



Chapter 11: Reproduction – How Life Continues

Class: 9 | Board: CBSE | Session: 2026–2027 | Book: NCERT Science – Exploration

2. Learning Objectives

- Understand the fundamental necessity of reproduction for the continuity of life on Earth.
- Differentiate clearly between **asexual** and **sexual** modes of reproduction.
- Explore various methods of asexual reproduction: **vegetative propagation**, **budding**, and **spore formation**.
- Grasp the biological significance of **mitosis** (in asexual reproduction) and **meiosis** (in sexual reproduction).
- Study sexual reproduction in flowering plants, including floral parts, **pollination**, and **fertilisation**.
- Comprehend human reproductive systems, the **menstrual cycle**, and reproductive health concepts.

3. Introduction

Every living organism has a definite life span—it is born, grows, matures, reproduces, and eventually dies.

Reproduction is the biological process by which living beings produce new individuals of their own kind. Without reproduction, species would face extinction, and life on Earth would cease to exist.

Living organisms reproduce through two primary pathways:

1. **Asexual Reproduction:** Involves a single parent; offspring are genetic copies (**clones**).
2. **Sexual Reproduction:** Involves two parents; offspring inherit a unique mix of traits, generating **variation**.

4. Complete Chapter Explanation

Part I: Asexual Reproduction

Asexual reproduction requires only **one parent** and occurs primarily through **mitosis**. Because no gametes fuse, offspring are genetically identical to the parent.

- **Vegetative Propagation:** New plants sprout from vegetative parts (roots, stems, leaves) rather than seeds.
 - *Underground Stems:* Potato tubers and ginger rhizomes.
 - *Stem Cuttings:* Money plant and sugarcane.
 - *Leaf Plantlets:* *Bryophyllum* leaves develop small plantlets along their margins.
- **Agricultural & Horticultural Methods:** Cutting, grafting, layering, and tissue culture.
- **Budding:** Yeast (unicellular) and Hydra (multicellular) form outgrowths that detach.
- **Spore Formation:** Fungi like *Rhizopus* produce microscopic spores inside sporangia.

Part II: Sexual Reproduction & The Role of Meiosis

Sexual reproduction involves the fusion of male and female gametes. **Meiosis** is a special reductional cell division that halves the chromosome number, producing haploid gametes to prevent doubling every generation, while generating genetic variation essential for evolution.

Part III: Sexual Reproduction in Flowering Plants

Flowers possess four whorls: sepals, petals, stamens (male part producing pollen), and pistil/carpel (female part containing ovary and ovules). Pollination transfers pollen to the stigma, leading to fertilisation where ovules become seeds and ovaries ripen into fruits.

Part IV: Human Reproduction

Comprises male (testes, vas deferens, urethra) and female (ovaries, oviducts, uterus, vagina) reproductive systems, governed by physiological processes like the ~28-day menstrual cycle and ovulation.

5. Definition Box

Reproduction: The biological process enabling living organisms to create new individuals of their own kind.

Clone: Offspring produced by asexual reproduction that are genetically identical to the parent.

Vegetative Propagation: Asexual reproduction in plants where new individuals arise from vegetative parts.

Mitosis / Meiosis: Equational cell division vs. reductional cell division forming haploid gametes.

Pollination & Fertilisation: Transfer of pollen vs. fusion of male and female gametes.

6. All Important Keywords with Meanings

- **Anther:** The pollen-bearing part of the stamen.
- **Stigma:** The sticky top part of the pistil that receives pollen.
- **Zygote:** The single-celled diploid structure formed after gamete fusion.
- **Scion / Stock:** Attached stem piece vs. rooted plant base used in grafting.
- **Apical Meristem:** Growing shoot-tip tissue used in plant tissue culture.

7. Flowcharts & Concept Maps

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[Reproduction]
├─ Asexual Reproduction (Single parent, Mitosis, Clones)
│   └─ Vegetative Propagation (Potato, Bryophyllum, Cuttings)
│   └─ Budding (Yeast, Hydra)
│   └─ Spore Formation (Fungi / Rhizopus)
└─ Sexual Reproduction (Two parents, Meiosis, Variation)
    └─ Flowering Plants (Pollination -> Fertilisation -> Seed/Fruit)
    └─ Animals & Humans (Gamete formation -> Fertilisation -> Development)
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8. Tables for Comparison

Feature	Asexual Reproduction	Sexual Reproduction
Number of Parents	Single parent	Two parents (usually)

Cell Division Type	Strictly Mitosis	Involves Meiosis (for gametes)
Genetic Nature	Genetically identical (Clones)	Genetically unique (Variation)
Advantage	Rapid population expansion	Promotes adaptability and evolution

9. Important Biological Processes & Activities

Process: Fertilisation in Flowering Plants

1. Pollination lands pollen on stigma. 2. Pollen grain sprouts a pollen tube. 3. Tube grows down the style. 4. Male gamete fuses with egg cell to form zygote. 5. Transformation into seed and fruit.

NCERT Activities: Observing gardening cuttings (Activity 11.1), yeast budding under microscope (Activity 11.2), and fungal bread mould cultures (Activity 11.3).

10. Important Facts & Common Mistakes

Scientific Facts

- Louis Pasteur disproved spontaneous generation.
- Tissue culture relies on cellular **totipotency**.

Common Mistakes

- Thinking vegetative propagation gives variation (it makes clones).
- Confusing pollination with fertilisation.
- Assuming the ovary becomes the seed (ovary becomes fruit, ovule becomes seed).

11. Competency & Assertion-Reason Questions

Assertion (A): Offspring produced by asexual reproduction are absolute clones of their parent.

Reason (R): Asexual reproduction involves only mitosis without the fusion of gametes.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

12. Quick Revision Sheet & 50 Points Summary

- **Key Formula / Fact Sheet:** Somatic cells = **46** chromosomes (2n); Gametes = **23** chromosomes (n); Normal cycle = **28** *ext{days}*; Ovulation = Day **14**.
- **Summary:** Chapter 11 covers essential survival mechanisms through asexual cloning and sexual variation, detailing plant structures, pollination, human reproductive systems, and health.