

## Why do organisms reproduce?

- Reproduction is not essential for an individual's survival, unlike processes like eating or breathing.
- Reproduction requires a lot of energy.
- We notice organisms *because* they reproduce. Large numbers of a single species make them noticeable.
- Reproduction creates new individuals that look similar to their parents.

## How do organisms create copies of themselves?

- Offspring look similar to their parents because they share similar body designs.
- These body designs come from "blueprints" stored in DNA (Deoxyribo Nucleic Acid).
- DNA contains instructions for making proteins, which determine traits.
- Reproduction involves creating copies of DNA.
- Cells divide to give each DNA copy its own cellular machinery to function.

The image shows a circular logo on the left with the text 'ABHIGYAN ACADEMY' and 'FALL 1993' around a central emblem. To the right is a green banner with the text 'ABHIGYAN ACADEMY' in large, bold, yellow letters. Overlaid on the banner is a list of bullet points.

- No, copying DNA isn't perfect. There are slight variations each time.
- Most variations are small, but some can be harmful and cause the new cell to die. These variations are the basis for evolution.

Why is variation important?

- Consistent DNA copying maintains traits that help a species thrive in its environment (its niche).

- Variations in individuals can allow some to survive these changes, ensuring the species continues.
- Example: If some bacteria have a variation that makes them resistant to heat, they will survive if water temperatures rise.

## Modes of Reproduction in Single Organisms

- **Fission:**
  - Common in unicellular organisms (like bacteria, protozoa).
  - Involves the cell dividing into two or more new individuals.
  - Can be simple splitting (binary fission) or multiple splitting (multiple fission).
  - Examples: Amoeba (splits in any plane), Leishmania (splits in a definite orientation), Plasmodium (multiple fission).
- **Fragmentation:**
  - Seen in some multicellular organisms with simple body organization (like Spirogyra).

- The organism breaks into fragments, each of which grows into a new individual.

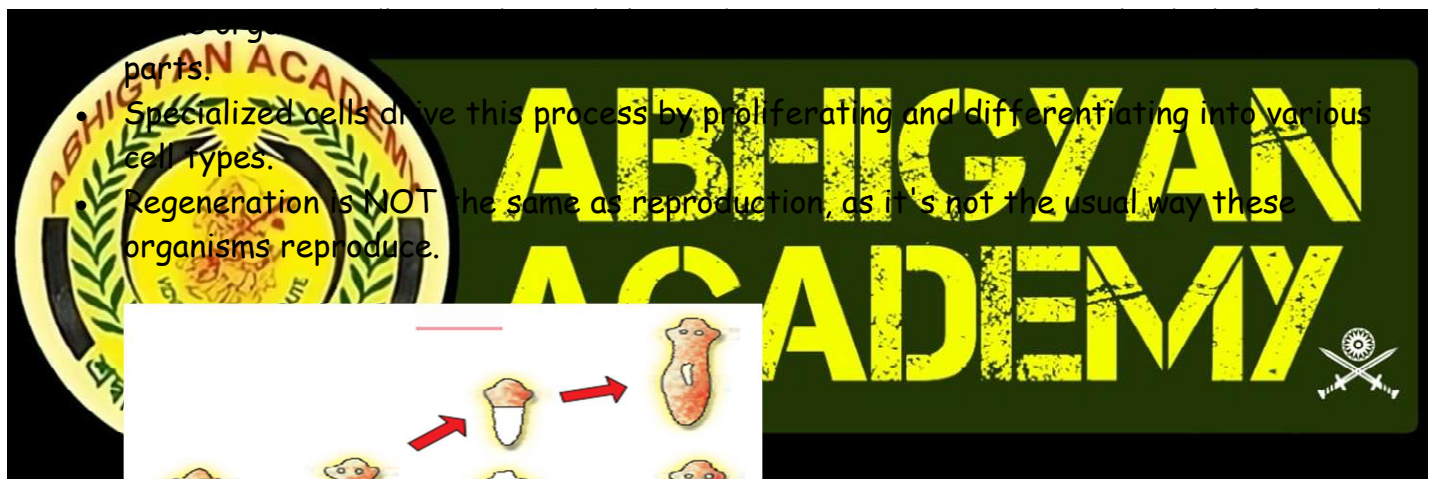
### Why not cell-by-cell division in complex multicellular organisms?

- Complex multicellular organisms have specialized cells organized into tissues and organs.
- Simple cell-by-cell division wouldn't work because it can't reproduce this complex organization.

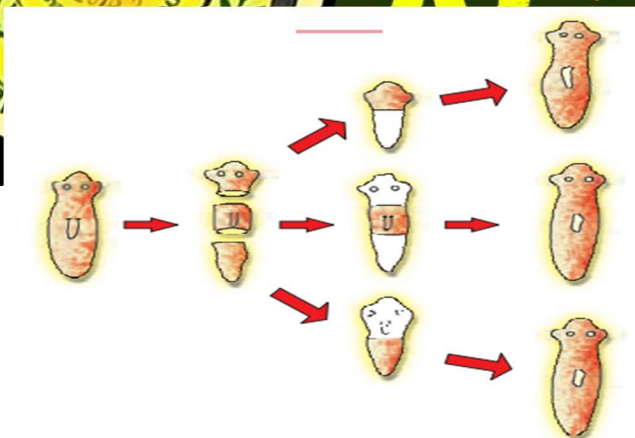
### Specialized Cells for Reproduction

- In complex multicellular organisms, specific cell types are responsible for reproduction.
- These cells can grow, proliferate, and create other cell types to form a new organism.

### Regeneration



- Specialized cells drive this process by proliferating and differentiating into various cell types.
- Regeneration is NOT the same as reproduction, as it's not the usual way these organisms reproduce.



Regeneration in Planaria

### Yeast vs. Mold Growth (Comparison)

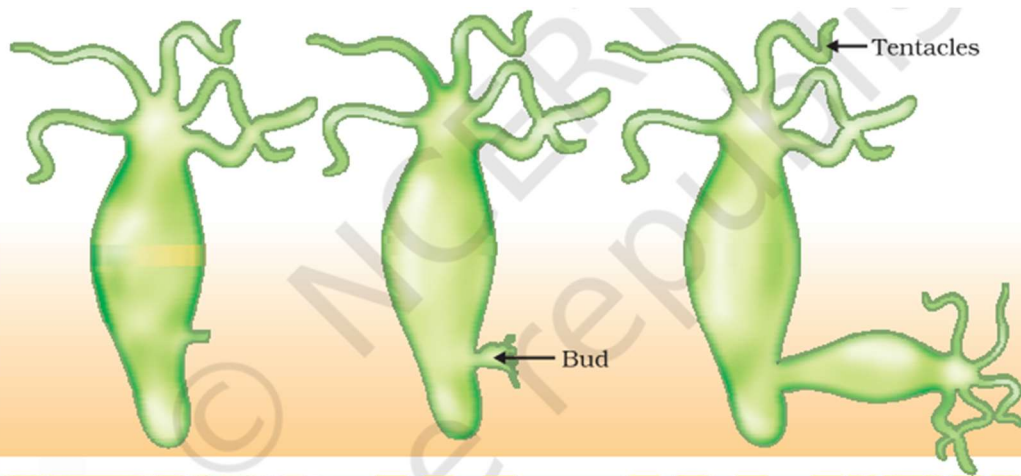
- **Yeast:** Grows by budding, where a small outgrowth (bud) develops and eventually separates from the parent cell.
- **Mold:** Grows by producing spores, which are released and can develop into new individuals under suitable conditions.

## Key Differences:

- Yeast produces new individuals through cell division (budding), while mold uses specialized reproductive structures (spores).
- Yeast growth is typically smoother and more localized, while mold growth can be fuzzy and spread out due to spore dispersal.

## Budding

- Occurs in organisms like Hydra.
- Involves the formation of an outgrowth (bud) due to repeated cell division at a specific site.
- The bud develops into a tiny individual.
- When fully mature, the bud detaches from the parent and becomes independent.



## Vegetative Propagation

- Parts like roots, stems, and leaves develop into new plants under the right conditions.
- Unlike most animals, plants can use this method for reproduction.

## Methods of Vegetative Propagation

- Layering
- Grafting

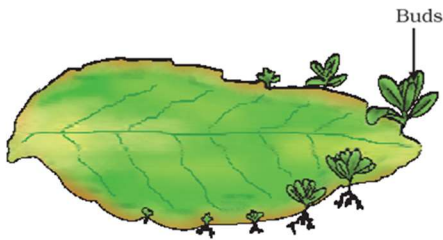
## Examples of Plants that use Vegetative Propagation

- Sugarcane
- Roses
- Grapes
- Banana
- Orange
- Jasmine

## Advantages of Vegetative Propagation

- Plants produced can bear flowers and fruits earlier than those grown from seeds.
- Allows propagation of plants that have lost the capacity to produce seeds.
- All plants produced are genetically similar to the parent plant, ensuring consistent traits.

## Bryophyllum Reproduction



Leaf of Bryophyllum

with buds

Develops buds in notches along its leaf margins.  
• These buds fall on the soil and grow into new plants.  
• This is an example of vegetative propagation.

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Spore Formation

A diagram of a Rhizopus mold. It shows a central point from which many long, thin hyphae grow outwards. At the tips of several of these hyphae are spherical structures called sporangia. Small dots are shown being released from the sporangia, labeled as 'Spores'.

Spore formation in Rhizopus

- Seen in many simple multicellular organisms like bread mold (Rhizopus).
- Spores are produced in structures called sporangia.
- Spores have thick walls that protect them until they land on a moist surface and start to grow.

## Asexual Reproduction

- All the reproduction methods discussed so far (fission, fragmentation, budding, vegetative propagation, spore formation) are types of asexual reproduction.
- Asexual reproduction involves only one parent.



## Sexual Reproduction

- Involves two parents (male and female).
- Examples: Bulls and cows are needed to produce calves, hens and roosters are needed to produce chicks.

## Why Sexual Reproduction?

- DNA copying is not perfect, leading to variations.
- Variations are important for the survival of a species in changing environments.
- Sexual reproduction allows for greater variation by combining DNA from two individuals.


## The Challenge of Sexual Reproduction

- Combining DNA from two parents could double the amount of DNA in each generation.

the Solution: Meiosis

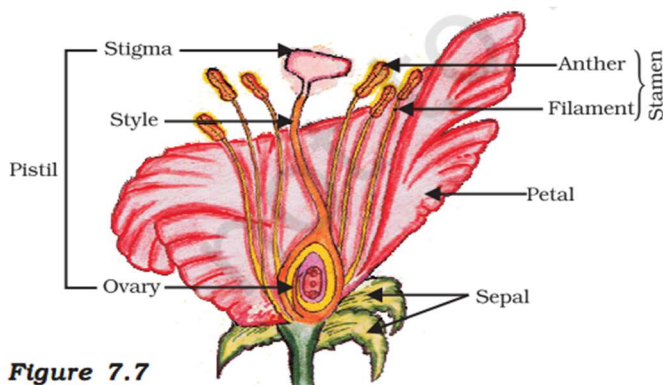
- Multicellular organisms have special cells (germ-cells) with half the number of chromosomes.
- Meiosis is the cell division process that creates these germ-cells.
- When germ-cells from two parents combine, the normal chromosome number is restored in the offspring.

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- In complex organisms, germ-cells specialize into male and female gametes.
- Male gametes (sperm) are small and motile.
- Female gametes (eggs) are larger and contain food stores.

## Sexual Reproduction in Flowering Plants



**Figure 7.7**  
Longitudinal section of  
flower

- Reproductive parts are in the flower.
- Stamens (male) produce pollen grains containing male germ-cells.
- Pistil (female) contains the ovary with ovules, each containing an egg cell.
- Fertilization occurs when a male germ-cell from a pollen grain fuses with an egg cell in an ovule.

## Pollination

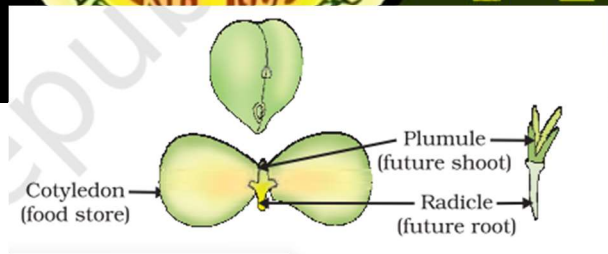
- Transfer of pollen from stamen to stigma.
- Can be self-pollination (within the same flower) or cross-pollination (between flowers).
- Agents of pollination include wind, water, and animals.

## After Fertilization

- The fertilized egg (zygote) develops into an embryo within the ovule.
- The ovule becomes a seed.



## Germination



- The process of a seed developing into a seedling.

## Puberty

- A period of rapid change in the body during early teenage years.
- Includes physical and emotional changes.
- Marks the beginning of sexual maturation.

## Changes During Puberty

- **Common to boys and girls:**
  - Hair growth in armpits and genital area.

- Thinner hair on legs, arms, and face.
- Oily skin and pimples.
- Increased awareness of self and others.
- **Specific to girls:**
  - Breast development.
  - Menstruation begins.
- **Specific to boys:**
  - Thick hair growth on the face.
  - Voice cracking.
  - Penis enlargement and erections.

## Why Puberty?

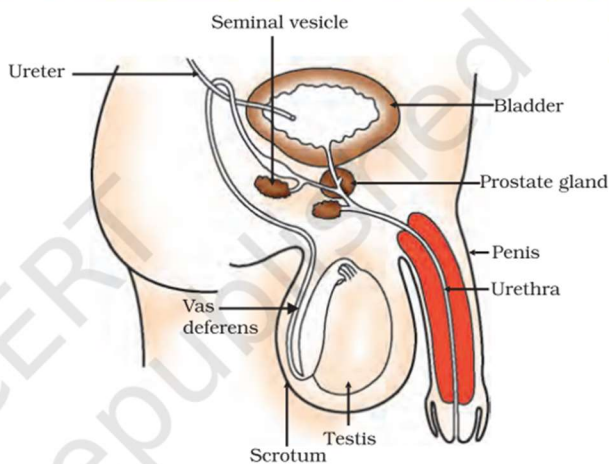
- The body prioritizes general growth during childhood.
- As general growth slows down, reproductive tissues begin to mature.

## Purpose of Puberty Changes

Signals sexual maturity to others.

Develops organs needed for sexual reproduction and (in females) for supporting a pregnancy.

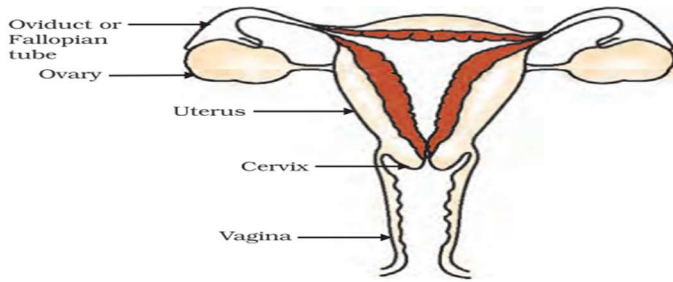
## Male Reproductive System



- **Testes:** Produce sperm and testosterone (hormone). Located outside the body to maintain a lower temperature needed for sperm production.
- **Vas deferens:** Tube that carries sperm from the testes to the urethra.
- **Urethra:** Common passage for sperm and urine.
- **Prostate and seminal vesicles:** Glands that add secretions to sperm to aid in transport and provide nutrition.



## Female Reproductive System



- **Ovaries:** Produce eggs (ova) and hormones.
- **Fallopian tubes (oviducts):** Carry eggs from the ovaries to the uterus.
- **Uterus (womb):** Where the fertilized egg implants and develops.
- **Cervix:** Opening of the uterus into the vagina.
- **Vagina:** Birth canal.

## Menstruation

Monthly cycle

- If fertilization doesn't occur, the lining sheds, resulting in bleeding (menstruation).

## Fertilization and Pregnancy

- Sperm enters the vagina during intercourse, travels to the fallopian tube, and may fertilize an egg.
- The fertilized egg (zygote) implants in the uterus lining.
- The placenta provides nourishment and removes waste for the developing embryo.
- Pregnancy lasts about nine months.

## Reproductive Health

- **Sexually Transmitted Infections (STIs):**
  - Diseases spread through sexual contact.
  - Examples: Gonorrhea, syphilis, warts, HIV-AIDS.
  - Condoms can help prevent STIs.
- **Contraception:**
  - Methods to prevent pregnancy.
  - Include barriers (condoms), hormonal methods (pills), and surgical methods.
- **Population Control:**
  - A large population can strain resources and make it difficult to improve living standards.
  - However, social inequality is a major contributor to poor living standards.