

## SHORT QUESTIONS

**1. How are the natural and artificial vegetative propagations the methods of asexual reproduction in plants?**

**Ans:** Vegetative reproduction (vegetative propagation, vegetative multiplication vegetative cloning) is a form of asexual reproduction in plants. It is a process by which new individuals arise without production of seeds or spores

When vegetative parts of plants i.e, roots, stems or leaves give rise to new plants, the process is called vegetative reproduction or vegetative propagation occurs naturally, and can also be brought about artificially

**OR (Second Answer)**

**Natural vs Artificial Methods of Vegetative Propagation**

**There are two methods of propagating plants vegetative:**

- i. Natural
- ii. Artificial

**Natural vegetative propagation:**

The natural method of vegetative propagation utilizes plant organs other than the seed and spore which, even without the involvement of man, serve as plants' means of perpetuating their species. These plant organs include the bulbs and bulblets, cloves, corms and cormels tubers and tubercles, tuberous roots rhizomes, runners, stolons, slips, suckers, crown and plantlets

**Artificial vegetative propagation:**

In contrast, the artificial method of vegetative propagation involves drastic manipulation of plant parts: Without man's active participation, they would not give rise naturally to new plants. This method includes the use of root, stem and leaf cuttings layering (including marcotting) and the application of special

techniques such as budding and grafting mainly to produce desirable clones with seed-grown rootstocks.

**2. Why do gardeners use the methods of cutting and grafting?**

**Ans.** Gardener use grafting to propagate many roses, peach trees, plum trees and various seedless fruits (including grapes)

Gardener use cutting to produce many plants from a single plant. All new plants are exactly the same This artificial vegetative propagation has been very beneficial on sugar cane plantation.

**3. "Parthenogenesis is a type of asexual reproduction". Give comments on this statement.**

**Ans.** Parthenogenesis is a form of asexual reproduction in which growth and development of embryos occur without fertilization. In plants, parthenogenesis means development of an embryo from an unfertilized egg cell.

Parthenogenesis is a form of asexual reproduction in which an unfertilized egg develops into new offspring. Therefore, Parthenogenesis is a type of asexual reproduction.

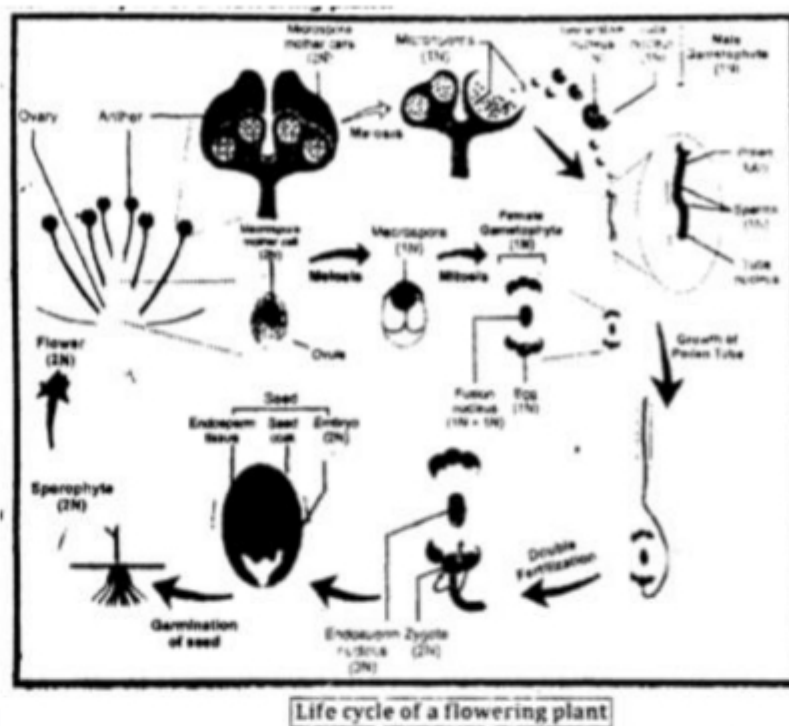
**Examples:**

Some fishes, frogs and insects reproduce by means of parthenogenesis

Similarly, queen honeybee lays eggs in the cells of honeycomb. Many eggs remain unfertilized and develop into haploid males (drones) by parthenogenesis At the same time, some eggs are fertilized by male bees and these develop into diploid females (new queen and worker bees).

**4. Outline the life cycle of a flowering plant.**

**Ans: life cycle of a flowering plant:**



**5. What structural adaptations will you find in a wind-pollinated flower?**

**Ans: Adaptations in wind-pollinated flowers:**

| Features            | Wind Pollinated Flowers                          |
|---------------------|--------------------------------------------------|
| Size                | Generally Small                                  |
| Colour              | Petals green or dull in colour                   |
| Nectar              | Do not produce nectar                            |
| Floral arrangement  | Flowers hang down for easy shaking               |
| Stamens and stigmas | Hang out of ring of petals                       |
| Pollen grains       | Large number produced/ light with smooth surface |

|               |                                      |
|---------------|--------------------------------------|
| <b>Stigma</b> | Feather branches for catching pollen |
|---------------|--------------------------------------|

**6. Give an introduction of Pakistan's National AIDS Control Program.**

**Ans. Pakistan's National AIDS Control Program (NACP):**

Pakistan's Federal Ministry of Health established NACP in 1987. The main objective of this programme is to help the public for the prevention of HIV transmission, safe blood transfusions and reduction of STDs.

The frequency of HIV infection in Pakistan is still low. But the country is at risk... eg exposure to infected blood or blood ... and injecting drug users. For improved prevention by the government ... NACP started services through-TV and radio channels and print media in 2005.

**Main objective of the programme:**

The objectives of this activity were to

- i. Change public attitude for safe sexual activities
- ii. Create demand for information on HIV and AIDS
- iii. Improve attitudes and behaviour among healthcare workers

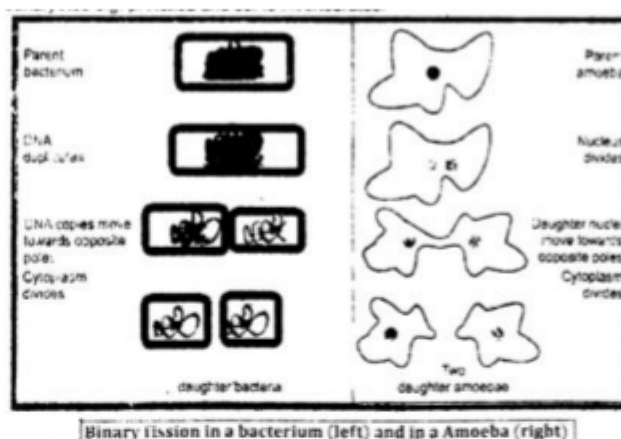
## UNDERSTANDING THE CONCEPT

**1. What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually?**

**Ans: i. asexual reproduction in prokaryotes:**

**Binary fission:**

Binary fission means "division into two". It is the simplest and most common method of asexual reproduction. It occurs in prokaryotes (bacteria), many unicellular eukaryotes e protozoa and some invertebrates.



### Duplication of DNA:

During binary fission in bacteria, the DNA is duplicated and so two copies of DNA are formed. The two copies move towards the opposite poles of cell. The cell membrane invaginates in centre and divides the cytoplasm into the... deposited between two cross membranes It results in the... bacteria, which grow in size and divide again.

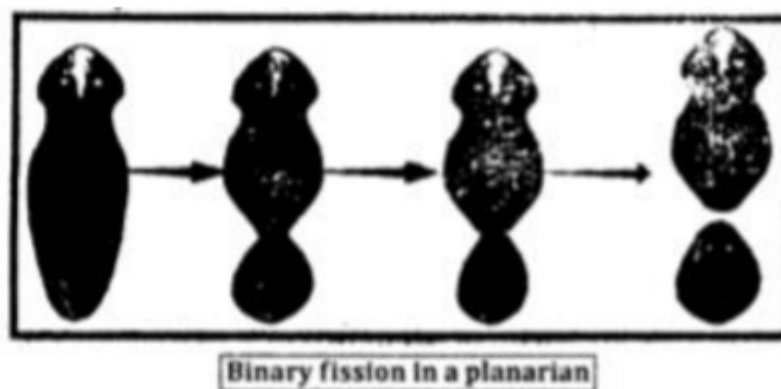
### Division of Nucleus of Parent Organism:

During binary fission in unicellular eukaryotes the nucleus of parent organism divides into two (by mitosis) it is followed by the division of cytoplasm two daughter cells of almost equal size are formed Daughter cells grow in size and then divide again

### Binary Fission in invertebrates:

Some invertebrates also reproduce asexual through binary ... reproduction body is cut into two...are regenerated in both halves. This type of asexual ... planaria and many echinoderms



**Multiple Fission:**

Some unicellular organisms (e.g. Amoebae) form hard walls called cysts around them, under unfavorable conditions. When favorable conditions return the nucleus of parent divides into many daughter nuclei by repeated divisions. This is followed by the division of cytoplasm into several parts. Each new part of cytoplasm encloses one nucleus. So, a number of daughter cells are formed from a single parent at the same time. This kind of fission is known as multiple fission

**ii. Asexual reproduction of protozoans:**

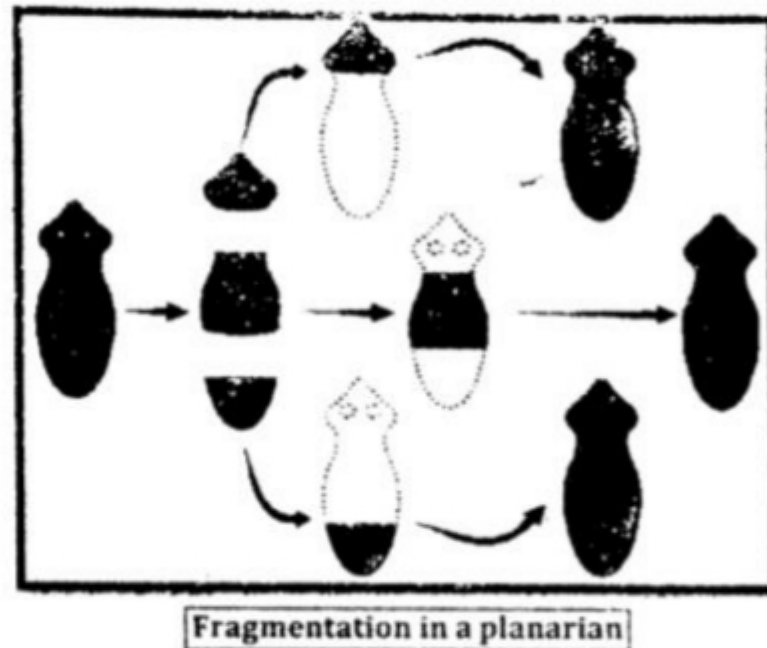
Asexual reproduction of protozoans occurs when the cell divides in half or binary fission. Some which are parasites multiply within the host. Some protozoans reproduce sexually as well. This can happen when two protozoans carrying half of their regular genetic material fuse together and form a new cell. Others exchange genetic material during mating.

**iii. Asexual reproduction in Fungi:****Fragmentation:**

A type of asexual reproduction in which the animal breaks up in pieces and each piece develops into a mature animal is called fragmentation.

**Explanation:**

As certain worms grow to full size, they spontaneously break up into 8 or 9 pieces. Each piece (fragment) develops into a mature worm, and the process is repeated. If a planarian breaks into many pieces instead of two, it will also be called as fragmentation

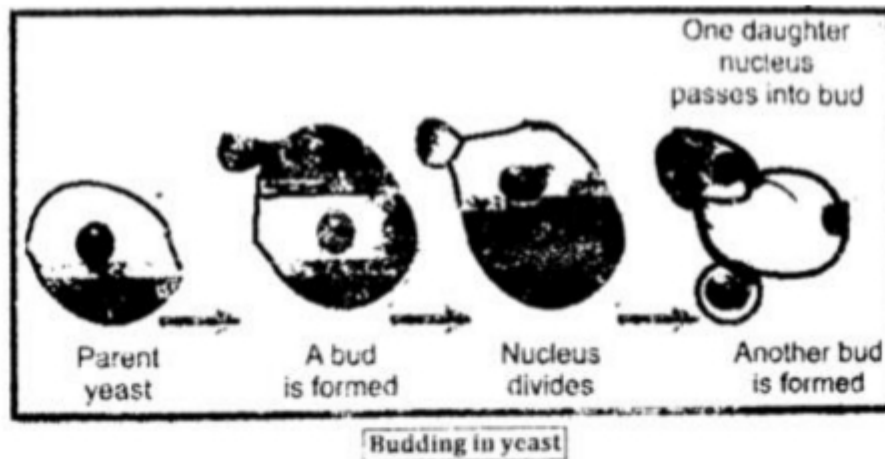


**b. Budding:**

A type of sexual reproduction in which a bud develops as a small outgrowth on parent's body and forms the new individual

**Explanation:**

in case of yeast (a unicellular fungus) a small bud is formed on one side of cell. The nucleus of cell divides and one of the daughter nuclei is passed into the bud. Parent cell may form more than one bud at a time. Each bud enlarges and develops the characteristics of parent organism. The bud may separate from parent body in some cases, the buds never separate and as a result colonies of individuals are formed

**Examples:****Budding in sponges, Hydra and corals:**

Animals such as sponges, Hydra and corals also reproduce by means of budding. In them, a small bud is formed on the side of body by mitosis. This bud enlarges by the formation of more cells. It then detaches from the parent and grows into new organism.



In corals, the buds do not detach from the parent body. Corals form big colonies, because the buds grow into new organisms by remaining attached to the parent body.

**c. Spore Formation:****Sporangia:**



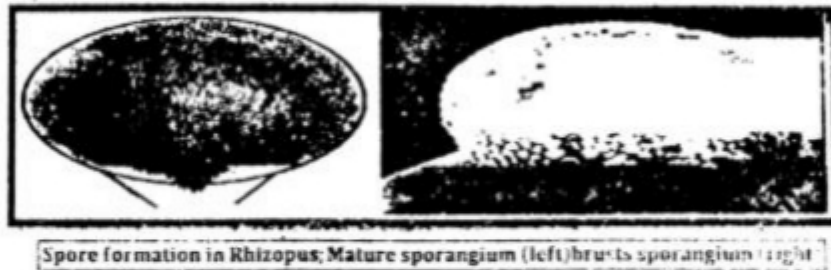
It is generally seen in most fungi (eg. Rhizopus) When Rhizopus reaches reproductive age, its body cells form thick walled spore sacs called sporangia (sing, sporangium)

**Spores:**

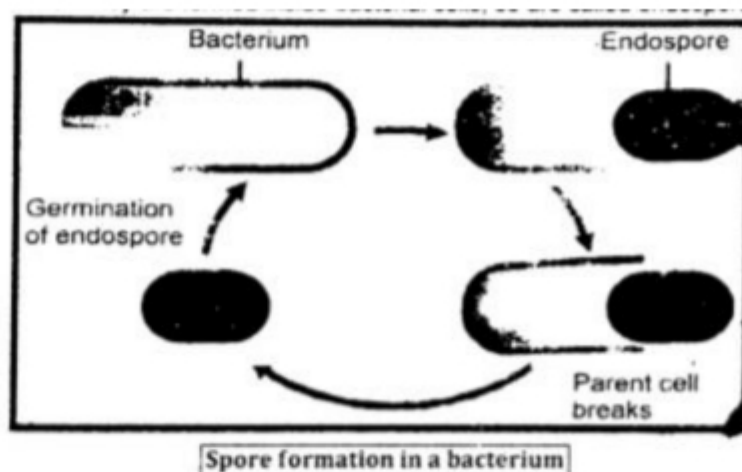
Inside each sporangium, a cell divides many times and forms many daughter cells called spores.

**Cyst:**

Each spore is covered with a thick wall called cyst and it can survive unfavorable conditions. When sporangia are mature, they burst and release spores. Under favorable conditions, the spores germinate and develop into new Rhizopus

**Endospores:**

Under unfavorable conditions, some species of bacteria reproduce by forming spores, e.g. Clostridium and Bacillus species. The bacterial spores are also thick-walled. They are formed inside bacterial cells, so are called endospores.



## 2. Explain the different parts of the plant that help in vegetative propagation.

### Ans. Parts of the plant that help in natural vegetative propagation

Vegetative propagation occurs in plants naturally in several ways.

#### i. **Bulbs:**

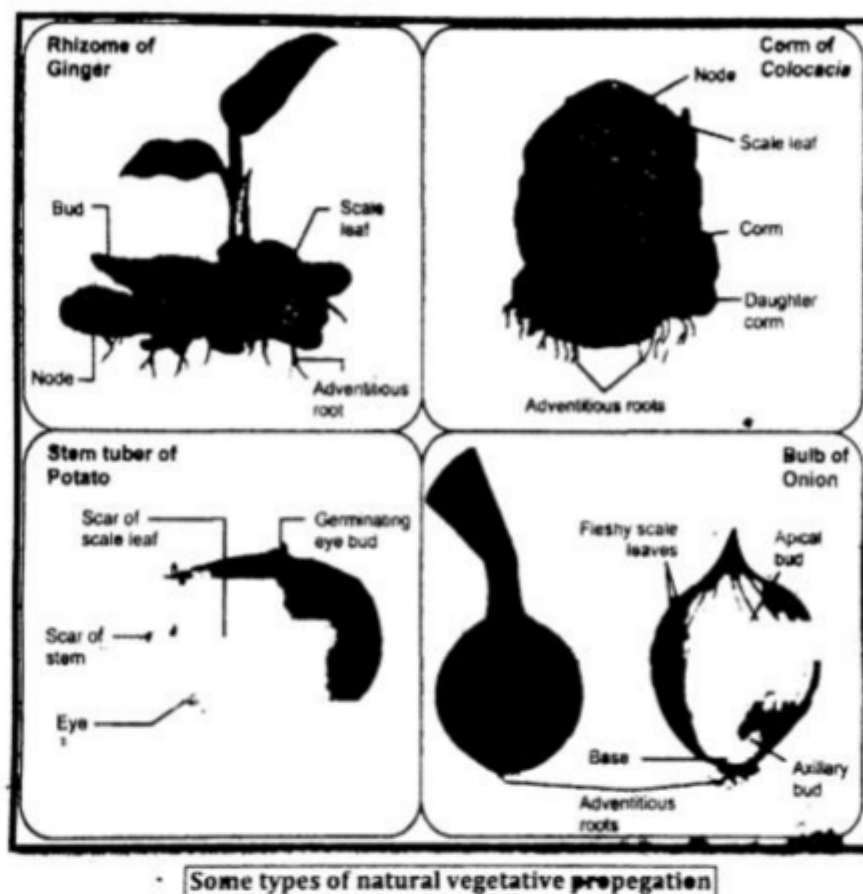
Bulbs are short underground stems surrounded by thick, fleshy leaves that contain stored food. Adventitious roots emerge under the base of bulb while shoots emerge from the top of the base. Tulips, onions and files reproduce by bulbs

#### ii. **Corms:**

Corms are short and swollen underground stems containing stored food Buds are present at the top of corm. From a bud, shoot grows and forms a new plant Dasheen and garlic reproduce by corms.

#### iii. **Rhizomes:**

Rhizomes are horizontal underground stems with scale leaves. There are enlarged portions called nodes on rhizome. Buds are produced at nodes. The buds present on the upper surface of rhizome give rise to shoot. The lower surface of rhizome produces adventitious roots Ginger, ferns and water les reproduce by rhizomes



#### iv. Stem Tubers:

Stem Tubers are the enlarged portions of an underground stem (rhizome). There are aggregations of tiny buds in the form of "eyes" along the surface of the tuber. Each bud develops into a shoot that grows upward and also produces roots. Potatoes and yams reproduce by tubers.

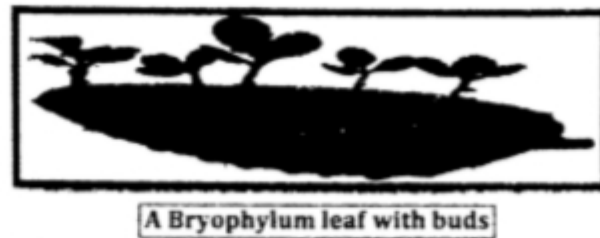
#### v. Suckers:

Suckers are lateral stems close to ground level. A sucker grows underground for some distance and then turns up, producing the new plant. Mint and Chrysanthemum reproduce in this way.

#### vi. Leaves:

Vegetative propagation by leaves is not common and is seen in plants such as Bryophyllum (Pather chut). This plant has fleshy leaves and adventitious buds.

are present at the margins of leaves. When leaf falls on ground, the buds grow into new plants



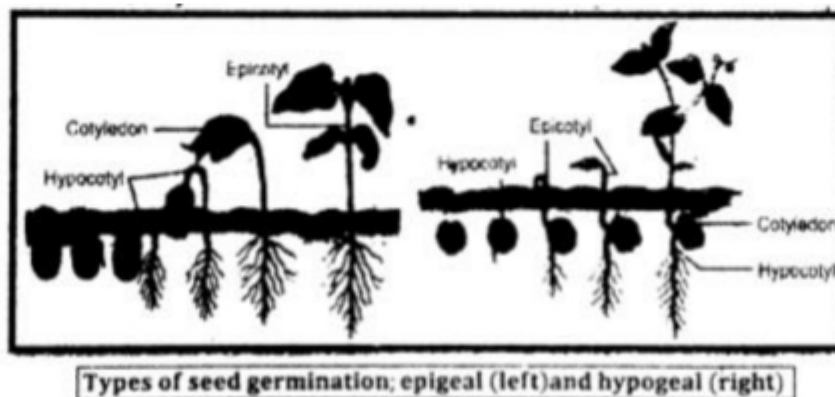
### 3. Explain, how the epigeal and hypogeal germinations are different?

#### Ans. Epigeal germinations:

In epigeal germination, the hypocotyl elongates and forms a hook, pulling the cotyledons above ground. Beans, cotton and papaya are the examples of seeds that germinate this way.

#### Hypogeal germinations:

In hypogeal germination, the epicotyl elongates and forms the hook. In this type of germination, the cotyledons stay underground. Pea, maize and coconut germinate this way.



OR (Second Answer)

#### Difference between epigeal and hypogeal germination:

| <b>Epigeal germination:</b>                                               | <b>Hypogeal germination:</b>                                                      |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>i.</b> Germination in which the cotyledons are forced above the ground | <b>i.</b> Germination in which the cotyledons remain in the seed below the ground |
| <b>ii.</b> The hypocotyl elongates                                        | <b>ii.</b> The epicotyl elongates.                                                |
| <b>iii.</b> Cotyledons become photosynthetic.                             | <b>iii.</b> Cotyledons do not come photosynthetic                                 |
| <b>iv.</b> Seed coat emerges from soil.                                   | <b>iv.</b> Seed coat remains in the soil                                          |
| <b>Example:</b> Bean, Canola                                              | <b>Example:</b> Pea                                                               |

#### 4. What conditions are necessary for the germination of seeds?

##### **Ans. Conditions for Seed Germination:**

Seed germination depends on both internal and external conditions

##### **Internal conditions for seed germination:**

The internal conditions include a live embryo and sufficient food storage

##### **External conditions for seed germination:**

The most important external conditions include water, oxygen and favorable temperatures

##### **i. Water (moisture):**

Seeds of most plants have low water content, and germination cannot occur is used in the digestion of the stored food and it also helps in the elongation of hypocotyl and epicotyl.

##### **ii. Oxygen:**

Oxygen is essential for the respiration in the cells of embryo.

##### **iii. Temperature:**



Seeds differ greatly in their temperature requirements for germination. The optimum temperature for the germination of the seeds of most plants ranges from 25-30°C.

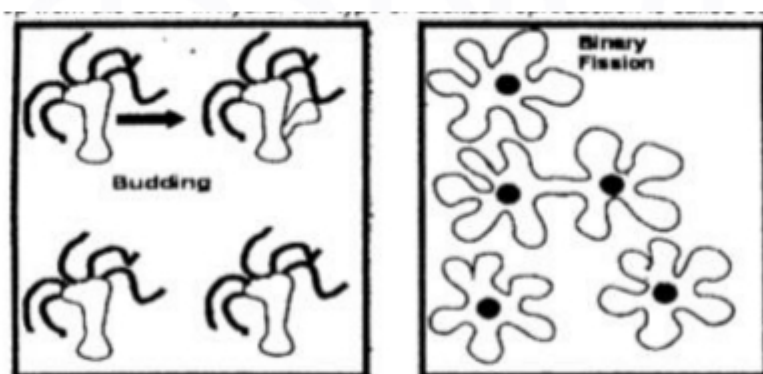
### 5. Outline the methods of asexual reproduction in animals.

#### Ans. Asexual Reproduction in animals:

The type of reproduction in which only a single parent is involved is called asexual reproduction e.g., budding and binary fission.

#### Budding:

In each hydra, there may be one or more bulges. These bulges are the developing new individuals and they are called buds. In hydra too the new individuals develop as outgrowths from a single parent. Since new individuals develop from the buds in hydra, this type of asexual reproduction is called budding



#### Binary fission:

Another method of asexual reproduction is observed in the microscopic organism, amoeba. Amoeba is a single-celled organisms. It begins the process of reproduction by the division of its nucleus into two nuclei. This is followed by division of its body into two each part receiving a nucleus. Finally, two amoebae are produced from one parent amoeba. This type of asexual reproduction in



which an animal reproduces by dividing into two individuals is called binary fission.

**6. Write a note on the male and female reproductive systems of rabbit.**

**Ans. Male reproductive system of rabbit:**

The male reproductive system of rabbit consists of a pair of testes that produce sperms, the associated ducts that transport sperm to external genitalia and glands that add secretions to sperms.

**Scrotum:**

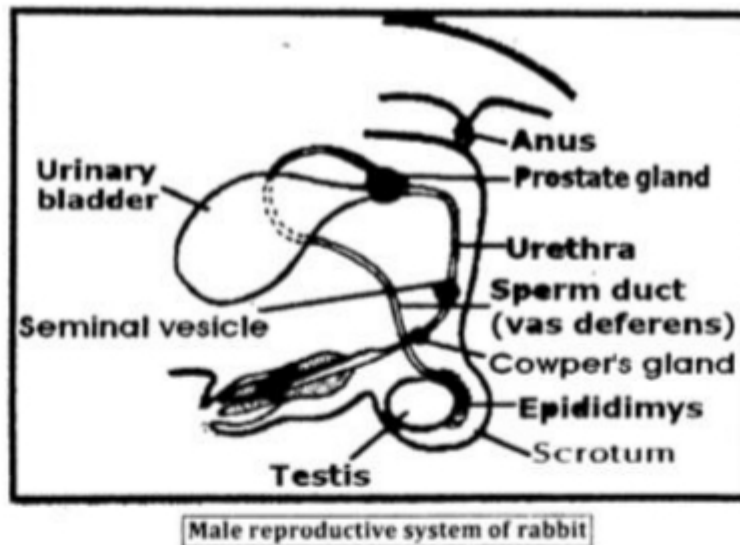
Testes are located in a bag of skin called the scrotum that hangs below the body. Each testis consists of a mass of coiled tubes called the seminiferous tubules. In these tubules, the sperms are formed

**Epididymis:**

When sperm are mature, they accumulate in the collecting ducts of testes and then pass to epididymis

**Vas deferens:**

From epididymis, sperms move to a sperm duct called vas deferens. Both sperm ducts join urethra just below urinary bladder. The urethra transports both sperm and urine

**Semen:**

Semen is the material containing sperms in a fluid. It consists of 10% sperms and 90% fluid. As the sperms pass down the ducts from testes to urethra, the associated glands add various secretions

**Seminal vesicles:**

Seminal vesicles produce secretions that provide nutrients for sperms

**Prostate gland:**

Prostate gland produces a secretion that neutralizes the acidity of the fluid

**Cowper's glands:**

Cowper's glands produce secretions that lubricate the ducts

**Female Reproductive System**

The female reproductive system of rabbit consists of ovaries and associated ducts

**Ovaries:**

Ovaries are small oval organs situated in abdominal cavity just ventral to kidneys. Like most animals, female rabbits have a pair of ovaries. The outer region of ovary produces egg cells.

**Follicle:**

A cluster of specialized cells called follicle surrounds and nourishes each egg cell.

**Fallopian tubes:**

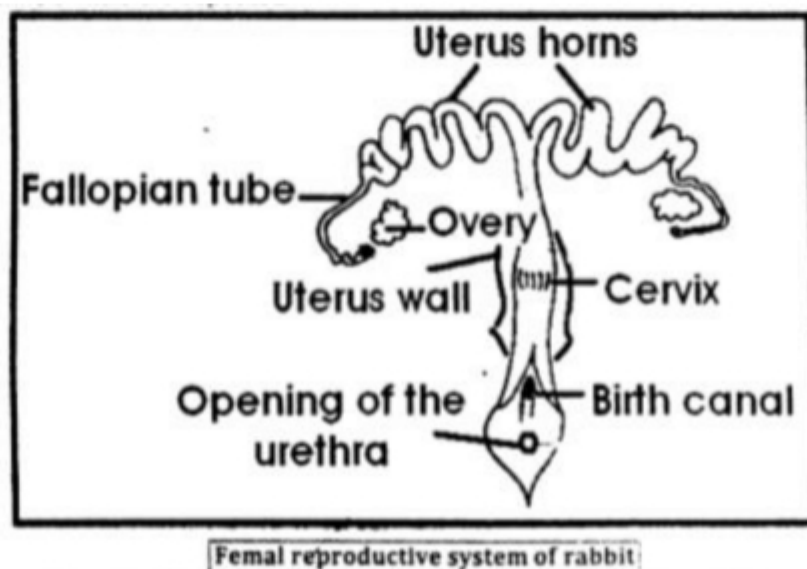
From ovaries, egg cells are released in fallopian tubes. The opening of fallopian tube lies close to ovary. Fertilization occurs in fallopian tubes and the fertilized egg (zygote) is carried to uterus.

**Vagina or birth canal:**

The uterus of rabbit is divided into two separate parts or horns. The uterus horns join and open into vagina or birth canal.

**Cervix:**

Cervix is the portion of uterus, which separates it from birth canal where sperms of male are deposited.



**7. Describe the processes of spermatogenesis and oogenesis.****Ans. Spermatogenesis:**

Some cells present in the walls of the seminiferous tubules of testes divide repeatedly by mitosis to form large number of diploid spermatogonia

**Primary and secondary spermatocytes:**

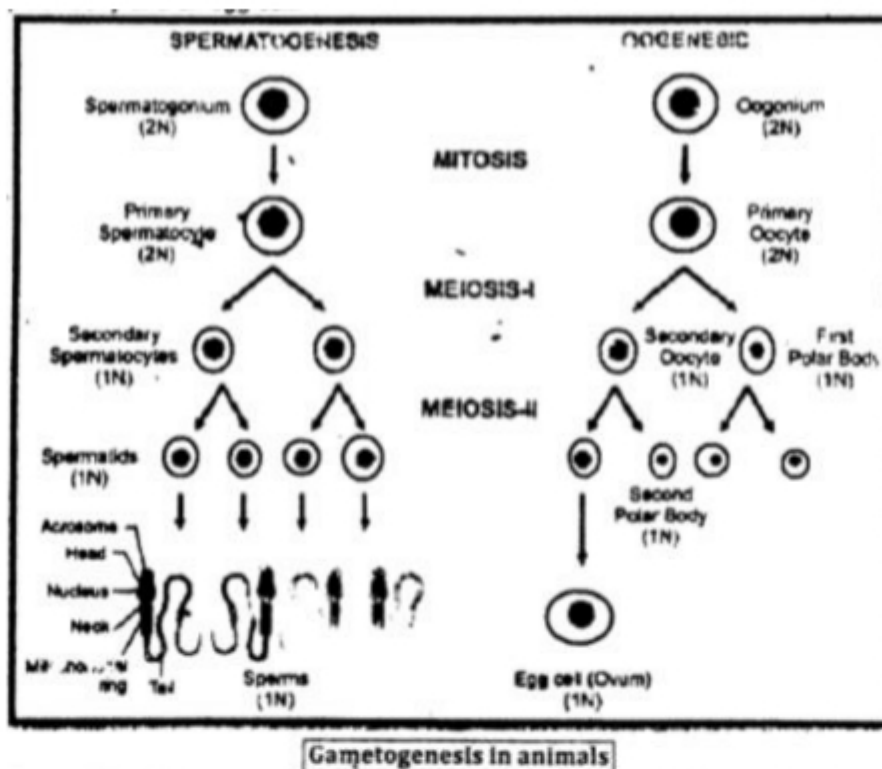
Some spermatogonia produce primary spermatocytes Each IV spermatocyte undergoes meiosis- and produces two haploid and secondary spermatocytes. These cells undergo meiosis. In this way four spermatids are produced from each primary spermatocyte

**Spermatids:**

The spermatids are non-motile and many changes occur in them to convert them into motile cells. Their nuclei shrink and some structures are formed 0,03 corner called acrosome, a tail and a mitochondrial ring. After these changes the spermatids are called sperms.

**Oogenesis:**

Some cells of ovary prepare structures called follicles, in which many diploid oogonia are present. Some oogonia produce diploid primary oocytes. One of the primary oocytes completes meiosis. and produces two haploid cells. The smaller cell is called first polar body and the larger one is called secondary oocyte. The secondary oocyte completes meiosis-II and produces two haploid cells i.e. a second polar body and an egg cell



### 8. Why do we consider that overpopulation is a global problem?

**Ans. Overpopulation is a global problem:**

When population growth exceeds the carrying capacity of an area or environment, it results in overpopulation. Many problems are associated with human overpopulation

- i. The overpopulated areas face severe shortage of fresh water and natural resources
- ii. Overpopulation results in deforestation and loss of ecosystems. It leads to more pollution and global warming.
- iii. There is high infant and child mortality rate in overpopulated areas due to poverty
- iv. Overpopulation raises demands for more housing units, more hospitals more jobs, more educational institutions, increase in food crops etc.

