

PWhy 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.

Are offspring exact copies of their parents?

- 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).
- But environments can change.
- 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?

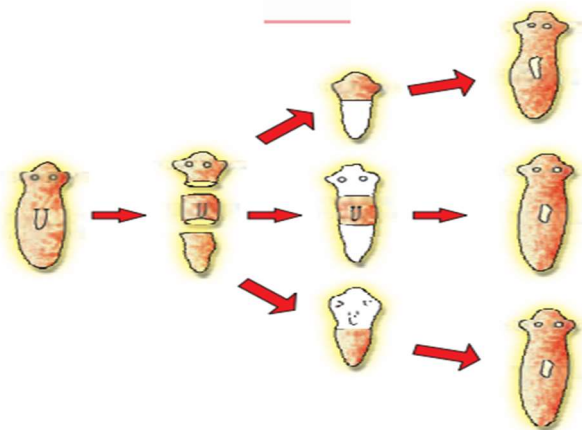
- Complex multicellular organisms have specialized cells organized into tissues and organs.
- Simple cell-by-cell division wouldn't work because it can't reproduce this complex organization.

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

- Some organisms (like Hydra and Planaria) can regenerate entire individuals from body parts.
- 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.

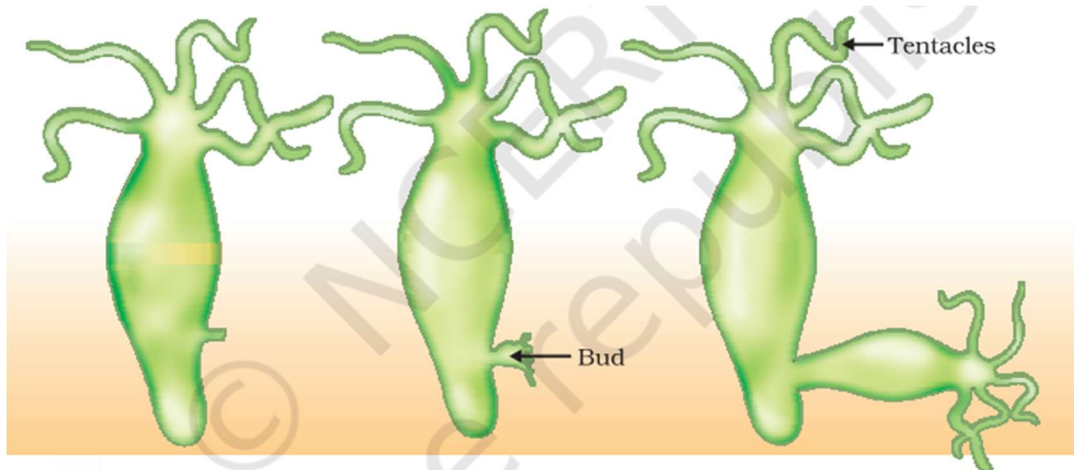
Key Differences:

- 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

- Seen in many plants.
- 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

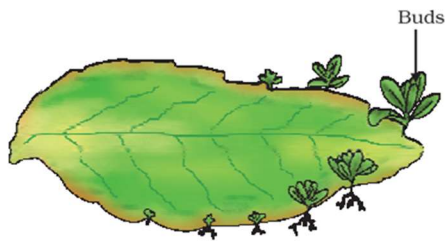
- Sugarcane
- Roses
- Grapes
- Banana
- Orange
- Jasmine

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

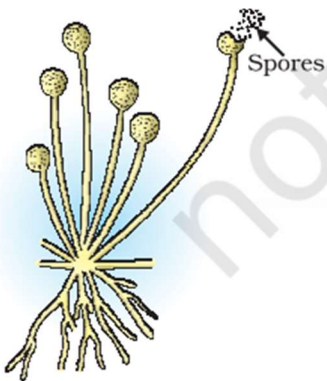


Leaf of Bryophyllum

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.

Spore Formation



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.
- This could disrupt cellular processes.

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.

Specialized Germ-cells (Gametes)

- 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

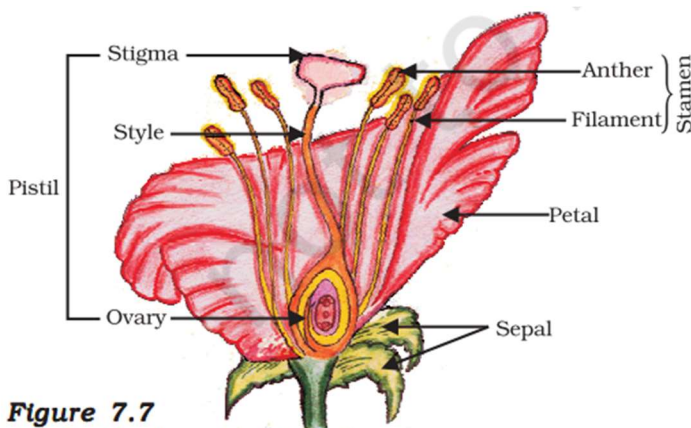


Figure 7.7
*Longitudinal section of
flower*

- 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.

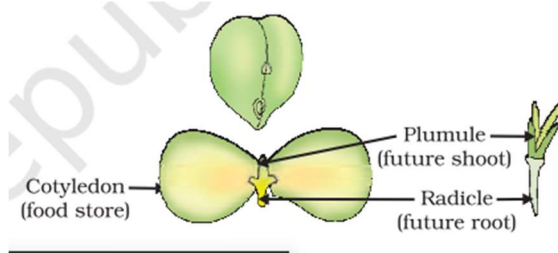
After Fertilization

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

Seed Advantages

- Protects the embryo.
- Helps in dispersal.

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.

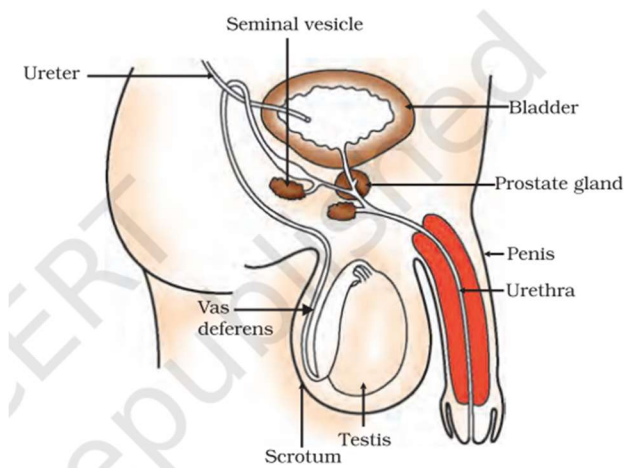
Why Puberty?

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

Purpose of Puberty Changes

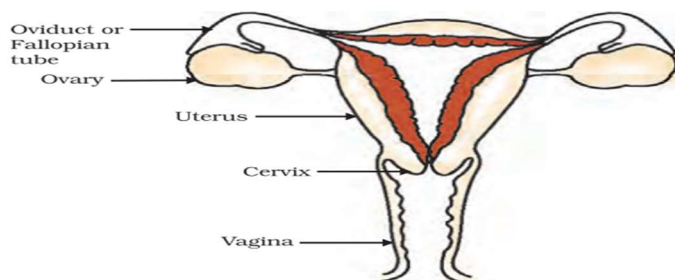
- Signals sexual maturity to others.
- Develops organs needed for sexual reproduction and (in females) for supporting a pregnancy.

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 in which the uterus lining thickens to prepare for a fertilized egg.
- 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.