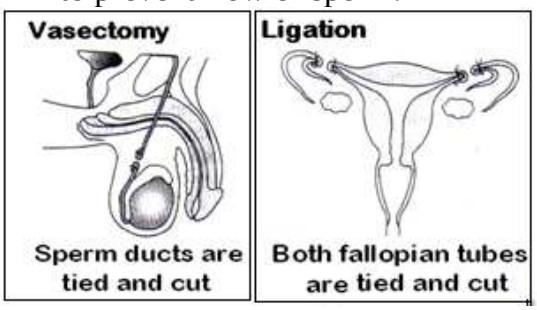
The Important of Pre-natal Care

1. **Nutrition for foetal Development**
   a. The foetal obtains his source of nutrients from the mother through umbilical cord / placenta.
   b. Therefore, the mother diet must contains:
      i. **Protein** -For formation of protoplasm/ to build tissues.
      ii. **Carbohydrates and fats** -Provide energy for growth.
      iii. **Minerals**
         - **Iron** to build heamoglobin red blood cells.
         - **Calcium** and **phosphate** for bone and cartilage development
      iv. **Vitamins** -Strengthen mother's immune system and health of foetus.
      v. **Folic acid** - for brain development and nervous system.
      c. **Smoking, alcohol and drugs** on the other hand are harmful to the foetus.

2. **Sterility/ Infertility –** unable to have children.
   a. **In Man**
      - Low sperms count in the semen.
      - Disorder of testicle.
      - Blockage in sperm duct.
      - Inability to erect
      - Hormone imbalance.
   b. **In Woman.**
      - Inability to release ovum. (no ovulation)
      - Blockage in fallopian tube.
      - Disorder in uterus/ovary.
      - Hormone imbalance.

3. **Overcome Sterility / Infertility**
   a. **In vitro fertilization / artificial insemination.**
      - Retrieving ovum from the women and fertilizing them with sperms in a dish and then implanted into the woman uterus.
   b. **Hormone treatment**
      - Help the inability ovary to release ovum.
      - To increase sperms count
   c. **Surgery**
      - Help to clear blockage in fallopian tube / sperm duct.
   d. **Surrogate mother**
   e. **Rhythmic method** (have sex during fertile phase day 11-17).

4. **Birth Control Method –** for family planning
   a. In **Woman**
      i. **Contraceptive pills.**
         - To prevent ovulation.
      ii. **Spermicides.**
         - Introduce into vagina to kill sperms.
      iii. **IUD**
         - Inserted into uterus to prevent zygote from **implanting** into uterus.
      iv. **Diaphragms**
         - Rubber cap fitted into cervix to prevent sperm from entering the uterus.
      v. **Tubectomy**
         - Legition of both fallopian tubes
      vi. **Natural method (Rythemic Method)**
         - Avoid having sex during fertile phase which is day 11 to 17.
         - Unreliable as the menstrual cycle is not constant.
   b. In **Man**.
      i. **Condom**
         - To prevent sperms from entering vagina.
      ii. **Vasectomy**
         - Cutting and trying up both sperm duct to prevent flow of sperm.



Type of fertilization in animals

4. **Fertilisation**

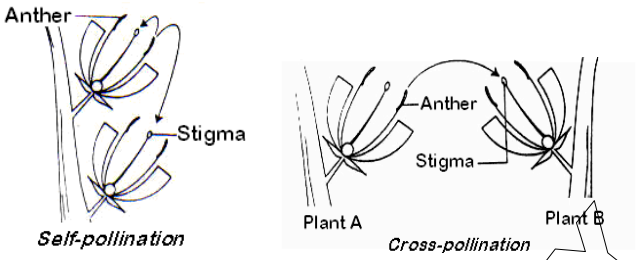
a. **Internal**	b. **External**
- Occur **inside** of the female's body. - eg. mammals, reptile, bird. - **Advantages**: a. Less gametes are produced b. Zygote / embryo is protected in the female's body. c. Chances of fertilisation is high, - **Disadvantage:** Require specific reproduction organs.	- Occur **outside** of the female's body. - eg: fish and amphibian - **Advantages**: No specific reproduction organs. - **Disadvantage:** a. Lot of gametes are produced b. Need water as medium of transport. c. Fertilization chances is low as lots of gametes are washed away or eaten by predators.

The Sexual Reproductive of flowering plants.

1. **Pollination**
   a. The transfer of pollen grains from the **anther** (male flower) to the **stigma** (female flower).

b. **Pollination**

Self	**Cross**
- occur in the **same** flower. - occur in the different flowers but in the **same plant.**	- occur in different flowers in **different plants**.



c. **The advantages of cross – pollination**
   i. Offspring which have good qualities in terms of size and taste.
   ii. Offspring which is healthier and can adapt to environmental changes.
   iii. More resistant to diseases.
   iv. More varieties

d. **Method to avoid self-pollination**
   i. The stamen and pistil mature on different time.
   ii. The male flowers and female flowers on different trees.
   iii. The anther is located below the stigma.

2. **Pollinating Agents.**

Characteristic of flowers	**Pollinated by**	
	i. **Insect**	ii. **Wind**
a. Petals	Large , bright, colourful	Small, dull, not colourful.
b. Pollen grains	Large, sticky.	Small, dry, light, smooth and a lot.
c. Stamens	Short	Long
d. Stigma	Short and sticky	Long, large and feathery
e. Produces	Scented and with nectar	Unscented without nectar.
f. Examples	Hibiscus, lotus, orchid, sunflower and rose.	Coconut, maize, paddy and grass.

3. a. **Stamen** (Male flower) → **Anther** → Pollen grains

Pistil (Female flower) → **Ovary** → Ovule

→ Pollination

↓

Pollen tube

↓

Fertilisation

↓

Zygote

↓

Seed

↓

Germination

↓

Seedling

ii. **Testa** → soften and crack

↓

iii. **Radical** → become roots (grow first)

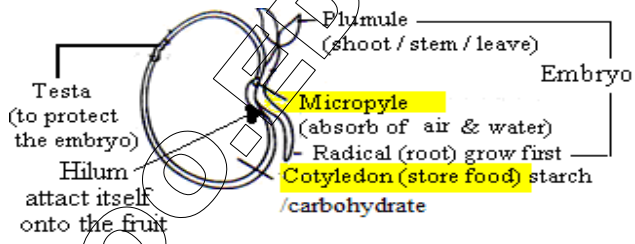
↓

iv. **Plumule** → become shoots

↓

v. **Cotyledon** getting smaller (as food being used up for growing)

2a.



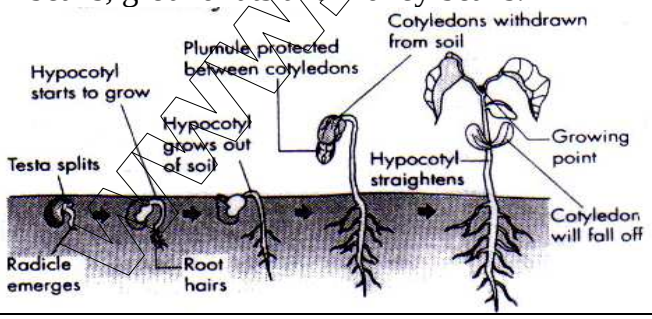
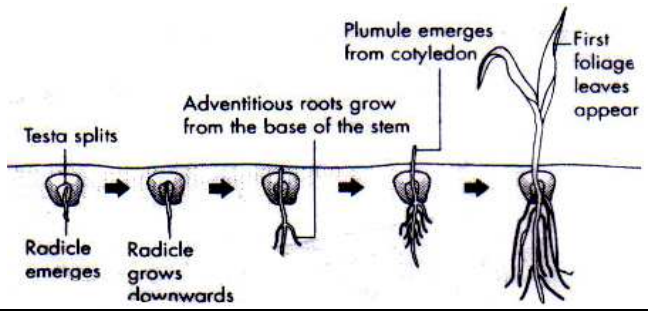
b. The plant will only make food / photosynthesis when the first foliage leaves appear.

3. **Ways of storing seed and to prevent germination of seed.**
   - Store in cool and dry place
   - Store in refrigerator
   - Store in air tight container

The Germination of Seeds

1. **The germination of seeds** need **water**, **air** and suitable **temperature /** heat(except sunlight because they do not have any leaves for photosynthesis.)
   a. **Sequences of germination**
      i. **Absorb** of water – the seed swells and increase in size

4.

Type of Germination	
Epygeal Germination	**Hypogeal Germination.**
- Cotyledon is brought **above the soil surface** during germination such as peanut, long beans, groundnuts and kidney beans. 	- Cotyledon is **below the ground** during germination such as like maize, paddy and rubber tree. 

5. During germination, the cotyledon is getting **smaller** because the **food has been used up for growing / germination.**

6. **Reproduction**

Sexual (produce variation)

- New individual is produced from **two** parents of different genders.

Animal
- Via **male** and **female**

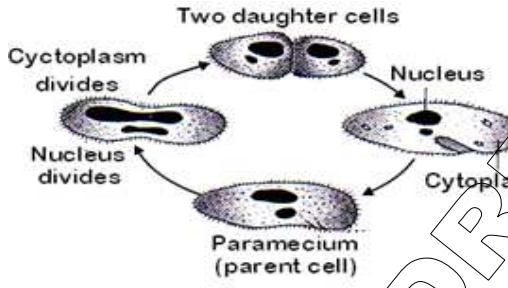
Plant
- Via **pistil** and **stamen** flowers

More healthier, better qualities, more resistant to diseases and adaptable to environmental changes.

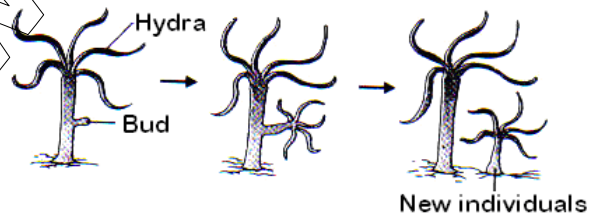
Asexual

- New individual is produced from a single parent.
- **Advantages**
  i. Involving a single parent.
  ii. A **quick** reproduction process.
- **Disadvantage**
  i. No variation
  ii. Less adaptable to environmental changes.

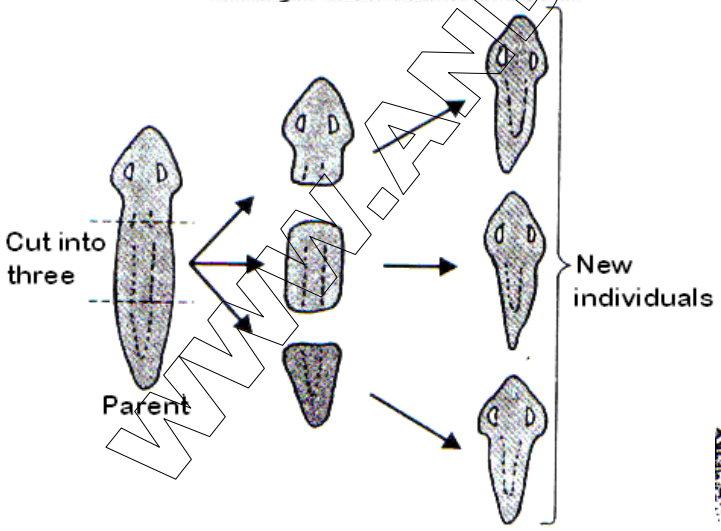
Vegetative	**Binary Fission**	**Budding**	**Spore formation**	**Rejuvenation / Regeneration**
- Rhizomes	- Amoeba	- Yeast	- Ferns	- Star fish
- Corms	- Bacteria	- Hydra	- Lichens	- Fluke
- Stem tubers	- Paramecium	- spirogyra	- Mushroom	- flatworm
- Leaves	- Euglena		- Mucor	- tapeworm
- Runners	- Chlamydomonas		- Moss	
- Stem cuttings				



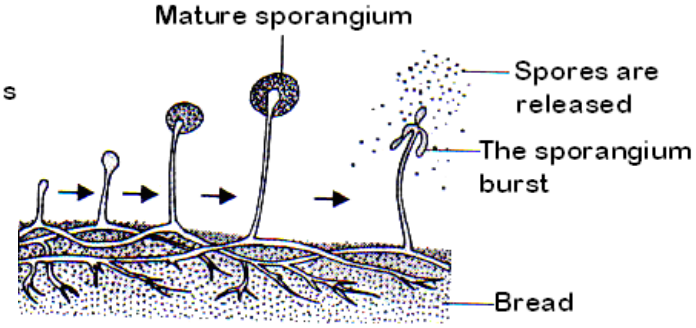
Binary fission in a Paramecium



Budding in Hydra



Rejuvenation of tapeworm



Formation and release of spores in bread mould

Vegetative Reproduction In Flowering Plants

1. **Grow from specific vegetative parts of the plant,** such as stems, leaves and roots.

i. Involving a single parent plant.
ii. No variation.

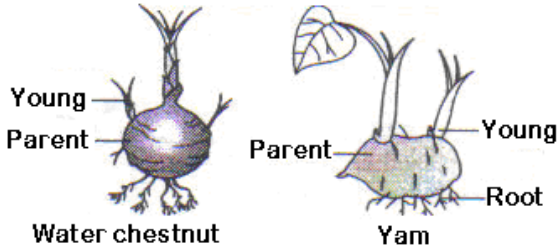
iii. A quick process.

a. **Rhizomes**

- **Grow horizontal underground** stems like lalang, ginger, lotus and tumeric.

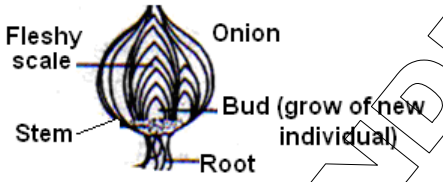
b. **Corms**

- Thick, **short underground stem swollen** with food reserves, like water chestnut and yam.



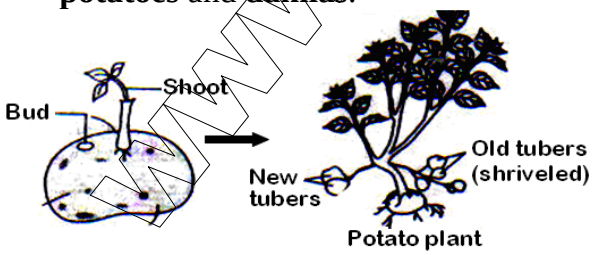
c. Bulbs

- With fleshy **scale leaves.**
- Food is stored in leaves, like **onion** and **garlic**, **tulips**, **lilies**.



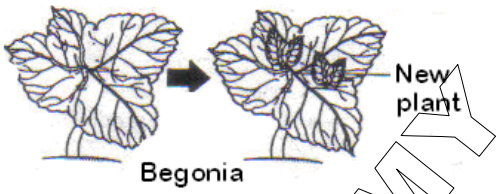
d**. Stem Tubers**

- **Swollen underground stem with a number of buds.**
- Buds produce young shoots like **potatoes** and **dahlias**.



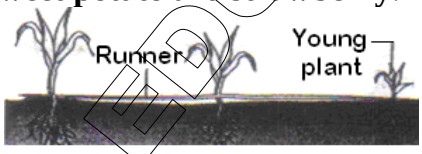
e. **Leaves**

- Plants growing from leaves like bryophyllum leaf and aloe vera.



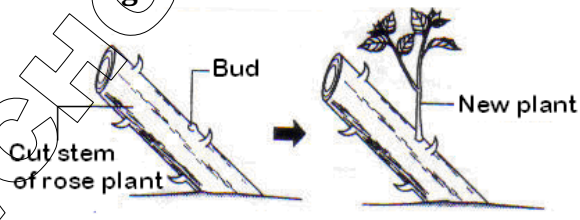
f. **Runners**

- With stems (runner / stolans) that **grow horizontally above the ground** like **sweet potato** and **strawberry**.



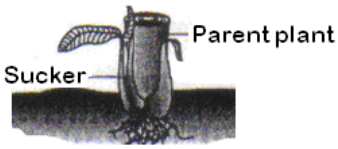
g. **Stem cutting**

– Growing from buds, found on the stem, like **tapioca**, **rose**, **sugar cane**, **bougainvillea** and **hibiscus**.



h. **Suckers**

- Shoot growing from the stem, like **banana**, **bamboo** and **pineapple plants**.



2. **Advantages of Vegetative Reproduction are as follow:**

a. **It takes a shorter time for new plants to develop** by vegetative reproduction than from seeds because no pollination or fertilization takes place as only one parent is needed.

b. **The new plants can survive better in harsh condition** because they can still obtain food from the parent plant.

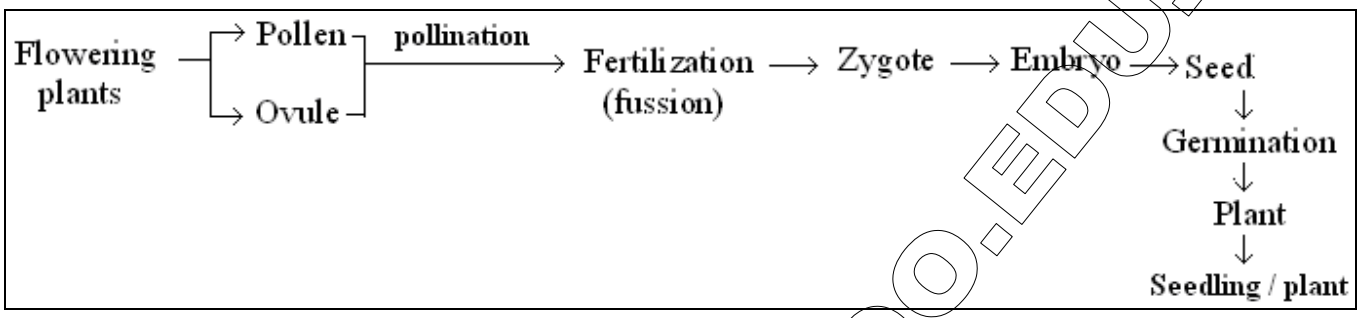
c. Since vegetative reproduction is a form of asexual reproduction.

i. **The daughter plant will resemble the parent** plant in every way.

ii. **The good qualities of the parent plant can be directly passed down**

to the daughter plant without any changes.

3. **Disadvantages of Vegetative Reproduction are as follow :**
   a. Compare to the new plants produced by seed, those produced by vegetative reproduction are of **lesser variety** and hence this makes them less adaptable to changes in the environment.
   b. The **lack of dispersal** make the new plants grow close together and have to complete for sunlight and nutrients with the parent plant.
   c. **No variation** occur



4. **Classification of vegetable reproduction**

P: Bryophyllum
Q: Potato
R: Yam
S: Aloe Vera

P, Q, R, S	
Reproduce from leaves	**Reproduce from stem**
P, S	***Q, R***