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## 14.1 REPRODUCTION

### 14.2 METHODS OF ASESEXUAL REPRODUCTION

#### LONG QUESTIONS

**Q.1** Define asexual reproduction, and write different method of asexual reproduction. (K.B)

OR

What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually? (K.B) (Understanding the Concept Q.1, Q.5)

**Ans:** ASEXUAL REPRODUCTION

Definition:

“Asexual Reproduction means simple **cell division** that produces an **exact duplicate** of an organism”.

#### METHODS

Asexual reproduction **does not involve** the **fusion of gametes**. There are **many types** of asexual reproduction, all producing individuals that are **genetically identical** to each other and to the **parent**. Few **methods of asexual reproduction** are following

- **Binary fission**
- **Fragmentation**
- **Budding**
- **Spore formation**
- **Parthenogenesis**
- **Vegetative propagation**

**Q.2** Write a note on binary fission. (K.B)

(LHR 2016)

**Ans:** BINARY FISSION

Definition:

“Binary fission means **“division into two”**. The **simplest** and most **common** method of asexual reproduction in which an organism **divides into two** by simple cell division is called **binary fission**”.

Examples:

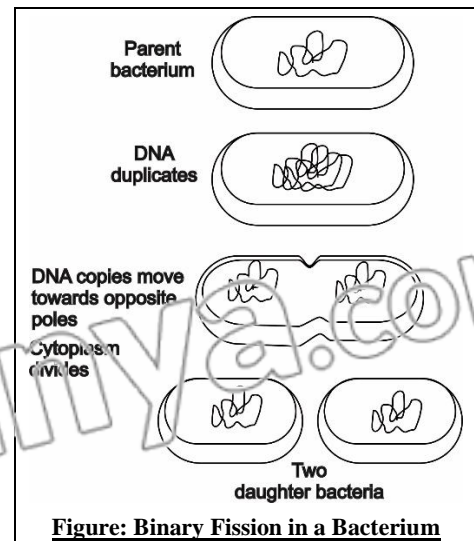
- It occurs in **prokaryotes** (Bacteria)
- Many **unicellular eukaryotes** (Protozoa)
- Some **invertebrates** (Planarian)

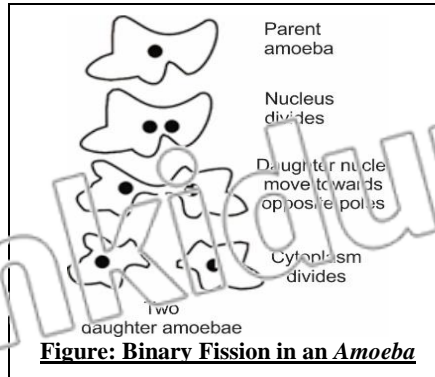
Prokaryotes (Bacteria):

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 two. **New cell wall** is deposited between two **cross membranes**. It results in the formation of **two daughter bacteria**, which grow **in size** and **divide again**.

Unicellular Eukaryotes (Amoeba):

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





**Invertebrates (Planarian):**

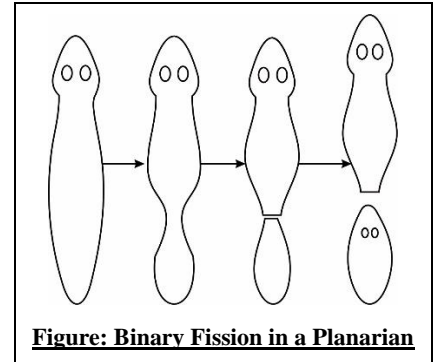
Some **invertebrates** also reproduce **asexually** through **binary fission**. During this **reproduction**, body is cut into **two halves** (fission) and the **missing body parts** are **regenerated** in both halves. This type of asexual reproduction is common in:

- **Planarian**
- **Many Echinoderms**

**Q.3** Write a note on multiple fission. (K.B)

**Ans:**

**MULTIPLE FISSION**



**Definition:**

“The kind of asexual reproduction in which **one unicellular** organism **divides** into **many daughter cells** is called multiple fission”.

**Example:**

- Amoeba

**Mechanism:**

**Formation of Cyst and Division of Nucleus:**

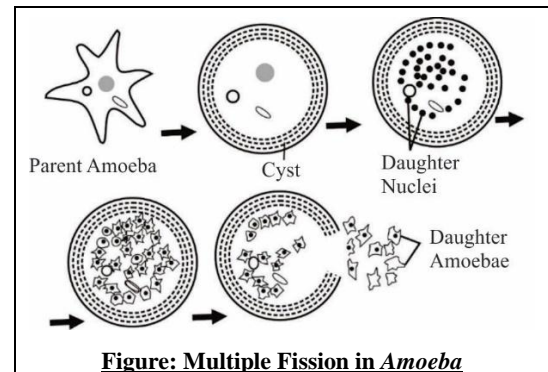
Some **unicellular organisms** form **hard walls** called **cysts** around them, under **unfavorable conditions**. When **favorable conditions** return, the nucleus of **parent** divides into many **daughter nuclei** by **repeated divisions**.

**Division of Cytoplasm:**

This is followed by the **division of cytoplasm** into **several parts**. Each **new part of cytoplasm** encloses one **nucleus**.

**Daughter Cells:**

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.



**Q.4** Write a note on fragmentation. (K.B)

**Ans:**

**FRAGMENTATION**

(DGE 2015)

**Definition:**

“A kind of **asexual** reproduction in which the **detached parts** of the **organism** develop into **new organism** is called **fragmentation**”.

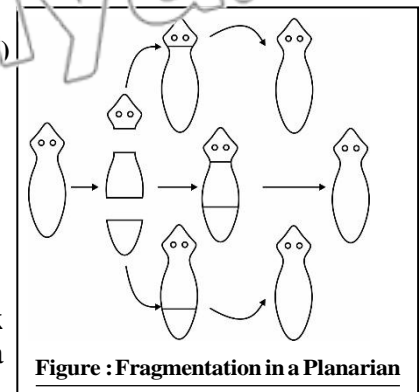
**Examples:**

**Worms:**

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**.

**Planarian:**

If a **planarian** breaks into **many pieces** instead of **two**, it will also be called as fragmentation.



Q.5 Write a note on budding. (K.B)

(LHR 2014, GRW 2014, DGK 2015)

Ans:

**BUDDING**

**Definition:**

“A type of **asexual reproduction** in which an **outgrowth on the body of an organism** develops into a **new complete organism** is called budding”.

**Bud:**

The **developed outgrowth on the body** of an organism is called **bud**.

**Explanation:**

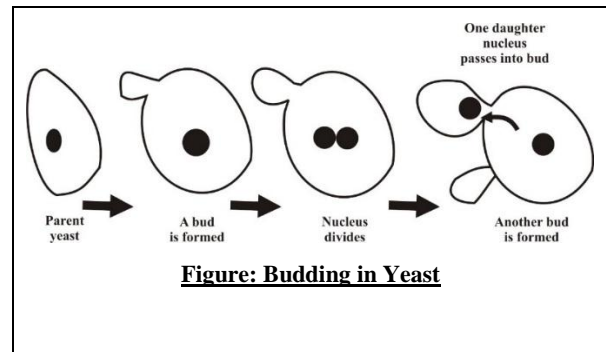
In this type of **asexual reproduction**, a **bud** develops as a **small outgrowth on parent's body**. The bud may **separate from parent body**. In some cases, the buds **never separate** and as a result, **colonies of individuals** are formed.

**Examples:**

- Yeasts
- Sponges
- Hydra
- Corals

**Budding in Yeast:**

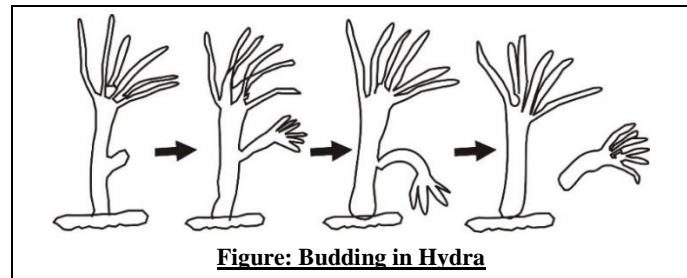
**Yeast** is a **unicellular fungus**. A **small bud** is formed on **one side of cell**. The **nucleus of cell divides** and **one of the daughter nuclei** is **passed into the bud**. **Parent cell** may form **more than one bud at a time**. Each **bud enlarges** and **develops the characteristics of parent organism**.



**Figure: Budding in Yeast**

**Budding in Hydra:**

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



**Figure: Budding in Hydra**

**Budding in Corals:**

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**.

Q.6 Write a note on spore formation. (K.B)

(GRW 2013, 2014)

Ans:

**SPORE FORMATION**

**Definition:**

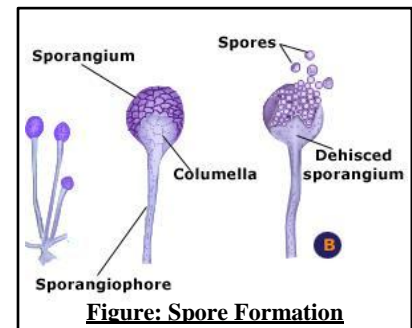
“An **asexual reproductive structure** that gives rise to **new plant body directly** is called as **spore**”.

**Example:**

- It is generally seen in most fungi e.g. **Rhizopus**.

**Spore Formation in Rhizopus:**

When **Rhizopus** reaches reproductive age, its body cells form thick walled spore sacs called **sporangia** (sing. Sporangium). Inside each sporangium, a cell divides many times and forms many daughter cells called **spores**. 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**.



**Figure: Spore Formation**

**Endospore Formation in Bacteria:**

Under unfavorable conditions, some species of bacteria reproduce by forming spores. The bacterial spores are also thick walled. They are formed inside bacterial cells, so are called endospores. For example, the bacteria of the following species form endospores:

- Clostridium
- Bacillus

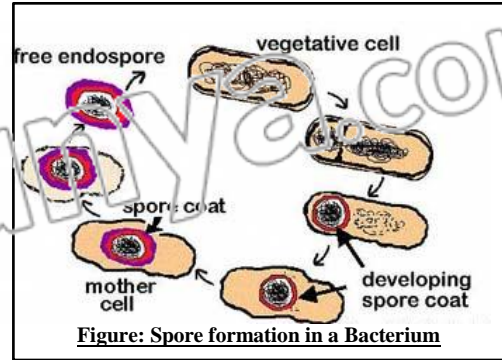


Figure: Spore formation in a Bacterium

Q.7 Write a note on parthenogenesis. (K.B)

Ans:

**PARTHENOGENESIS**

**Definition:**

“A type of asexual reproduction in which an **unfertilized egg develops into a new individual** is called parthenogenesis”.

**Examples:**

The **phenomenon** of parthenogenesis is **observed** in some **fishes, frogs and insects**.

**Parthenogenesis in Honey Bees:**

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

Q.8 Write a note on natural vegetative propagation. (A.B)

(LHR 2016, MTN 2015)

OR

**Explain the different parts of the plants that help in natural vegetative propagation.**

(A.B)

(Understanding the Concept Q.2)

Ans:

**VEGETATIVE PROPAGATION**

**Definition:**

“The process in which vegetative parts of **plants** i.e. roots, stems or leaves **give rise** to **new plants**, is called vegetative propagation”. It is also called **vegetative reproduction**.

**NATURAL VEGETATIVE PROPAGATION**

**Definition:**

“If the process of vegetative propagation occurs **naturally** then it is called **natural vegetative propagation**”.

**Types of Natural Vegetative Propagation:**

Vegetative propagation occurs naturally in several ways:

1. **Bulbs**
2. **Corms**
3. **Rhizomes**
4. **Stem Tubers**
5. **Suckers**
6. **Leaves**

**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**.

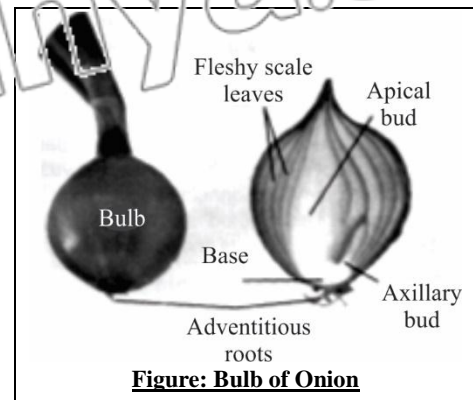


Figure: Bulb of Onion

**Examples:**

- Tulips
- Onions
- Lilies

**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**.

**Examples:**

- Dasheen
- Garlic

**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**.

**Examples:**

- Ginger
- Ferns
- Water lilies

**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 tuber. Each bud **develops into shoot** that grows **upward** and also **produces roots**.

**Examples:**

- Potatoes
- Yams

**Suckers:**

Suckers are **lateral stems close to ground level**. A sucker grows **underground** for some **distance** and then **turns up**, producing the **new plant**.

**Examples:**

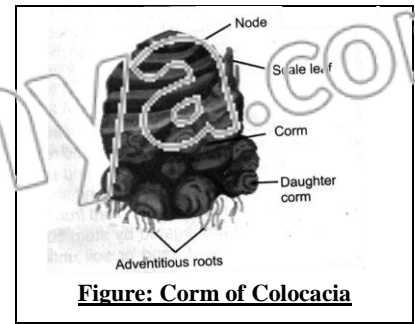
- Mint
- Chrysanthemum

**Leaves:**

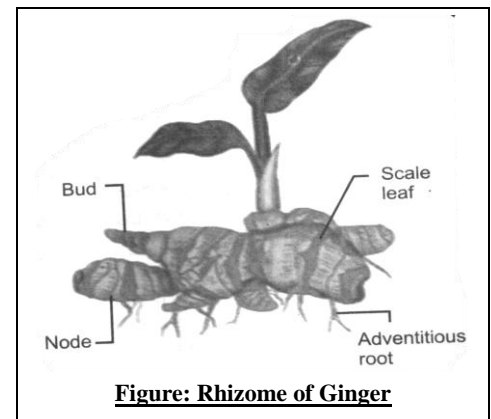
Vegetative propagation by leaves is **not common** and is seen in plants such as:

- Bryophyllum (Pather chut)

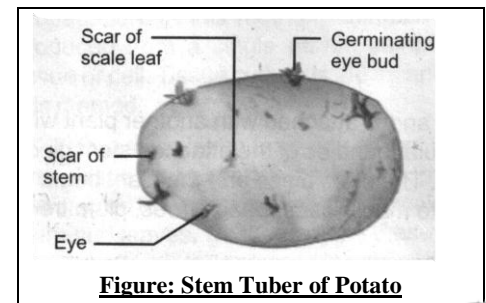
This plant has **fleshy leaves** and **adventitious buds** are present at the **margins** of leaves. When **leaf falls on ground**, the **buds grow** into new plants.



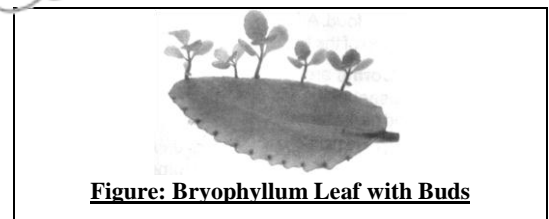
**Figure: Corm of Colocacia**



**Figure: Rhizome of Ginger**



**Figure: Stem Tuber of Potato**



**Figure: Bryophyllum Leaf with Buds**

Q.9 Write different methods of artificial vegetative propagation. (A.B) (LHR 2017, DGK 2015)

Ans: ARTIFICIAL VEGETATIVE PROPAGATION

**Definition:**

“If the **process** of vegetative propagation occurs **artificially** by gardeners and farmers then it is called **artificial vegetative propagation**”.

**Types:**

The following **two** are the most common **methods** of artificial vegetative propagation:

- **Cuttings**
- **Grafting**

**Cuttings:**

In this method, **cuttings** may be **taken** mainly from the **stems or roots** of **parent plant**. These cuttings must have a **meristematic region** from which **growth** can occur. The cuttings will form **roots and shoots** when they are placed in a **suitable soil** and under **favorable conditions** like:

- **Sufficient nutrients**
- **Water**
- **Sunlight**

Roots and shoots grow and **develop** into a **plant identical** to the **parent plant** from which the cuttings were taken.

**Stem Cuttings:**

The following plants are artificially propagated through stem cuttings:

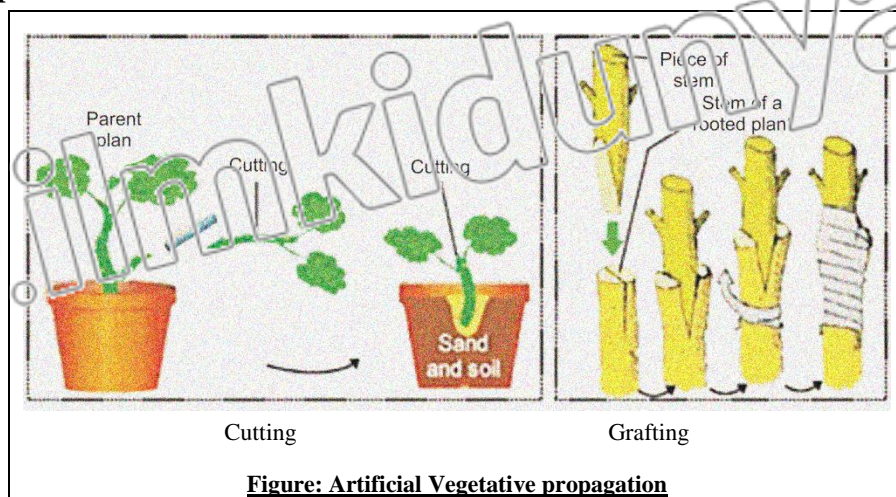
- **Roses**
- **Ivy**
- **Grapevines**

**Root Cuttings:**

Sweet potato is an **enlarged root**. Farmers place it in **moist sand or soil** until it produces **several plantlets**. Then the plantlets are **removed and planted**.

**Advantages:**

- This process is used 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.**



**Figure: Artificial Vegetative propagation**

**Grafting:**

In grafting, a **piece of stem** is cut from the plant and is **attached** with **another plant** with established **root system**. After a while, the **vascular bundles** of the **attached stem piece** and the host plant are connected to each other. The stem piece and the plant **begin to grow together**.

**Examples:**

This method is used to propagate:

- **Many roses**
- **Peach trees**
- **Plum trees**
- **Various seedless fruits including grapes**

**Q.10** Describe the advantages and disadvantages of vegetative propagation of plants. (A.B)

(LHR 2014, 16, GRW 2014, 17)

**Ans:**

**VEGETATIVE PROPAGATION****Definition:**

“The process in which **vegetative parts** of plants i.e. roots, stems or leaves give **rise** to new **plants**, is called vegetative propagation”. It is also called vegetative reproduction.

**ADVANTAGES**

The **advantages** of vegetative propagation are as follows:

**Genetically Identical Offspring:**

The offspring produced through vegetative propagation are **genetically identical**. Therefore **beneficial characteristics** can be preserved.

**Pollination:**

In vegetative propagation, there is **no need** of any **mechanism** of pollination. It helps to **increase number of plants** at a rapid rate.

**Unfavorable Conditions:**

The **organs** of vegetative propagation **enable** many plants to **pass over unfavourable conditions**.

**Seedless Plants:**

Plants bearing **seedless fruits** can be **grown only** by vegetative propagation.

**DISADVANTAGES**

The **disadvantages** of vegetative propagation are as follows:

**Genetic Variations:**

The plants **do not** have **genetic variations**.

**Diseases Attack:**

Species specific **diseases** can **attack** and this can result in the **destruction** of an **entire crop**.

**Q.11** Write a note on tissue culture and cloning. (A.B)

(GRW 2015)

**Ans:**

**TISSUE CULTURE AND CLONING****Cloning:**

“The process in which **identical offspring** are **produced** from a **single parent** using its vegetative **tissue or cell** is called cloning”.

This method of propagation is also called **micro-propagation** since it uses only a small part of plant.

**Latest Method:**

Cloning is the **latest method** of vegetative propagation.

**Technique:**

**Tissue culture** is the **technique** applied in this **method**.

**Mechanism:**

**Tissues** are **taken from** any part of plant and are **put** in a **suitable nutrient medium**.



**Formation of Calluses:**

The tissue cells start **mitosis** and produce **masses of cells called calluses** that are **transferred** to other **medium** that contains different **hormones** for the **formation** of roots, stem and leaves

**Formation of New Plant:**

Calluses make these **structures** and grow into **new small plants**. The small plants are then planted in pots and then in fields

**14.1, 14.2 SHORT QUESTIONS**

**Q.1 Define the term reproduction. Why it is necessary? (U.B) (DGK 2015)**

**Ans:** REPRODUCTION

Definition:

“Reproduction is defined as production of individuals of the same species. i.e the next generation of species.”

Need of Reproduction:

It is one of the fundamental characteristics of living things. It is not an essential life process. Reproduction is necessary because of the following reasons.

- For the survival of species
- For the continuation of species

**Q.2 What is the significance of reproduction? (K.B)**

- Reproduction is one of the fundamental characteristics of living things, it is not an essential life process.
- It is essential for the continuation of species.
- It ensures that the genetic material of one generation is transmitted to the next.
- This ensures that the advantageous characteristics are transmitted to the next generation.

**Q.3 Why each generation produces more offsprings for the next generation? (U.B)**

**Ans:** Many individuals die due to various reasons like diseases, competition, genetic factors etc. before reaching the reproductive age. So each generation produces more offsprings for the next generation and only the fittest and the best survive can reach the reproductive age.

**Q.4 How reproduction is important for the continuation of species? (U.B)**

(LHR 2013, BWP 2015)

**Ans:** IMPORTANCE OF REPRODUCTION

Reproduction is essential for continuation of species. It ensures that the genetic material of one generation is transmitted to the next. Each generation produces more offspring for the next generation. Characteristics are transmitted to the next generation. Only the best and fittest survive.

**Q.5 What is difference between asexual and sexual reproduction? (K.B) (GRW 2013, DGK 2015)**

**Ans:** DIFFERENTIATION

The differences between asexual and sexual reproduction are as follows:

Asexual Reproduction	Sexual Reproduction
<b>Definition</b>	
• Simple cell division that produces an exact duplicate of an organism.	• Involves the joining (fusion) of male and female sex cells gametes.
<b>Example</b>	
• Binary fission in Bacteria	• Reproduction in Humans

**Q.6 Define the term binary fission. Give examples. (K.B) (DGK 2015)**

**Ans:** Page no 122.

**Q.7 How budding occur in corals? (U.B) (LHR 2017)**

**Ans: BUDDING IN CORALS**

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

**Q.8 How plants reproduced by suckers? Give examples. (U.B) (LHR 2017)**

**Ans:** Page no 126

**Q.9 What is meant by cutting? Give one example. (K.B) (GRW 2016)**

**Ans:** Page no 127.

**Q.10 How binary fission take place in planarian? (K.B)**

**Ans:** Page no 123.

**Q.11 What is multiple fission? (K.B) (GRW 2014, LHR 2016)**

**Ans:** Page no 123.

**Q.12 Define fragmentation. (K.B) (GRW 2015)**

**Ans:** Page no 123.

**Q.13 What is spore formation? (K.B) (LHR 2014)**

**Ans:** Page no 124.

**Q.14 What are endospores? (K.B)**

**Ans:** Page no 125.

**Q.15 Define the term parthenogenesis. (K.B) (BWP 2015)**

**Ans:** Page no 125.

**Q.16 Define the term vegetative propagation. (K.B) (GRW 2017)**

**Ans:** Page no 125.

**Q.17 How vegetative propagation occur by leaves? (K.B) (GRW 2017)**

**Ans:** Page no 125.

**Q.18 What are the disadvantages of vegetative propagation? (A.B) (LHR 2017)**

**Ans:** Page no 127.

**Q.19 Define the term cloning and tissue culture. (K.B) (LHR 2015)**

**Ans:** Page no 128.

**Q.20 What are the steps of tissue culture technique? (A.B) (DGK 2015)**

**Ans: TISSUE CULTURE TECHNIQUE**

The steps involved in tissue culture technique are as follows:

- Tissues are taken from any part of plant and put in a suitable nutrient medium.
- The tissue cells start mitosis and produce masses of cells called calluses are transferred to other medium that contain different hormones for the formation of root, stem and leaves. Calluses make these structures and grow into new small plants.
- The small plants are then planted in pots and then in field.

**14.1, 14.2 MULTIPLE CHOICE QUESTIONS**

1. All of the following characters are essential for the life of an individual, except; (U.B)
 

(A) Respiration	(B) Metabolism
(C) Homeostasis	(D) Reproduction
2. All of the following characteristics can be performed by non-living things, except; (U.B)
 

(A) Movement	(B) Co-ordination
(C) Reproduction	(D) Breakdown of C-H bond
3. Which of the following is an attribute relates to asexual reproduction? (U.B)
 

(A) Involves fusion of gametes	(B) Produce genetically identical off springs
(C) Meiosis occurs	(D) Bi-parental generation
4. All of the following events are similar in mitosis and binary fission, except; (U.B)
 

(A) Replication of DNA	(B) Division of cytoplasm
(C) Formation of spindle fibers	(D) Produces Genetically identical individuals
5. The simple and common method of asexual reproduction is: (U.B) (LHR 2016)
 

(A) Budding	(B) Regeneration
(C) Multiple fission	(D) Binary fission
6. Reproduction is essential for the survival of: (U.B)
 

(A) Species	(B) Individual
(C) Organism	(D) human
7. Which of the following is a prokaryote passing through Binary fission? (U.B)
 

(A) Amoeba	(B) Planaria
(C) Bacteria	(D) All of these
8. Simple cell division that produces an exact duplicate of an organism is: (K.B)
 

(A) Asexual reproduction	(B) Sexual reproduction
(C) Photosynthesis	(D) Respiration
9. Mark the exact sequence of the underground stem of vegetative propagation in onion, ginger, Potato and garlic: (U.B)
 

(A) Bulb, stem tuber, rhizome, corm	(B) Bulb, rhizome, stem tuber, corm
(C) Stem tuber, bulb, rhizome, corm	(D) None of these
10. Method of asexual reproduction found in Amoeba is: (K.B) (LHR 2013)
 

(A) Binary fission	(B) Fragmentation
(C) Budding	(D) Spore formation
11. Multiple fission occurs in: (K.B)
 

(A) Planarian	(B) Yeast
(C) Amoeba	(D) Hydra
12. Binary fission means division into: (K.B)
 

(A) Two	(B) Three
(C) Four	(D) Five
13. The type of division in which Amoeba nucleus divides to form many nuclei: (K.B)
 

(A) Binary fission	(B) Multiple fission
(C) Fragmentation	(D) Budding

- 14. Breaking of an organism's body into many pieces: (K.B)**  
 (A) Binary fission (B) Multiple fission  
 (C) Fragmentation (D) Budding
- 15. An outgrowth on the body of an organism: (K.B)**  
 (A) Fragment (B) Bud  
 (C) Fission (D) Spore
- 16. Asexual reproduction in yeast take place by: (K.B) (LHR 2017)**  
 (A) Binary fission (B) Multiple fission  
 (C) Fragmentation (D) Budding
- 17. Which animal reproduces by budding? (K.B)**  
 (A) Planaria (B) Bacteria  
 (C) Hydra (D) Buffalo
- 18. The animals in which the bud does not detaches from the parent body: (K.B)**  
 (A) Hydra (B) Goat  
 (C) Planaria (D) Coral
- 19. All o the following are animals reproduce by Budding, except; (K.B)**  
 (A) Yeast (B) Hydra  
 (C) Sponges (D) Corals
- 20. Spore formation takes place in: (K.B) (DGK 2014, LHR 2015)**  
 (A) Yeast (B) Rhizopus  
 (C) Onion (D) Potato
- 21. Spores are produced in: (K.B)**  
 (A) Sporangiphore (B) Stolon  
 (C) Rhizoids (D) Sporangia
- 22. Spores are enclosed in thick walled structure called: (K.B)**  
 (A) Bulb (B) Corm  
 (C) Cyst (D) Hyphae
- 23. Which of the following structure can survive under unfavorable conditions? (K.B)**  
 (A) Cyst (B) Exospore  
 (C) Endospore (D) All of these
- 24. Form of asexual reproduction in which unfertilized egg develops into new offspring: (K.B)**  
 (A) Multiple fission (B) Budding  
 (C) Parthenogenesis (D) Cloning

25. Tulips reproduce by the formation of: (K.B) (SWL 2014)  
(A) Rhizomes (B) Corms  
(C) Bulbs (D) Suckers
26. Dasheen and garlic reproduce by the formation of: (K.B)  
(A) Rhizomes (B) Corms  
(C) Bulbs (D) Suckers
27. Which plant is not found in the form of underground bulb? (U.B) (GRW 2013)  
(A) Garlic (B) Tulip  
(C) Onion (D) Lily
28. Vegetative propagation through suckers: (K.B)  
(A) Ginger (B) Chrysanthemum  
(C) Mint (D) Mint, Ginger
29. An example of rhizome is: (K.B) (LHR 2013)  
(A) Onion (B) Garlic  
(C) Ginger (D) Potato
30. Ginger reproduces by the formation of: (K.B)  
(A) Rhizomes (B) Corms  
(C) Bulbs (D) Suckers
31. Potatoes and yams reproduce by the formation of: (K.B) (BWP 2014)  
(A) Rhizomes (B) Corms  
(C) Bulbs (D) Stem tubers
32. Mint and Chrysanthemum reproduce by the formation of: (K.B)  
(A) Rhizomes (B) Corms  
(C) Bulbs (D) Suckers
33. Vegetative propagation by leaf in: (K.B)  
(A) Chrysanthemum (B) Bryophyllum  
(C) Lilies (D) Tulips
34. Pathar chut is the name of: (K.B)  
(A) Chrysanthemum (B) Bryophyllum  
(C) Rhizopus (D) Clostridium
35. A latest method of vegetative propagation in which identical offspring are produced from a single parent using its vegetative tissue (K.B)  
(A) Tissue culture (B) Cloning  
(C) Callus culture (D) All of these

## 14.3 SEXUAL REPRODUCTION IN PLANTS

### LONG QUESTIONS

**Q.1 Describe sexual reproduction in plants (K.B)**

**Ans:** SEXUAL REPRODUCTION IN PLANTS

**Definition:**

“Sexual reproduction involves the **production of gametes** (sperms and egg cells) and their **fusion** i.e. fertilization”.

**Explanation:**

The gametes are produced in **special structures** in plant body. The **major plant groups** are mosses, ferns and seed plants. The seed plants include **gymnosperms** and **angiosperms** (flowering plants).

**Methods:**

Plant groups use **different methods** for bringing the sperm and egg cell together.

- In mosses and ferns sperms are **motile** and can **swim to egg cells**. Therefore, these plants **require water** (in the form of dew or rain) for sexual reproduction.
- On the other hand, gymnosperms and angiosperms have **special methods** for carrying their **sperms to egg cells**. They **do not need water** for reproduction.

**Q.2 Explain the phenomenon of alternation of generations in plants. (K.B)**

(GRW 2013, 14, MTN 2015)

**Ans:** ALTERNATION OF GENERATIONS

**Definition:**

“The phenomenon in which **two different generations alternate** with each other during **life cycle** is known as alternation of generations”.

In the life cycle of plants, two different generations alternate with each other.

**Sporophyte Generation:**

One generation is **diploid** and produces **spores**. It is called **sporophyte generation**. In most plants, sporophyte generation is **dominant**. It means that it is **big in size** and is **independent**.

**Gametophyte Generation:**

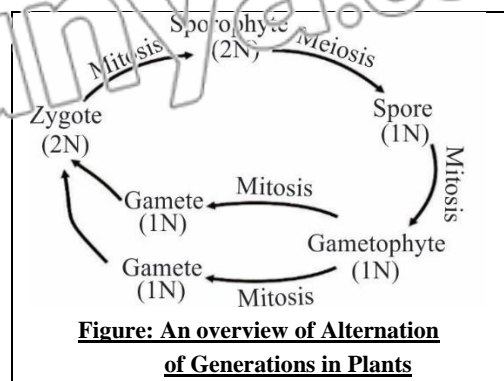
The other generation is **haploid** and produces **gametes**. It is called **gametophyte generation**. It is **small in size** and **depends** upon sporophyte. It produces gametes by mitosis.

**Formation of Gametophyte:**

Sporophyte produces **haploid spores** by **meiosis**. The spores **develop** into **gametophyte**.

**Formation of Sporophyte:**

The male and female **gametes fuse** and form **diploid zygote**. The **zygote** undergoes repeated **mitosis** and **develops** into a new **diploid sporophyte**.



**Figure: An overview of Alternation of Generations in Plants**

**Q.3 Describe structure of flower. (K.B)**

**Ans:**

**STRUCTURE OF FLOWER**

**Definition:**

“The flower is actually a **condensed shoot** with the **nodes** present very **close** to each other”.

In **angiosperms**, parent plant is **diploid sporophyte** generation. **Flower** is the **reproductive** structure in this generation. The flower **components** are arranged in the form of **whorls**. The **outer two whorls** in a flower are the **non-reproductive** whorls while the **inner two whorls** are the **reproductive** whorls.

**Whorl:**

“All the **structures** present at **one node** are collectively called the **whorl**”.

The following **four whorls** are present in the flower:

- Calyx
- Corolla
- Androecium
- Gynoecium

**Calyx:**

- **Calyx** is the **outermost whorl**.
- It usually **green** in colour.
- Its **individual units** (leaflets) are called **sepals**.

**Function:**

Sepals **protect** the **inner whorls** at **bud stage**.

**Corolla:**

- **Corolla** is the **next inner whorl**.
- It is **brightly coloured**.
- Its **individual units** (leaflets) are called **petals**.

**Function:**

They **serve** to **attract** **bees, birds** etc. which are the **agents of pollination**.

**Androecium:**

**Androecium** is the **third whorl** and the **male reproductive part** of flower.

- Its **units** are called **stamens**.
- Each stamen has a **thread-like filament** at the **free end** of which **anther** is attached.
- Anther has **pollen-sacs** in which **haploid microspores** (pollen grains) are **produced** through **meiosis**. Each **microspore** germinates into the **male gametophyte generation**.

**Gynoecium:**

**Fourth whorl** i.e. **gynoecium** is the **female reproductive part** of flower.

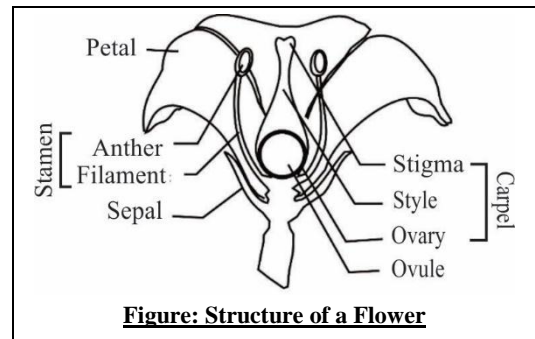
**Carpel:**

Its units are called **carpels** or **pistils**.

**Structure of Carpel:**

Each carpel is made up of:

- **Basal ovary**
- **Middle style**
- **Upper stigma**



**Figure: Structure of a Flower**

**Ovules:**

Inside ovary, there are one to many ovules. Inside each ovule, one haploid microspore is produced through meiosis. Microspore germinates into the female gametophyte generation.

**Q.4** Describe life cycle of a flowering plants. (K.B)

**Ans:** LIFE CYCLE OF A FLOWERING PLANT

**Definition:**

“The flower is actually a condensed shoot with the nodes present very close to each other”.

**Explanation:**

In angiosperms, parent plant is diploid sporophyte generation. Flower is the reproductive structure in this generation. The flower components are arranged in the form of whorls. The outer two whorls in a flower are the non-reproductive whorls while the inner two whorls are the reproductive whorls.

**Whorls:**

“All the structures present at one node are collectively called the whorl”.

The following four whorls are present in the flower:

- Calyx
- Corolla
- Androecium
- Gynoecium

**Calyx:**

- Calyx is the outermost whorl
- It usually green in colour
- Its individual units (leaflets) are called sepals

**Function:**

Sepals protect the inner whorls at bud stage.

**Corolla:**

- Corolla is the next inner whorl
- It is brightly coloured
- Its individual units (leaflets) are called petals

**Function:**

They serve to attract bees, birds etc. which are the agents of pollination.

**Androecium:**

Androecium is the third whorl and the male reproductive part of flower.

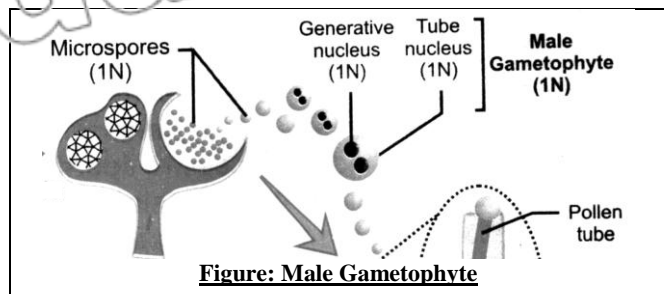
- Its units are called stamens.
- Each stamen has a thread-like filament at the free end of which anther is attached.
- Anther has pollen-sacs in which haploid microspores (pollen grains) are produced through meiosis. Each microspore germinates into the male gametophyte generation.

**Formation of Male Gametophyte:**

The nucleus of microspore undergoes mitosis and produces two nuclei:

- Tube nucleus
- Generative nucleus

The generative nucleus again undergoes mitosis and produces two sperms. So, a germinated microspore has a tube nucleus and two sperms. All these structures are the male gametophyte generation of plant.



**Figure: Male Gametophyte**



**Gynoecium:**

**Fourth whorl** i.e. **gynoecium** is the **female reproductive** part of flower.

**Carpels:**

Its **units** are called **carpels** or **pistils**.

**Structure of Carpel:**

Each carpel is made up of:

- **Basal ovary**
- **Middle style**
- **Upper stigma**

**Ovules:**

Inside ovary, there are one to **many ovules**. Inside each ovule, **one haploid macrospore** is **produced** through **meiosis**. **Macrospore germinates** into the **female gametophyte generation**.

**Formation of Female Gametophyte:**

The **macrospore** undergoes **mitosis** and **produces** an **egg cell** and some **associated structures** e.g. **fusion nucleus**. Egg cell and associated structures are the **female gametophyte generation** of plant.

**Pollination:**

When **pollen grains mature**, they are **transferred** to stigma. It is called **pollination**.

On reaching the stigma, the **tube nucleus** of **pollen grain** constructs a **pollen tube**. The pollen tube **contains** a **tube nucleus** and **two sperms**. The tube **grows** through **style and ovary** and enters ovule. Here, it bursts and releases the sperms. Both sperms enter the female gametophyte.

**Double Fertilization:**

“The process of fertilization **involves two fusions**, it is called double fertilization.”

**Formation of Zygote:**

One sperm fuses with egg and forms a diploid (2N) zygote.

**Formation of Endosperm Nucleus:**

The other sperm fuses with diploid fusion nucleus and forms a triploid (3N) nucleus called endosperm nucleus.

**Developmental Process:**

Zygote develops into embryo and **endosperm nucleus develops into endosperm tissue** (food of the growing embryo). Ovule then becomes seed and ovary changes into fruit.

**Dispersal of Seeds.**

When seeds mature, they are dispersed. If seeds get suitable conditions, their embryos develop into new plants i. e. the diploid sporophytes of the next generation.

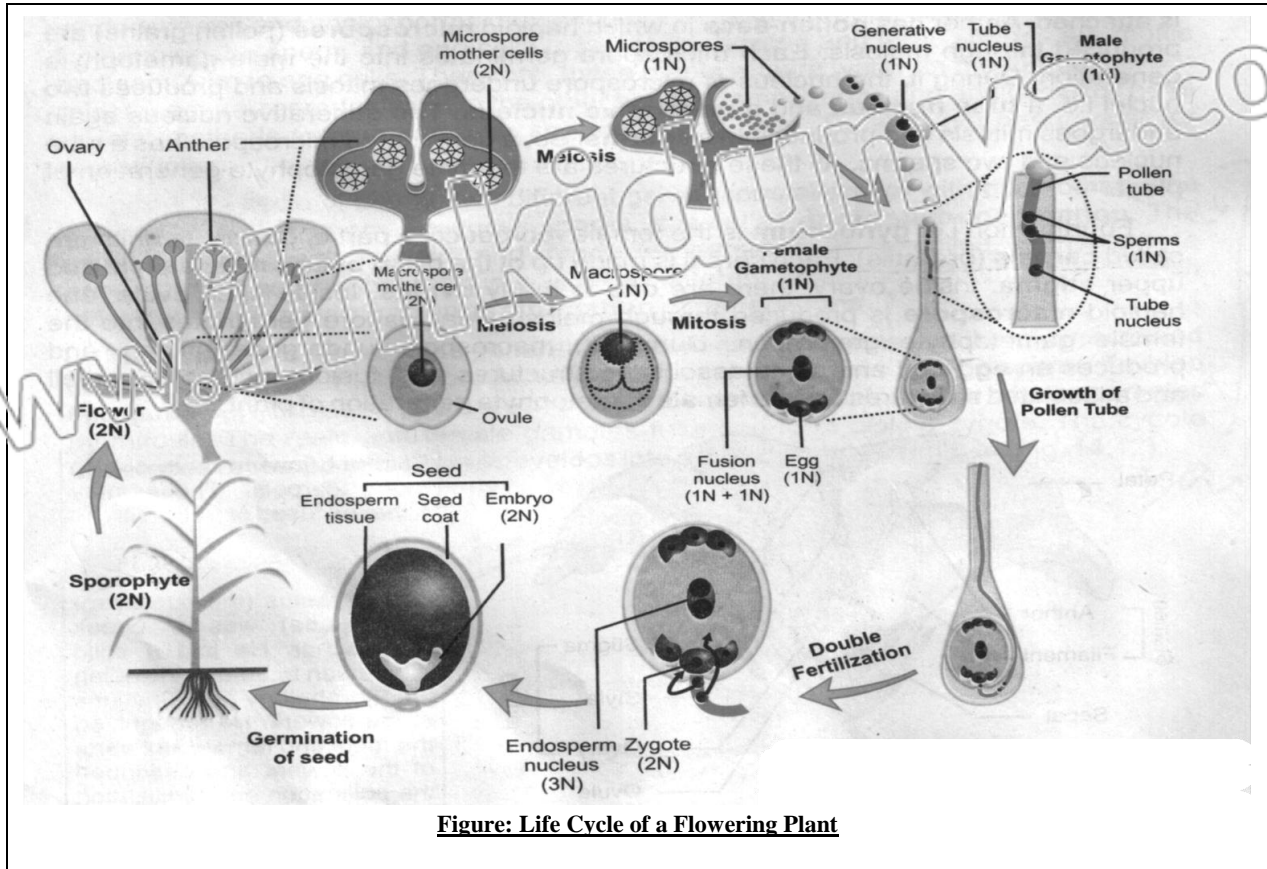


Figure: Life Cycle of a Flowering Plant

Q.5 Define pollination. Explain its types. (K.B)

Ans:

**POLLINATION**

**Definition:**

“The transfer of pollen grains from anther of the stamen (male part of the flower) to stigma of carpel (female part of the flower) is called pollination”.

**Types:**

The following two types of pollination are recognized:

- Self pollination
- Cross pollination

**Self-Pollination:**

The transfer of pollen grains from the anther of stamen to the stigma of the carpel of the **same flower** or **other flower of the same plant** is called self pollination.

**Cross Pollination:**

The transfer of pollen grains from anther of stamen to the stigma of the carpel of one plant to the flower **on other plant of the same species** is called cross pollination.

**Sources of Cross Pollination:**

Cross pollination is brought about by various agencies like:

- Wind
- Water
- Bees
- Birds
- Bats
- Other animals including man

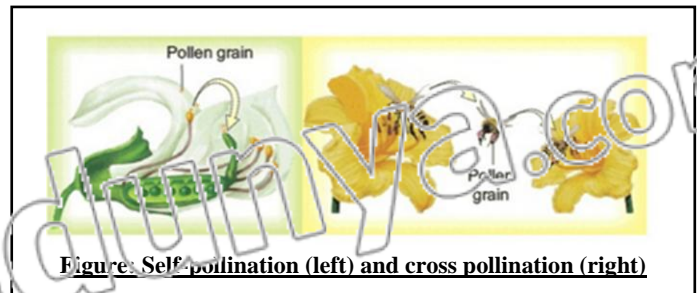


Figure: Self-pollination (left) and cross pollination (right)

Q.6 Discuss the adaptations in insect and wind pollinated flowers. (A.B)

(MTN 2015)

Ans:

**ADAPTATIONS**

The insect pollinated and wind pollinated flowers have structural adaptations that facilitate the transfer of pollen grains between two plants. Some of these adaptations are described here.

Feature	Insect Pollinated Flowers	Wind Pollinated Flowers
Size	Generally large	Generally small
Colour	Petals brightly coloured	Petals green or dull in colour
Nectar	Produce nectar	Do not produce nectar
Flora Arrangement	Flowers face upwards	Flowers hang down for easy shaking
Stamens and Stigmas	Enclosed inside ring of petals	Hang out of ring of petals
Pollen Grains	Small number produced /heavy and sticky	Large number produced / light with smooth surface
Stigma	Pinhead shaped with no branches	Feathery branches for catching pollen
Examples	<ul style="list-style-type: none"> <li>• Buttercup</li> <li>• Rose</li> <li>• Wallflower</li> <li>• Sunflower</li> <li>• Orchid</li> </ul>	<ul style="list-style-type: none"> <li>• Grasses</li> <li>• Hazel</li> <li>• Willow</li> <li>• Corn</li> </ul>

Q.7 Describe the development and structure of seed. (U.B)

(LHR 2017, GRW 2016)

Ans:

**DEVELOPMENT OF SEED**

**Definition:**

“The fertilized ovule is called seed”.

**Explanation:**

After fertilization in the female gametophyte, zygote divides repeatedly by mitosis and develops into an embryo. At this stage (in gymnosperms and angiosperms), **ovule changes into seed**. The formation of seed completes the process of sexual reproduction in seed plants. The form of the stored nutrients in seeds varies depending on the kind of plant.

**STRUCTURE OF SEED**

Angiosperm seeds consist of three distinct parts:

1. The embryo formed from zygote
2. The endosperm tissue formed from endospermic nucleus
3. The seed coat which develops from the wall of ovule called integument

**Seed Coat:**

The other name of seed coat is testa. **Seed coat develops from the integument**, originally surrounding the ovule.

**Thickness:**

It may be a paper-thin layer, for example:

- Peanut

It may be thick and hard, for example

- Coconut

**Function:**

Seed coat protects embryo from mechanical injury and from drying out.

**Hilum:**

There is a scar on seed coat, called hilum. It is where the seed is attached to ovary wall (fruit).

**Micropyle:**

At one end of hilum, there is micropyle. This is the same **opening through which the pollen tube entered** the ovule.

**Function:**

Seed uses it for the absorption of water.

**Embryo:**

Embryo is actually an immature plant. It consists of:

- A Radicle
- A Plumule
- One or two cotyledons (Seed leaves)

**Radicle:**

The radicle of embryo develops into new root.

**Plumule:**

The plumule develops into new shoot.

**Epicotyl:**

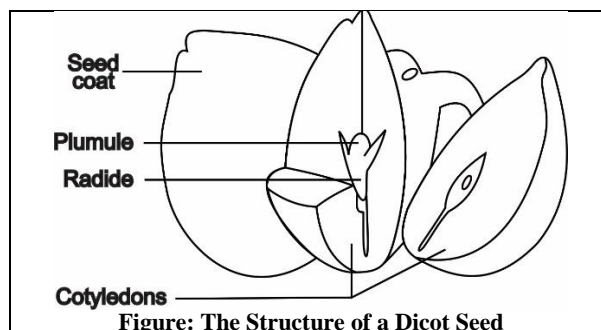
The embryonic stem above the point of attachment of cotyledons is called epicotyl.

**Hypocotyl:**

The embryonic stem **below the point of attachment** of cotyledons is called hypocotyl.

**Endosperm:**

Within seed, there is a store of nutrients for the seedling that will grow from embryo. In angiosperms, the **stored food is derived from the endosperm tissue**. This tissue is rich in oil or starch and protein. In many seeds, the food of the endosperm is absorbed and stored by cotyledons.



Q.8 **Define germination. Explain its types. Write conditions necessary for seed germination. (U.B)**  
(GRW 2015, LHR 2016)

OR

**Explain, how the epigeal and hypogeal germinations are different? (U.B)**

(Understanding the Concept Q.3)

OR

**What conditions are necessary for the germination of seeds? (U.B)**

(Understanding the Concept Q.4)

OR

**Describe the types of seed germination. (K.B)**

Ans:

**GERMINATION OF SEED**

**Definition:**

“The process by which a seed embryo develops into a seedling is called seed germination”.

**Explanation:****Location:**

For the germination of seed, they must arrive at the suitable location and be there at a time favourable for germination and growth.

**Absorption of Water:**

During germination, embryo soaks up water which causes it to swell, splitting the seed coat.

**Formation of Root:**

Root is the first structure that emerges from the radicle present in seed. It grows rapidly and absorbs water and nutrients from soil.

**Formation of Shoot:**

In the next phase, plumule develops into tiny shoot which elongates and comes out of soil.

TYPES OF GERMINATION

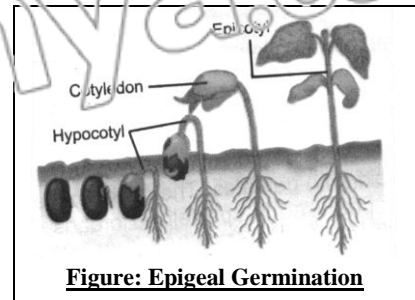
On the basis of the elongation of hypocotyl and epicotyl, there are two types of germination:

- Epigeal Germination
- Hypogeal Germination

Epigeal Germination:

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

- Beans
- Cotton
- Papaya



**Figure: Epigeal Germination**

Hypogeal Germination:

In hypogeal germination, the **epicotyl elongates** and forms the hook. In this type of germination, the cotyledons stay underground. The examples of seeds that germinate this way are:

- Pea
- Maize
- Coconut

CONDITIONS FOR SEED GERMINATION

Seed germination depends on both internal and external conditions.

Internal Conditions:

The internal conditions include:

- A live embryo
- Sufficient food storage

External Conditions:

The most important external conditions include:

- Water
- Oxygen
- Favorable temperature

Water (Moisture):

Seeds of most plants have low water content, and germination cannot occur until seed coat or other tissues have **imbibed (taken in) water**. The absorbed water is used in the digestion of the stored food and it also helps in elongation of hypocotyl and epicotyl.

Oxygen:

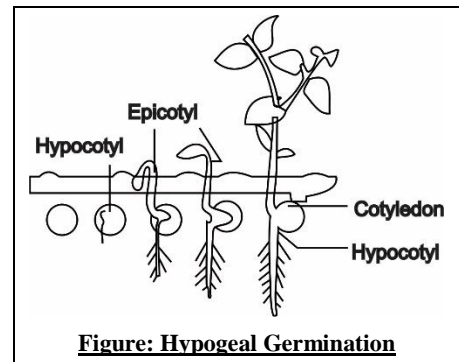
Oxygen is essential for the respiration in the cells of embryo.

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**.

Light:

Germination of seeds of many plants is also favoured by light. In other plants, germination is retarded by light.



**Figure: Hypogeal Germination**

**14.3 SHORT QUESTIONS**

**Q.1** What are the major groups of plants and what are seed plants? (K.B) (LIR 2015)

**Ans:** SEXUAL REPRODUCTION IN PLANTS

**Definition:**

“Sexual reproduction involves the production of gametes (sperms and egg cells) and their fusion i.e. fertilization”.

**Explanation:**

The gametes are produced in special structures in plant body. The major plant groups are mosses, ferns and seed plants. The seed plants include gymnosperms and angiosperms (flowering plants).

**Methods:**

Plant groups use different methods for bringing the sperm and egg cell together.

- In mosses and ferns sperms are motile and can swim to egg cells. Therefore, these plants require water (in the form of dew or rain) for sexual reproduction.
- On the other hand, gymnosperms and angiosperms have special methods for carrying their sperms to egg cells. They do not need water for reproduction.

**Q.2** How many types of seed plants (spermatophytes) are present? (K.B)

**Ans:** There are two types of seed plants based upon the nature of their seed production i.e.

- Gymnosperms (Cones bearing)
- Angiosperms (flowering plants).

**Q.3** How plant groups use different method for bringing the sperm and eggs together? (U.B)

**Ans:** FERTILIZATION IN PLANTS

- In mosses and ferns, sperms are motile and can swim to egg cells. Therefore, these plants required water (in the form of dew as rain) for sexual reproduction.
- On the other hand, the gymnosperms and angiosperms have special method for carrying their sperm to egg cells. They do not need water for reproduction wind and insects are the source.

**Q.4** Enlist the different methods of fertilization in plants. (K.B)

**Ans:** Plant groups use different methods for bringing the sperm and egg cells together.

**Fertilization due to water:**

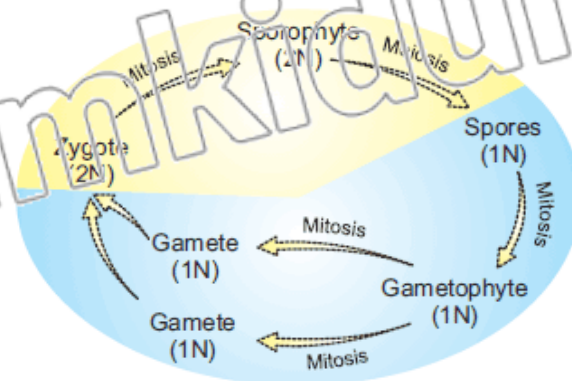
In mosses and ferns sperms are motile and can swim to egg cells. Therefore, these plants require water (in the form of dew or rain) for sexual reproduction.

**Fertilization due to air:**

Gymnosperms and angiosperms have special methods for carrying their sperms to egg cells. They do not need water for reproduction.

**Q.5 What is meant by Alternation of generation in plants. (K.B)**

**Ans:** The phenomenon in which a diploid sporophyte generation alternates with haploid gametophyte generation during life cycle in plants is known as alternation of generations.



**Q.6 What are whorls? (K.B)**

**Ans:** Page no 135.

**Q.7 Define the term calyx and corolla? (K.B)**

(LHR 2015)

**Ans:** Page no 135.

**Q.8 What is the contribution of Theophrastus? (K.B)**

**Ans:** CONTRIBUTION OF THEOPHRASTHUS

Theophrastus (the successor of Aristotle) was a Greek philosopher. He laid a solid foundation of botany including the morphology and functions of the flowers. He recognized the male and female sex parts of the flowers and described the pollination and fertilization in flower.

**Q.9 Define the term double fertilization. (K.B)**

(GRW 2016, 17)

**Ans:** Page no 137.

**Q.10 Define pollination. Write its types? (K.B)**

(SWL 2015)

**Ans:** Page no 138.

**Q.11 Define self-pollination. (K.B)**

OR

**Differentiate between self-pollination and cross pollination (K.B)**

(LHR 2016)

**Ans:** DIFFERENTIATION

The difference between self pollination and cross pollination is as follows:

Self-Pollination	Cross-Pollination
<ul style="list-style-type: none"> <li>It is the transfer of pollen grains from anther to the stigma of the same flower or other of flower of the same plant.</li> </ul>	<ul style="list-style-type: none"> <li>It is the transfer of pollen grains from the flower on one plant to the flower on other plant of the same species. Cross pollination is brought about by various agencies like wind water, bees, birds, bats and other animals including man.</li> </ul>

**Q.12 Define the term parthenocarpy. (K.B)**

**Ans:** PARTHENOCARPY

**Definition:**

“In some plants, ovaries develop into fruit without the fertilization inside the ovary. This process is known as parthenocarpy and it results in seedless fruits”.

- Bananas
- Seedless varieties of grapes

**Q.13 What are the parts of angiospermic seed? (K.B)**

**Ans:** Page no 139.

**Q.14 What is a seed coat or testa? (K.B)**

**Ans:** Page no 139.

**Q.15 Write the functions of radical and plumule. (A.B)**

**Ans:** Page no 140.

**Q.16 Define the term epicotyl and hypocotyls. (K.B)**

**Ans:** Page no 140.

**Q.17 Define seed dormancy. (U.E)**

**OR**

**What is the dormancy? (U.B)**

**(LHR 2016, GRW 2017)**

**Ans:** ANGIOSPERMIC SEED

Angiosperm seeds consist of three distinct parts:

- a. The embryo formed from zygote.
- b. The endosperm tissue formed from endosperm nucleus.
- c. The seed coat which develops from the wall of ovule (integument).

**Q.18 What is epigeal germination? Give examples. (K.B)(LHR 2017, GRW 2016, 17, MTN 2015)**

**Ans:** Page no 141.

**Q.19 What is hypogeal germination? Give examples. (K.B) (MTN 2015, GRW 2016, LHR 2017)**

**Ans:** Page no 141.

**Q.20 What is the future of ovule and ovary after fertilization in flower? (K.B)**

**Ans:** Page no 141.

**Q.21 Write importance of seed evolution in plants life. (A.B)**

**Ans:** Page no 141.

### **14.3 MULTIPLE CHOICE QUESTIONS**

**1. Fertilization of gametes in water, a characteristic relates to (U.B)**

- |                    |                    |
|--------------------|--------------------|
| (A) Spermatophytes | (B) Gymnosperms    |
| (C) Angiosperms    | (D) Mosses & ferns |

**2. Which of the following generation is dominant in seed producing plants? (U.B)**

- |                         |                         |
|-------------------------|-------------------------|
| (A) Diploid gametophyte | (B) Haploid sporophyte  |
| (C) Diploid sporophyte  | (D) Haploid gametophyte |

**3. Gametes in angiosperms are produced by (K.B)**

- |                   |             |
|-------------------|-------------|
| (A) Mitosis       | (B) Meiosis |
| (C) Fragmentation | (D) Budding |

**4. Major plant groups involve (K.B)**

- |                                  |                  |
|----------------------------------|------------------|
| (A) Ferns                        | (B) Mosses       |
| (C) Seed plants (spermatophytes) | (D) All of these |

**5. Number of major plant groups. (K.B)**

- |       |       |
|-------|-------|
| (A) 1 | (B) 2 |
| (C) 3 | (D) 4 |

**6. Sporophyte generation in plant life cycle: (K.B)**

- |              |                |
|--------------|----------------|
| (A) Haploid  | (B) Diploid    |
| (C) Triploid | (D) Tetraploid |

**7. Gametophyte generation in plant life cycle: (K.B)**

- |              |                |
|--------------|----------------|
| (A) Haploid  | (B) Diploid    |
| (C) Triploid | (D) Tetraploid |



8. **Male and female gametes fuse to form: (K.B)**  
(A) Ovum (B) Zygote  
(C) Embryo (D) Faetus
9. **The male reproductive part of flower is: (K.B)** (MTN 2015)  
(A) Stigma (B) Stamen  
(C) Ovary (D) Carpel
10. **How many floral whorls are present in a complete flower? (K.B)**  
(A) 2 (B) 4  
(C) 6 (D) 8
11. **The outermost whorl flower is called: (K.B)**  
(A) Calyx (B) Androecium  
(C) Gynoecium (D) Corolla
12. **The leaflets of calyx are called: (K.B)**  
(A) Petals (B) Sepals  
(C) Stamens (D) Carpels
13. **The second whorl of flower is called: (K.B)**  
(A) Calyx (B) Androecium  
(C) Gynoecium (D) Corolla
14. **The leaflets of corolla are called: (K.B)**  
(A) Petals (B) Sepals  
(C) Stamens (D) Carpels
15. **The third whorl of flower is called: (K.B)**  
(A) Calyx (B) Androecium  
(C) Gynoecium (D) Corolla
16. **Fourth whorl of flower is: (K.B)** (LHR 2015)  
(A) Calyx (B) Corolla  
(C) Androecium (D) Gynoecium
17. **The units of androecium are called: (K.B)**  
(A) Petals (B) Sepals  
(C) Stamens (D) Carpels
18. **The innermost whorl of flower is called: (K.B)**  
(A) Calyx (B) Androecium  
(C) Gynoecium (D) Corolla
19. **The units of gynoecium are called: (K.B)**  
(A) Petals (B) Sepals  
(C) Stamens (D) Carpels
20. **Is diploid (2N): (U.B)** (BWP 2014)  
(A) Zygote (B) Sperm  
(C) Egg cell (D) Endospore
21. **Stamen consists of: (K.B)**  
(A) Anther (B) Filament  
(C) Anther, Filament (D) Stigma
22. **Carpel consists of: (K.B)**  
(A) Stigma (B) Style  
(C) Ovary (D) Stigma, style, ovary

23. **The egg cell is: (K.B)**  
 (A) Haploid (B) Diploid  
 (C) Triploid (D) Tetraploid
24. **The sperm is: (K.B)**  
 (A) Haploid (B) Diploid  
 (C) Triploid (D) Tetraploid
25. **Pollen grains are produced in anther of flower by \_\_\_\_\_ . (K.B) (LHR 2014)**  
 (A) Meiosis (B) Mitosis  
 (C) Binary fission (D) Multiple fission
26. **The endosperm is: (K.B)**  
 (A) Haploid (B) Diploid  
 (C) Triploid (D) Tetraploid
27. **Which structure is present inside the ovary of the carpel? (K.B)**  
 (A) Anther (B) Style  
 (C) Stigma (D) Ovule
28. **The ovule develops into: (K.B)**  
 (A) Seed (B) Fruit  
 (C) Flower (D) Sporophyte
29. **The wall of ovary develops into: (K.B)**  
 (A) Seed coat (B) Fruit  
 (C) Flower (D) Stem
30. **Pollination means transfer of pollen grain from anther to \_\_\_\_\_ . (K.B) (GRW 2013)**  
 (A) Style (B) Stigma  
 (C) Filament (D) Ovary
31. **The fusion nucleus is: (K.B)**  
 (A) Haploid (B) Diploid  
 (C) Triploid (D) Tetraploid
32. **The flowers producing nectar are pollinated by: (K.B)**  
 (A) Wind (B) Water  
 (C) Insects (D) None of these
33. **How many distinct parts are present in an angiosperm seed? (K.B)**  
 (A) 7 (B) 5  
 (C) 3 (D) 11
34. **Point of attachment of seed with the ovary wall: (K.B)**  
 (A) Seed coat (B) Epicotyl  
 (C) Hypocotyl (D) Hilum
35. **Microspore of plant is also termed as: (K.B)**  
 (A) Pollen grain (B) Pollen tube  
 (C) Germ nucleus (D) Mega spore
36. **Which of the following is an example of epigeal germination. (K.B)**  
 (A) Beans (B) Cotton  
 (C) Papaya (D) All of these
37. **A type of germination, the epicotyl elongates and forms the hook, called (K.B)**  
 (A) Epigeal germination (B) Hypogeal germination  
 (C) Both A&B (D) Dormancy
38. **A period in seed of no growth is called (K.B)**  
 (A) Dormancy (B) Dominancy  
 (C) Germination (D) Fertilization

39. Seed absorbs water through: (K.B) (LHR 2017)  
 (A) Testa (B) Hilum  
 (C) Micropyle (D) Cornea
40. The root is formed the part of the embryo: (K.B) (GRW 2017)  
 (A) Hilum (B) Radical  
 (C) Plumule (D) Epicotyl
41. There is a scar on seed coat under the seed is attached to ovary wall is called: (K.B)(GRW 2016)  
 (A) Radical (B) Hilum  
 (C) Plumule (D) Apcotyl
42. Is not a part of carpel: (K.B) (LHR 2016)  
 (A) Ovary (B) Anther  
 (C) Sigma (D) Style
43. Calyx is the outermost whorl of the flower bears the colour: (U.B) (LHR 2016)  
 (A) Red (B) Green  
 (C) Blue (D) White
44. Ovary is ripened into: (K.B) (LHR 2016)  
 (A) Seed (B) flower  
 (C) Fruit (D) Sweetness
45. In some plants, ovaries develop into fruits without the fertilization inside their ovules. (K.B)  
 (A) Lemon (B) Oranges  
 (C) Bananas (D) Peach
46. The embryonic stem above the point of attachment of cotyledon's is called: (K.B)  
 (A) Hypocotyls (B) Epicotyls  
 (C) Endosperm (D) Radical
47. The plant in which vegetative propagation occurs by leaves is: (K.B)  
 (A) Garlic (B) Ginger  
 (C) Potato (D) Bryophyllum

## 14.4 SEXUAL REPRODUCTION IN ANIMALS

### LONG QUESTIONS

- Q.1 Write a note on gametogenesis in animals. (K.B) (GRW 2013, 2015)  
 OR

Describe the processes of spermatogenesis and oogenesis. (K.B)

(Understanding the Concept Q.7)

Ans:

#### GAMETOGENESIS

##### Definition:

"The formation of gametes is called gametogenesis".

In this process, diploid (2N) **gamete-mother cells** undergo meiosis and form haploid (1N) gametes.

##### Gonads:

"The **male gametes** (sperms) and **female gametes** (egg cells or ova) are produced in specialized organs called **gonads**".

- Male gonads are called testes. The singular of testes is testis.
- Female gonads are called ovaries.

##### Spermatogenesis:

"The process of **production of sperms in testes** is called spermatogenesis".

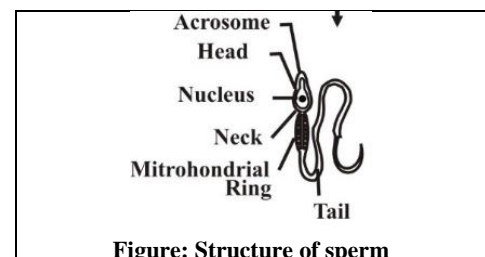


Figure: Structure of sperm

**Spermatogonia:**

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

**Primary Spermatocyte:**

Some spermatogonia produce **primary spermatocytes**

**Secondary Spermatocyte:**

Each primary spermatocyte undergoes meiosis-I and produces two haploid daughter cells called secondary spermatocytes.

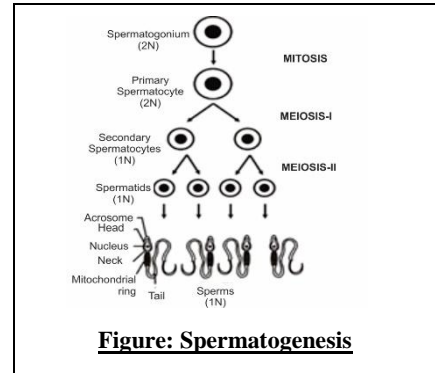
**Spermatids:**

These cells undergo meiosis-II. In this way four haploid spermatids are produced from each primary spermatocyte. The **spermatids are non-motile** and many changes occur in them to **convert them into motile** cells.

**Sperms:**

Nuclei of spermatids shrink and the following structures are formed:

- A corner called acrosome
- A tail
- A mitochondrial ring



**Figure: Spermatogenesis**

After these changes, the spermatids are called sperms.

**Oogenesis:**

“The process of production of egg cells in ovaries is called oogenesis”.

**Explanation:**

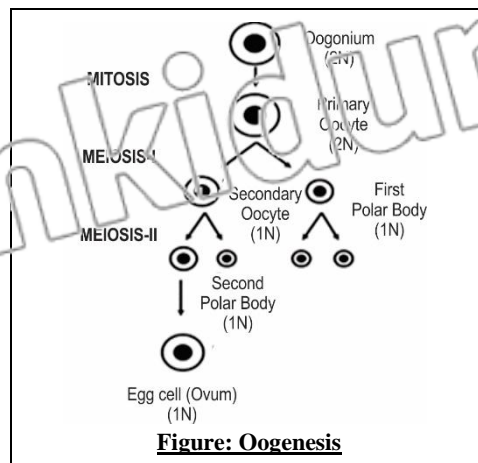
Some cells of ovary prepare structures called **follicles**, in which many diploid **oogonia** are present. Some oogonia produce diploid **primary oocytes**.

**Meiosis-I:**

One of the primary oocytes completes meiosis-I and produces two haploid cells. The smaller cell is called first **polar body** and the larger one is called secondary oocyte.

**Meiosis-II:**

The secondary oocyte completes meiosis-II and produces two haploid cells i.e. a second polar body and an egg cell.



**Figure: Oogenesis**

Q.2 Define fertilization. Explain its mechanism. (K.B)

(SWL 2015)

OR

What do you know about external and internal fertilization (U.B)

(GRW 2017)

Ans:

**FERTILIZATION**

**Definition:**

“The fusion of male gamete (sperm) and female gamete (egg or ovum) to form diploid zygote is called fertilization”.

After the formation of gametes, fertilization occurs.

**Mechanism of Fertilization:**

There are two mechanisms by which fertilization can take place:

- External Fertilization
- Internal Fertilization

**External Fertilization:**

In external fertilization, egg cells are **fertilized outside of body**. External fertilization occurs mostly in aquatic environment.

**Release of Gametes:**

It requires both the male and the female animals to **release their gametes into their surroundings at almost the same time**. For external fertilization, the animals have to release great number of gametes.

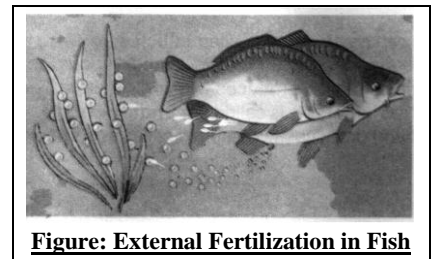
**Disadvantage:**

In external fertilization, there is **risk of loss of gametes** due to environmental hazards such as predators.

**Examples:**

External fertilization occurs in many invertebrates and the first two groups of vertebrates:

- Fishes
- Amphibians



**Figure: External Fertilization in Fish**

**Internal Fertilization:**

(DGK 2015)

In internal fertilization, egg cells are **fertilized within the reproductive tract of female**. Such animals provide protection to the developing embryo.

**Examples:**

It occurs in:

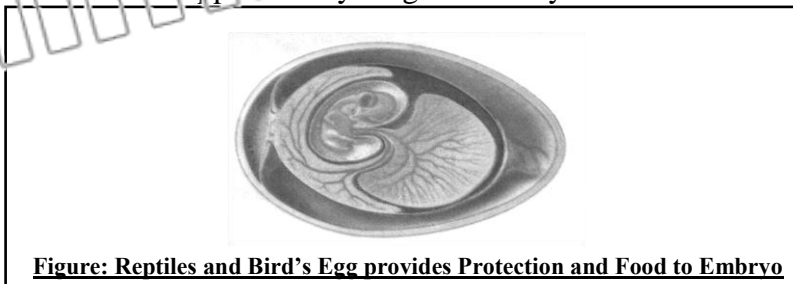
- Reptiles
- Birds
- Mammals

**In Reptiles and Birds:**

After fertilization, reptiles and birds make protective shells around their egg cells and then lay them. The shell is resistant to water loss and damage.

**In Mammals:**

In mammals (with the exception of egg-laying mammals) the development of **fertilized egg** into new baby takes place **within mother body**. In this case, there is extra protection to the embryo and mother also supplies everything that embryo needs.



**Figure: Reptiles and Bird's Egg provides Protection and Food to Embryo**

**Q.3 Describe male reproductive system of rabbit. (K.B)**

**OR**

**Describe female reproductive system of rabbit. (K.B)(LHR 2015, GPW 2014, 2015, 3 WP 2015)**

**OR**

**Write a note on the male and female reproductive systems of rabbit (K.B)**

**(Understanding the Concept Q.6)**

**Ans: MALE REPRODUCTIVE SYSTEM OF RABBIT**

**Introduction:**

Rabbits are small mammals found in several parts of the world. They are used in research as experimental animals

**Parts:**

The male reproductive system of rabbit consists of:

- A pair of testes that produce sperms
- The associated ducts that transport sperms to external genitalia and glands that add secretions to sperms

Rabbits reingest their own pallet-like faeces to digest their food further and extract sufficient nutrients.

**Scrotum:**

Testes are located in a bag of skin called the scrotum that hangs below the body.

**Seminiferous Tubules:**

Each testis consists of a **mass of coiled tubes** called the **seminiferous tubules**. In these tubules, the **sperms are formed**.

**Epididimis:**

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

**Vas Deferens:**

From epididimis, sperms move to a **sperm duct** called **vas deferens**.

**Sperm Duct:**

Both **sperm ducts** join urethra just below urinary bladder.

**Urethra:**

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**.

**Associated Glands:**

As the sperms pass down the ducts from testes to urethra the **associated glands** add various secretions

**Seminal Vesicles:**

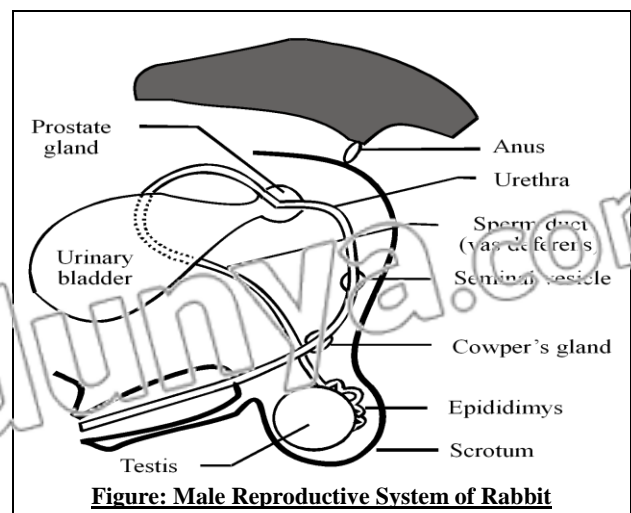
**Seminal vesicles** produce secretions that provide **nutrients for sperms**.

**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**.



**Figure: Male Reproductive System of Rabbit**

FEMALE REPRODUCTIVE SYSTEM OF RABBITIntroduction:

Rabbits are **small mammals** found in several parts of the world. They are used in research as experimental animals.

Parts:

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**.

Follicles:

A **cluster of specialized cells** called **follicle** surrounds and **nourishes** each egg cell. From ovaries, egg cells are released in **fallopian tubes**.

Fallopian Tube:

The **opening** of fallopian tube lies close to ovary. **Fertilization** occurs in **fallopian tubes**.

Uterus:

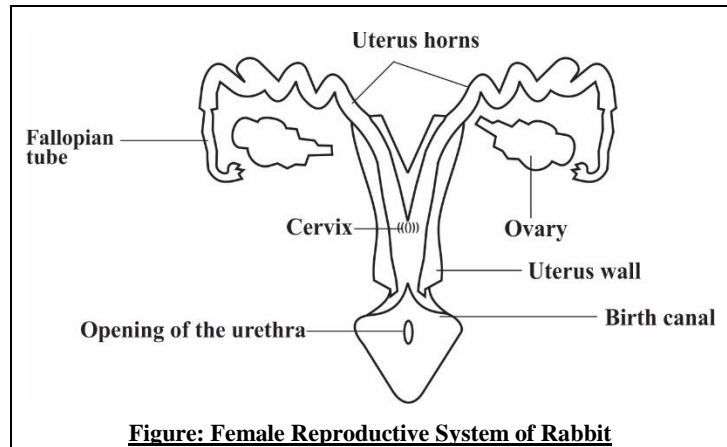
The **fertilized egg** (zygote) is carried to uterus. The uterus of rabbit is divided into two **separate parts or horns**.

Birth Canal:

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.



**Figure: Female Reproductive System of Rabbit**

**Q.4 Describe fertilization and development in rabbit. (K.B)**

**Ans:**

FERTILIZATION AND DEVELOPMENT IN RABBITDefinition:

“The **fusion of male gamete** (sperm) and **female gamete** (egg or ovum) to **form diploid zygote** is called fertilization”.

After the **formation of gametes**, fertilization occurs.

Mechanism:

Rabbits can **breed throughout** the year but **male rabbits** are commonly **sterile** during the summer months. Male rabbit deposits its **sperms** in the vagina (birth canal) of female.

Sperms swim through **cervix** and uterus to **fallopian tubes** where they **fertilize** the **egg cells**, released from **ovary**.

Embryo Formation:

After fertilization, **zygote** is carried to **uterus**. By this time, the zygote has **started dividing** and is now called **embryo**.

Placenta:

The embryo is **implanted** in **uterus walls**. A connection, called **placenta**, is established between embryo and **uterus wall**.

**Gestation Period:**

Embryo develops into **new offspring** (rabbit kit) in **30-32 days**, after which it is born.

**Q.5 Discuss growth in human population and its consequences. (U.B)**

**OR**

**Why do we consider that overpopulation is a global problem? (U.B)**

(Understanding the Concept Q.8)

**Ans:**

**GROWTH IN HUMAN POPULATION****Population Growth:**

Pakistan's population in the year 2014-2015 was 189,000,000. By the end of this **decade**, our population is **expected to exceed 200 million**. Pakistan's population had a **relatively high** growth rate in past.

**Overpopulation:**

When population **growth exceeds** the carrying capacity of an area or **environment**, it results in **overpopulation**.

**CONSEQUENCES OF OVERPOPULATION**

Many **problems are associated** with human overpopulation are as follows:

**Shortage of Resources:**

The overpopulated areas **face severe shortage of fresh water and natural resources**.

**Loss of Ecosystems:**

Overpopulation results in **deforestation and loss of ecosystems**.

**Pollution:**

It leads to **more pollution and global warming**.

**Mortality Rate:**

There is high infant and **child mortality rate in overpopulated** areas due to poverty.

**Increased Demands:**

Overpopulation raises demands for more:

- **Housing units**
- **Hospitals**
- **Jobs**
- **Educational institutions**
- **Food crops**

**Control of Overpopulation:**

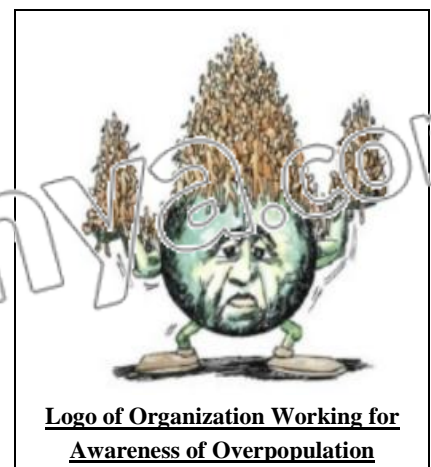
The overpopulation should be **checked** otherwise we will have to **face huge problems** because of our **limited resources**.

**Education:**

People should be educated about the problems of overpopulation.

**Role of Ministry of Population Welfare:**

Pakistan's Ministry of Population Welfare has taken a number of steps to make people **aware** of the **hazards of overpopulation** and to **stabilize the population** to match our resource:





Q.6 Write a note on AIDS. (K.B)

(BWP 2015, LHR 2016)

Ans:

AIDS

Sexually Transmitted Diseases (STDs):

“The diseases that are transmitted through sexual act are called sexually transmitted diseases”.

- The most serious and challenging health problem faced by the world today is AIDS.
- It is also a sexually transmitted disease.

Causative Agent:

It is caused by **Human Immune Deficiency Virus (HIV)**

Mode of Action:

The virus destroys **white blood cells**, which results in loss of **resistance against infections**.

Fatal Disease:

It is a **fatal disease**.

Spread of Disease:

It spreads through **transfer of body fluids** such as **blood and semen**.

Causes:

The main causes are:

- **Unprotected sexual activities**
- **Use of infected needles**
- **Transfusion of infected blood**

According to the United Nations Programme on AIDS i.e. UNAIDS estimates, some 70,000 to 80,000 persons, or 0.1 percent of the adult population in Pakistan, are infected with HIV.

Q.7 Describe the role of national AIDS control programme (NACP) and NGOs. (A.B)

Ans:

ROLE OF (NACP)

Introduction:

**Pakistan's Federal Ministry of Health** established NACP in **1987**.

Objective:

The **main objective** of this program is to **help the public** for the **prevention of HIV** transmission, **safe blood transfusions** and **reduction of STDs**.

Risk Factors:

The **frequency of HIV** infection in Pakistan is **still low**. But, the country is at risk of epidemic due to various **risk factors**:

- **Exposure to infected blood or blood products**
- **Homo-sexuality**
- **Injecting drug users**

Campaign:

For improved prevention by the general public, the **NACP** started services through **TV** and **radio channels** and **print media** in **2005**. The objectives of this activity were to:

- **Change public attitude** for safe sexual activities
- Create **demand for information on HIV and AIDS**
- Improve attitudes and behavior among healthcare workers

ROLE OF NON-GOVERNMENT ORGANIZATIONS

According to the latest data by the **World Bank**, at least **54 NGOs** are working in Pakistan for **HIV/AIDS** public awareness and for the care and support of persons living with **HIV/AIDS**.

- These **NGOs** also work on **AIDS education** and **prevention for sex workers** and other **high-risk groups**.
- **NGOs** serve as members of the provincial consortium on HIV/AIDS, which has been set up in all the provinces of Pakistan.

Limitation of NGOs:

Although **NGOs** are very busy in HIV/AIDS prevention activities, it is believed that they are reaching less than **5 percent** of the **vulnerable population**.

**14.4 SHORT QUESTIONS**

**Q.1 Define the term gametogenesis. (K.B)**

**Ans:** Page no 147.

**Q.2 What are gonads? (K.B)**

**Ans:** Page no 147.

**Q.3 Define the term spermatogenesis and oogenesis. (K.B)**

**OR**

**Differentiation between spermatogenesis and oogenesis. (K.B) (LHR 2017, GRW 2016,17)**

**Ans:** Page no 148.

**Q.4 What is semen? (K.B)**

**Ans:** Page no 150.

**Q.5 What are three associated glands in male reproductive system of rabbit? (K.B)**

**Ans:** Page no 150.

**Q.6 Define the terms embryo and placenta. (K.B)**

**Ans:** Page no 151.

**Q.7 Define the term STD. (K.B)**

**Ans:** Page no 153.

**Q.8 What is AIDS? (K.B)**

**(LHR 2013)**

**Ans:** Page no 153.

**Q.9 What is UNFPA? (K.B)**

**Ans:**

**UNFPA**

UNFPA (United Nations Population Fund) began operation in 1969. It is largest international organization funding for population and health programmes. The UNFPA works in over 140 countries, for awareness about the consequences of over population.

**Q.10 Write the number of drug addicts in Pakistan currently. (K.B)**

**Ans:** **NUMBER OF DRUG ADDICTS IN PAKISTAN**

The number of drug addicts in Pakistan is currently estimated to be about 500,000, of whom 60,000 inject drugs.

**14.4 MULTIPLE CHOICE QUESTIONS**

**1. Formation of gametes is called: (K.B)**

**(BWP 2014)**

(A) Spermatogenesis

(B) Oogenesis

(C) Gametogenesis

(D) Sporogenesis

**2. Sperm consists of: (K.B)**

(A) Mitochondrial ring

(B) Acrosome

(C) Tail

(D) Mitochondrial ring, Acrosome and a Tail

**3. The spermatids develop into: (K.B)**

(A) Primary spermatocytes

(B) Secondary spermatocytes

(C) Spermatogonia

(D) Sperms

**4. Oogonia are produced in: (K.B)**

(A) Testes

(B) Follicles

(C) Polar bodies

(D) Tube nucleus

**5. The process after gamete formation: (U.B)**

(A) Fertilization

(B) Development

(C) Growth

(D) Birth

6. **Testes are present in a bag of skin called: (K.B)**  
 (A) Semen (B) Prostate  
 (C) Vesicle (D) Scrotum
7. **Which produce the secretion that neutralizes the acidity of the semen? (K.B)**  
 (A) Cowper's gland (B) Seminal vesicle  
 (C) Prostate gland (D) Epididimys
8. **The sperm duct is called: (K.B)**  
 (A) Vas deferens (B) Seminal vesicle  
 (C) Prostate gland (D) Epididimys
9. **In which of the following animals groups, external fertilization takes place: (K.B)(LHR 2014)**  
 (A) Reptiles (B) Amphibians  
 (C) Birds (D) Mammals
10. **Normally external fertilization occurs in: (U.B) (LHR 2015)**  
 (A) In the body (B) Air  
 (C) Water (D) Air, Water, In the body.
11. **Internal fertilization occurs in: (U.B)**  
 (A) Uterus (B) Fallopian tube  
 (C) Vagina (D) Cervix
12. **After fertilization the zygote is carried to: (K.B)**  
 (A) Uterus (B) Fallopian tube  
 (C) Vagina (D) Cervix
13. **Gestation period of rabbits: (K.B)**  
 (A) 20-30 days (B) 25-30 days  
 (C) 20-35 days (D) 30-32 days
14. **The UNFPA works in how many countries? (A.B)**  
 (A) 110 (B) 120  
 (C) 130 (D) 140
15. **The number of drug addicts in Pakistan is currently estimated to be about 500,000 of whom \_\_\_\_\_ in inject drugs. (A.B)**  
 (A) 50,000 (B) 30,000  
 (C) 60,000 (D) 45,000
16. **In animals process reproduction without fertilization is called: (K.B) (GRW 2016)**  
 (A) Parthenocaryp (B) Parthenogenesis  
 (C) Tissue culture (D) Fission
17. **The material combining sperms in a fluid is called: (K.B) (GRW 2017)**

- (A) Vas deferens (B) Uterus  
(C) Cervix (D) Semens
18. According to united nations program on AIDS, UNAIDS estimates \_\_\_\_\_ % of the adult population in Pakistan are infected with HIV: (A,B)
- (A) 0.3 % (E) 0.1 %  
(C) 0.2 % (D) 0.4 %
19. Pakistan population, by the end of this decade is expected to exceed: (U,B)
- (A) 170 million (B) 175 million  
(C) 176 million (D) 200 million
20. Each testis consists of a mass of coiled tubes called: (K,B)
- (A) Epidermis (B) Collecting duet  
(C) Seminiferous tubules (D) Urethra
21. In external fertilization, there is risk of loss of gametes due to environmental hazards such as: (K,B)
- (A) Prey (B) Predator  
(C) Consumers (D) Epiphytes
22. Sperms and fluid collectively called: (K,B) (LHR 2014)
- (A) Hormones (B) Follicle  
(C) Semen (D) Scrotum
23. Some cells present in the walls of the seminiferous tubules of testes divide repeatedly by mitosis to form large number of diploid: (K,B)
- (A) Primary spermatocytes (B) Secondary spermatocytes  
(C) Spermatogonia (D) Sperms
24. The male and females gametes (sperm, egg cells) are produced in specialized organs called: (K,B)
- (A) Oogonia (B) Spermatogonia  
(C) Gonads (D) Polar body
25. Semen in rabbit contains \_\_\_\_\_ sperms: (K,B) (LHR 2015)
- (A) 5% (E) 10%  
(C) 90% (D) 50%
26. \_\_\_\_\_ is essential for the respiration in the cells of embryo. (K,B)
- (A) Nitrogen (B) Carbon  
(C) Oxygen (D) Sulphur

**ANSWER KEY**

**MULTIPLE CHOICE QUESTIONS**

**14.1 REPRODUCTION**

**14.2 METHODS OF ASEXUAL REPRODUCTION**

1	D	2	C	3	B	4	C	5	D	6	A
7	C	8	A	9	B	10	A	11	C	12	A
13	B	14	C	15	B	16	D	17	C	18	D
19	C	20	B	21	D	22	C	23	A	24	C
25	C	26	B	27	A	28	B	29	C	30	A
31	D	32	D	33	B	34	B	35	B		

**14.3 SEXUAL REPRODUCTION IN PLANTS**

1	D	2	C	3	B	4	D	5	B	6	B
7	A	8	B	9	B	10	B	11	A	12	B
13	D	14	A	15	B	16	B	17	C	18	C
19	D	20	A	21	C	22	D	23	A	24	A
25	A	26	C	27	D	28	A	29	B	30	B
31	B	32	C	33	C	34	D	35	A	36	D
37	B	38	B	39	C	40	B	41	B	42	B
43	B	44	C	45	C	46	B	47	D		

**14.4 SEXUAL REPRODUCTION IN ANIMALS**

1	C	2	D	3	D	4	B	5	A	6	D	7	C
8	A	9	B	10	C	11	B	12	B	13	D	14	D
15	C	16	B	17	D	18	B	19	D	20	C	21	B
22	C	23	C	24	C	25	B	26	C				

## REVIEW QUESTIONS

## MULTIPLE CHOICE QUESTIONS

1. **Growing an entire new plant from part of the original plant is called: (K.B)**
  - (a) Budding
  - (b) Regeneration
  - (c) Fragmentation
  - (d) Vegetative propagation
2. **Rhizopus reproduces asexually by: (K.B)**
  - (a) Binary fission
  - (b) Budding
  - (c) Spore formation
  - (d) Endospore formation
3. **A corm develops into new garlic plant. This is the process of: (U.B)** (GRW 2016)
  - (a) Vegetative propagation
  - (b) Regeneration
  - (c) Meiosis
  - (d) Gametogenesis
4. **Which is not an advantage of grafting? (K.B)**
  - (a) The graft is identical to the parent plant
  - (b) Grafting allows the propagation of seedless fruits
  - (c) The graft combines the characteristics of two plants
  - (d) Grafting may allow for the faster production of desirable fruits
5. **Pollination is the transfer of pollens from: (K.B)**
  - (a) Anther to stigma
  - (b) Stigma to anther
  - (c) Sepal to petal
  - (d) Petal to sepal
6. **Double fertilization in plants means: (K.B)**
  - (a) Fusion of two sperms with two egg cells
  - (b) Fusion of one sperm with egg cell and other sperm with fusion nucleus
  - (c) Fusion of two sperms with a single egg cell
  - (d) Fusion of tube nucleus with fusion nucleus and sperm with egg cell
7. **After fertilization in plants, the fruit develops from: (K.B)**
  - (a) Ovule wall
  - (b) Ovary wall
  - (c) Petals
  - (d) Anther
8. **Which part of the female reproductive system receives egg cells from the ovary? (K.B)**
  - (a) Fallopian tube
  - (b) Uterus
  - (c) Vagina
  - (d) Cervix
9. **Inside testes, the sperms are produced in: (K.B)**
  - (a) Vas deferens
  - (b) Sperm duct
  - (c) Seminiferous tubules
  - (d) Collecting ducts
10. **Which of these cells has haploid number of chromosomes? (K.B)**
  - (a) Spermatogonia
  - (b) Primary spermatocyte
  - (c) Secondary spermatocyte
  - (d) All of these

## ANSWER KEY

1	d	2	c	3	a	4	a	5	a
6	b	7	b	8	a	9	c	10	c

**SHORT QUESTIONS**

1. How are the natural and artificial vegetative propagations different from the methods of asexual reproduction in plants? (U.B)

Ans: NATURAL AND ARTIFICIAL VEGETATIVE PROPAGATIONS

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. It occurs naturally, and can also be brought about artificially.

2. Why do gardeners use the methods of cutting and grafting? (K.B)

Ans: METHODS OF CUTTING AND GRAFTING

Gardeners use the methods of cutting of grafting because of the following reasons:

- To produced many plants from single plant.
- To get desirable traits.
- To get more fruits and flowers.

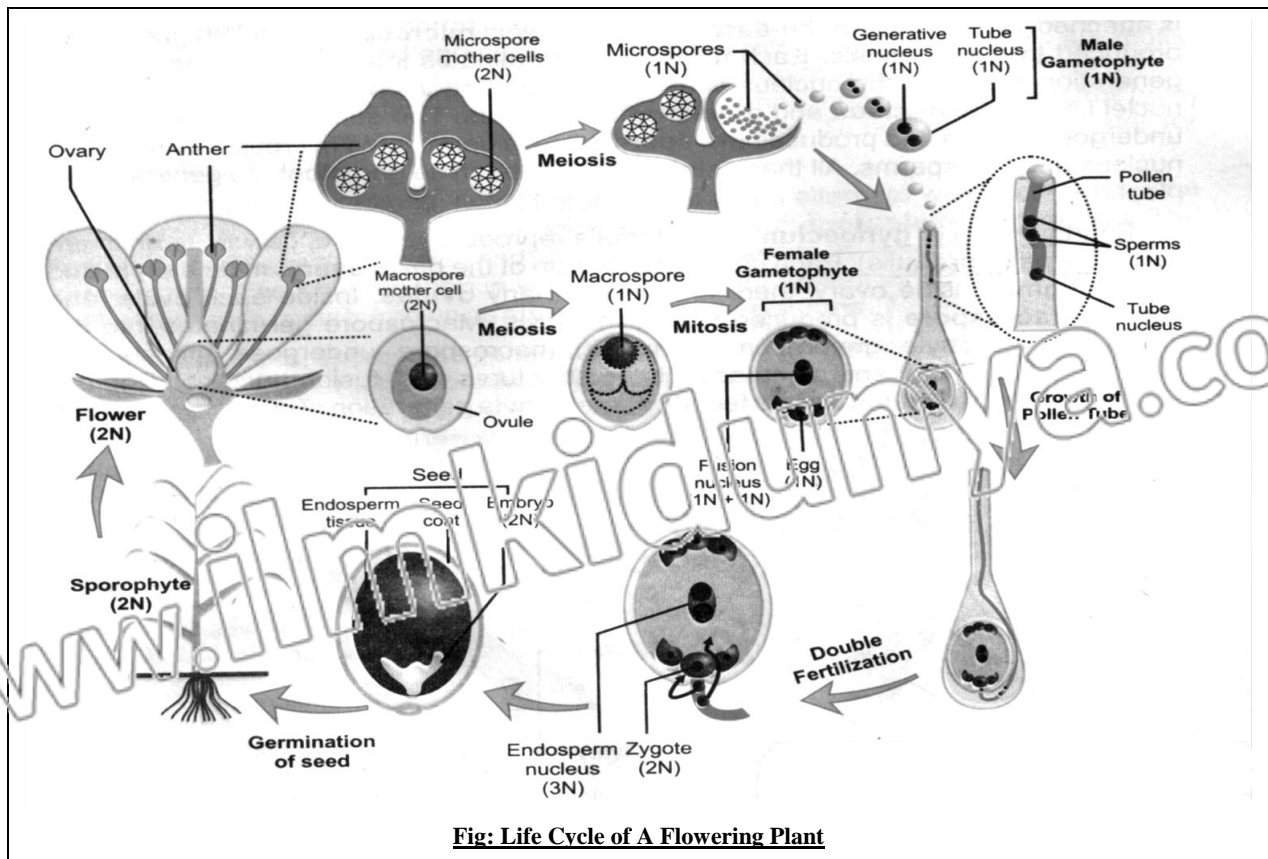
3. "Parthenogenesis is a type of asexual reproduction". Give comments on this statement. (K.B)

Ans: PARTHENOGENESIS

Parthenogenesis is a type of asexual reproduction because an unfertilized egg develops into new offspring. Some fishes, frogs and insects reproduce by means of parthenogenesis.

4. Outline the life cycle of a flowering plant. (K.B)

Ans: LIFE CYCLE OF A FLOWERING PLANT



**Fig: Life Cycle of A Flowering Plant**

5. What structural adaptations will you find in a wind-pollinated flower? (K.B)

Ans:

**ADAPTATIONS**

The insect pollinated and wind pollinated flowers have structural adaptations that facilitate the transfer of pollen grains between two plants. Some of these adaptations are described here.

Structural Feature	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
Stigma	Feathery branches for catching pollen
Examples	<ul style="list-style-type: none"> <li>• Grasses</li> <li>• Hazel</li> <li>• Willow</li> <li>• Corn</li> </ul>

6. Give an introduction of Pakistan's National AIDS Control Program. (K.B)

Ans:

**PAKISTAN'S NATIONAL AIDS CONTROL PROGRAM**

**Introduction:**

Pakistan's Federal Ministry of Health established NACP in 1987.

**Objective:**

The main objective of this program is to help the public for the prevention of HIV transmission, safe blood transfusions and reduction of STDs.

**UNDERSTANDING THE CONCEPT**

1. What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually? (K.B)

Ans: See LQ. 1 (Topic 14.1,14.2)

2. Explain the different parts of the plant that help in natural vegetative propagation. (U.B)

Ans: See LQ.8 (Topic 14.1)

3. Explain, how the epigeal and hypogeal germinations are different? (K.B)

Ans: See LQ.8 (Topic 14.3)

4. What conditions are necessary for the germination of seeds? (K.B)

Ans: See LQ.8 (Topic 14.3)

5. Outline the methods of asexual reproduction in animals. (K.B)

Ans: See LO. (Topic 14.1, 14.2)

6. Write a note on the male and female reproductive systems of rabbit. (K.B)

Ans: See LC.3/LQ.4 (Topic 14.4)

7. Describe the processes of spermatogenesis and oogenesis. (K.B)

Ans: See LQ.1 (topic 14.4)

8. Why do we consider that overpopulation is a global problem? (U.B)

Ans: See LQ.6 (topic 14.4)

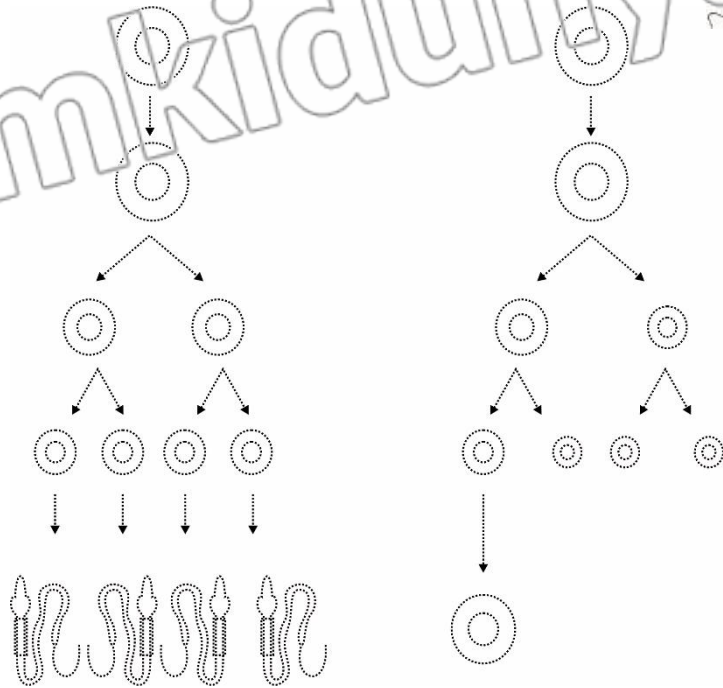


**ASSIGNMENT**

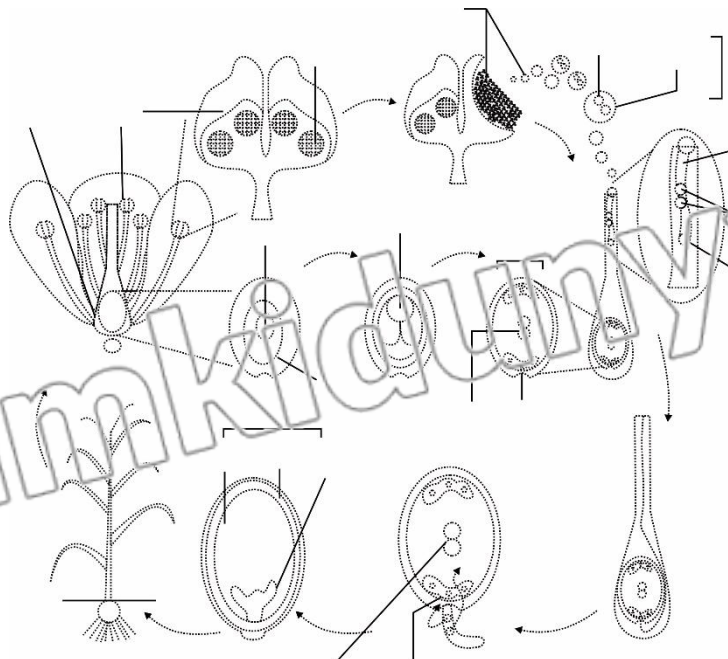
**PRACTICE DIAGRAM & LABEL**

SPERMATOGENESIS

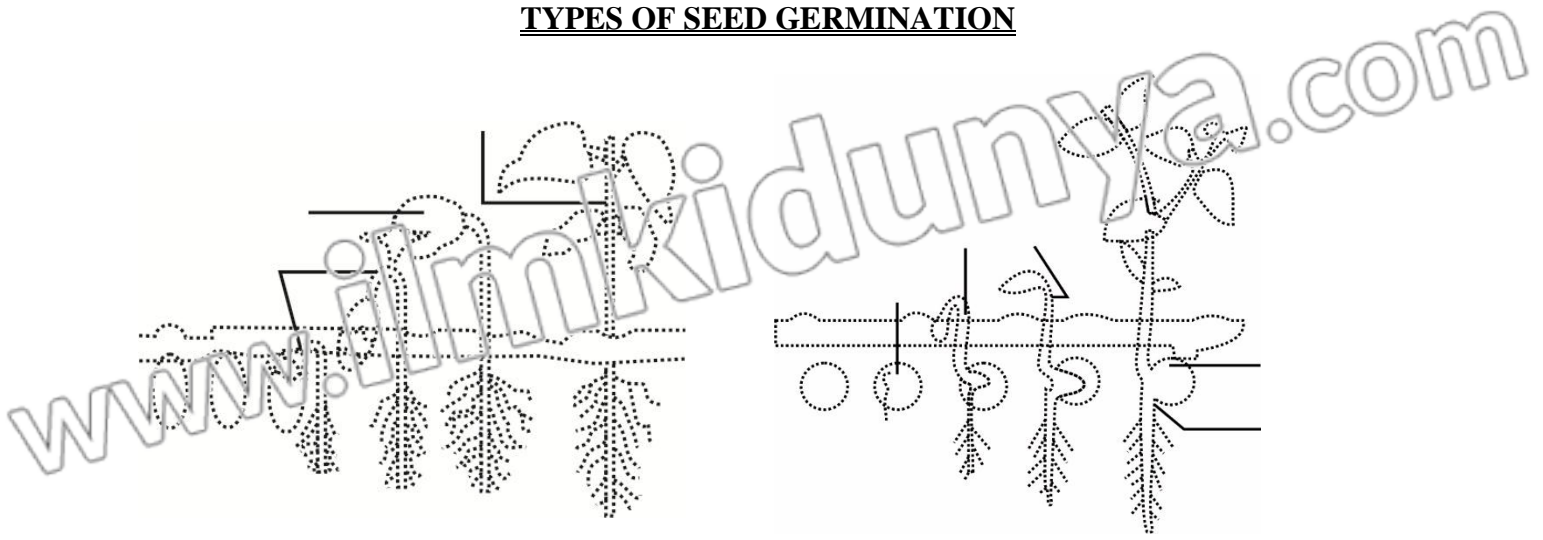
OOGENESIS



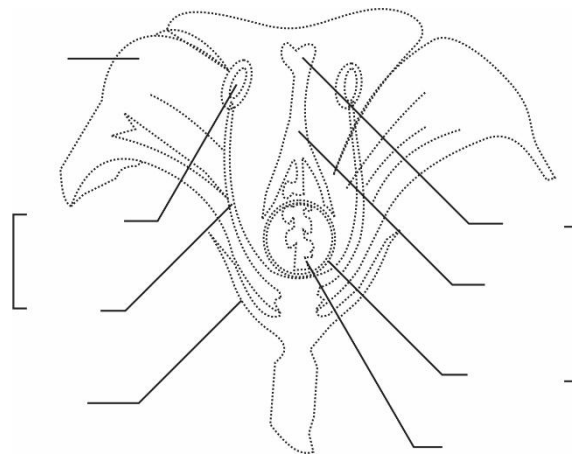
**LIFE CYCLE OF A FLOWERING PLANT**



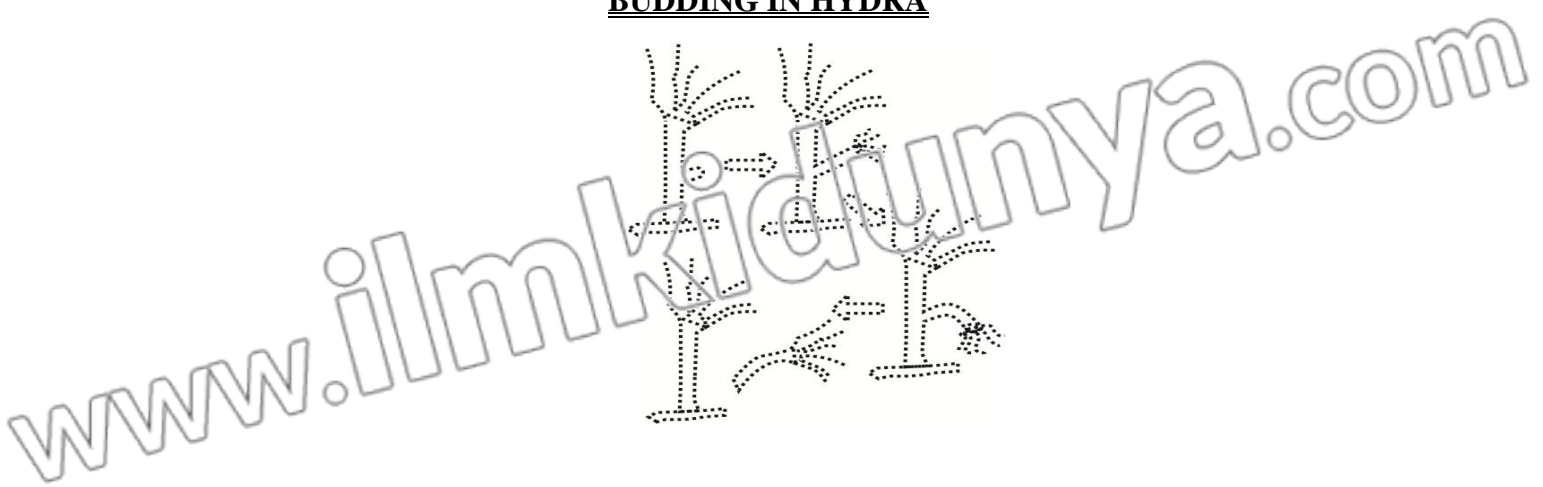
TYPES OF SEED GERMINATION



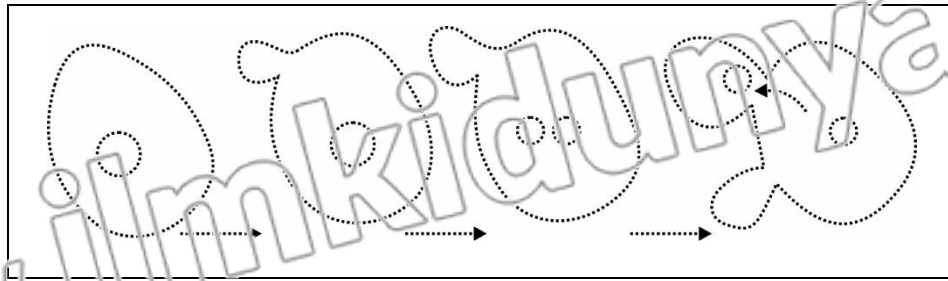
STRUCTURE OF FLOWER



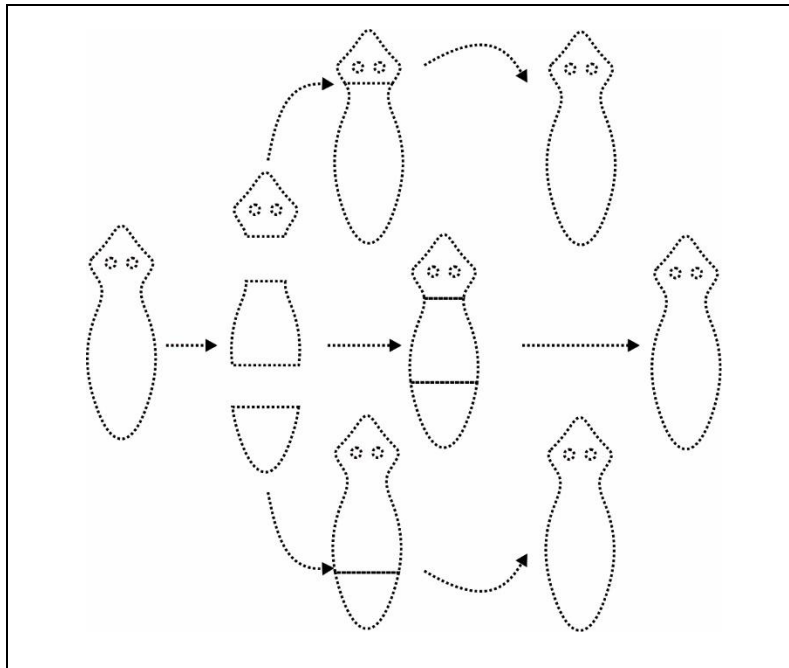
BUDDING IN HYDRA



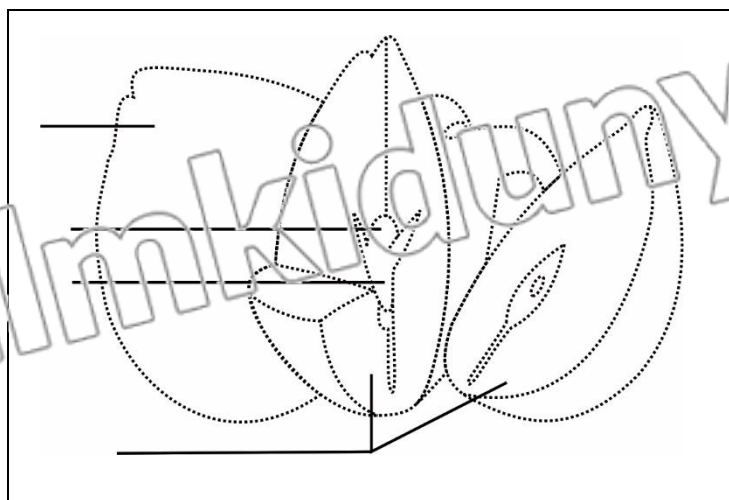
BUDDING IN YEAST



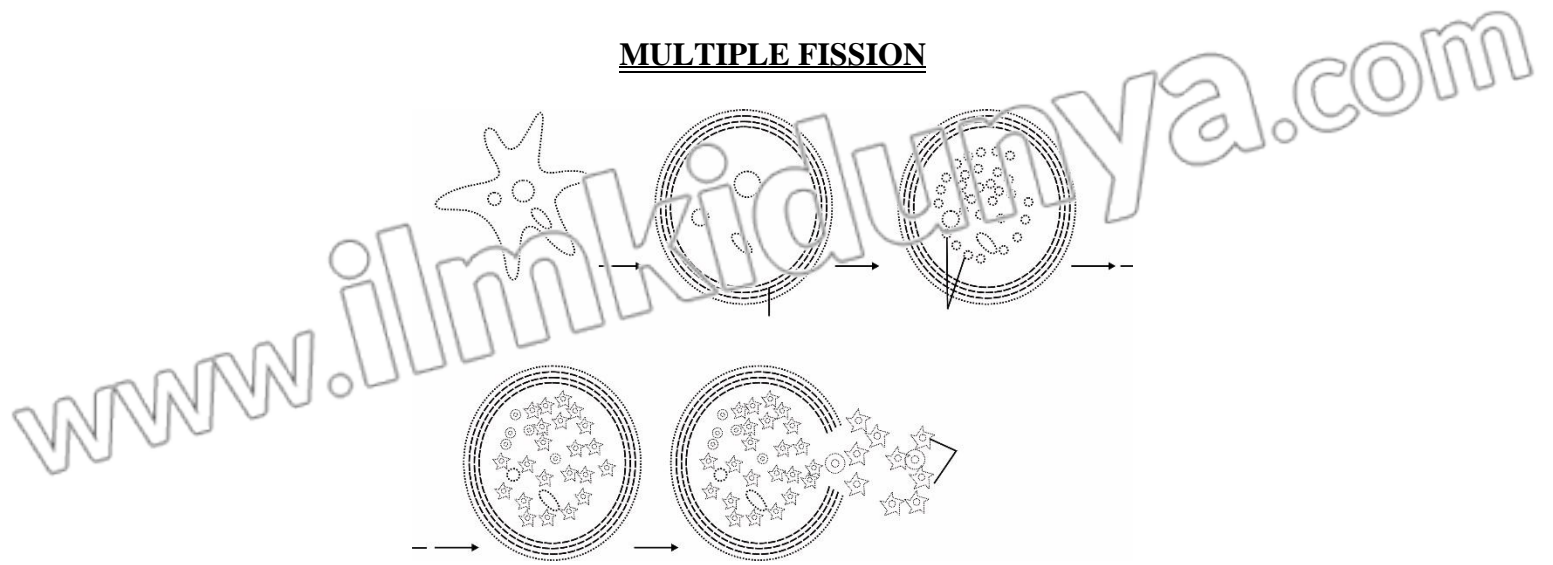
FRAGMENTATION IN A PLANARIAN



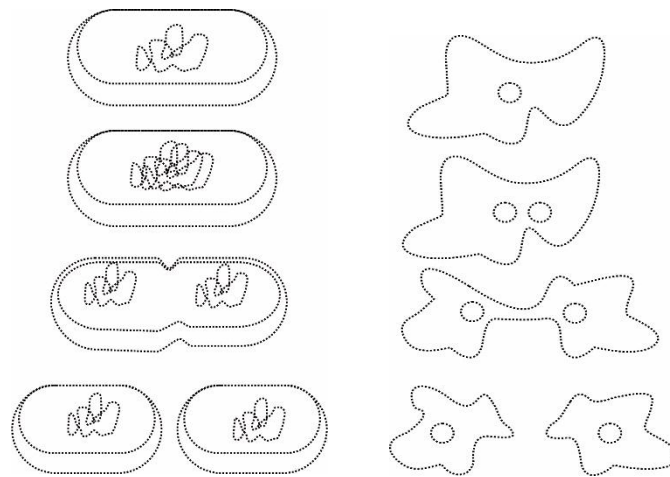
The Structure of a Dicot Seed



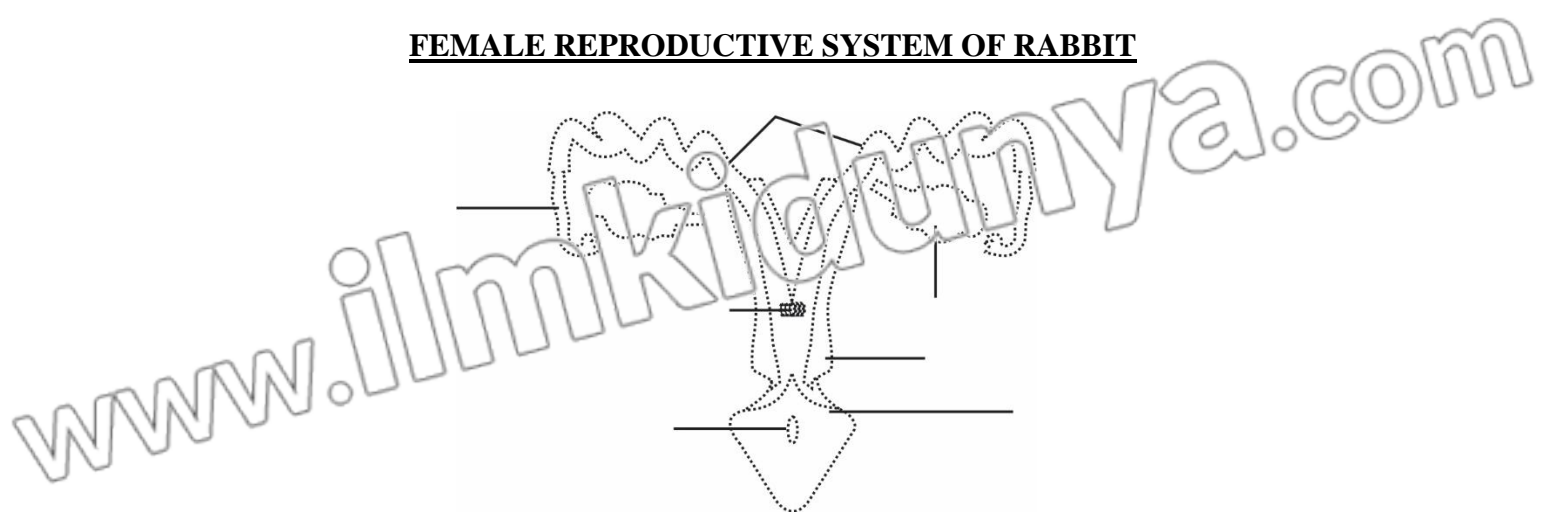
**MULTIPLE FISSION**



**BINARY FISSION IN A BACTERIUM AND AMOEBA**



**FEMALE REPRODUCTIVE SYSTEM OF RABBIT**



**SELF TEST****Time: 40 min****Marks: 25****Q.1 Four possible answers A, B, C and D to each question are given, mark the correct answer. (6×1=6)****1. Method of asexual reproduction found in Amoeba is: (K.B)**

- (A) Binary fission (B) Fragmentation  
(C) Budding (D) Spore formation

**2. How many floral whorls are present in a complete flower? (K.B)**

- (A) 2 (B) 4  
(C) 6 (D) 8

**3. Oogonia are produced in: (K.B)**

- (A) Testes (B) Follicles  
(C) Polar bodies (D) Tube nucleus

**4. The process after gamete formation: (K.B)**

- (A) Fertilization (B) Development  
(C) Growth (D) Birth

**5. Carpel consists of: (K.B)**

- (A) Stigma (B) Style  
(C) Ovary (D) Stigma, Style, Ovary

**6. The egg cell is: (K.B)**

- (A) Haploid (B) Diploid  
(C) Triploid (D) Tetraploid

**Q.2 Give short answers to following questions. (5×2=10)**

- (i) Define the term binary fission give examples. (K.B)  
(ii) How vegetative propagation occur by leaves? (K.B)  
(iii) Define the term double fertilization. (K.B)  
(iv) What are three associated glands in male reproductive system of rabbit? (K.B)  
(v) Define AIDS. (K.B)

**Q.3 Answer the following questions in detail. (5+4=9)**

- (a) Explain life cycle of flowering plant. (K.B)  
(b) Describe oogenesis. (K.B)

**NOTE:** Parents or guardians can conduct this test in their supervision in order to check the skill of the students.