



Amoeba → Fission
Hydra → Budding
Flower → Seeds
Human → Sexual

UNDERSTAND • REVISE • SCORE

CHAPTER - 7

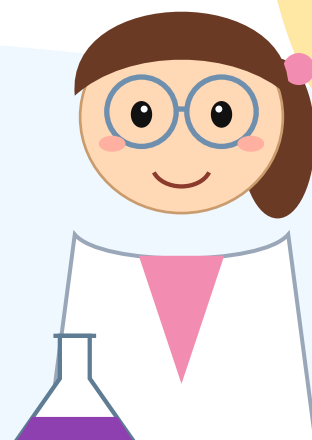
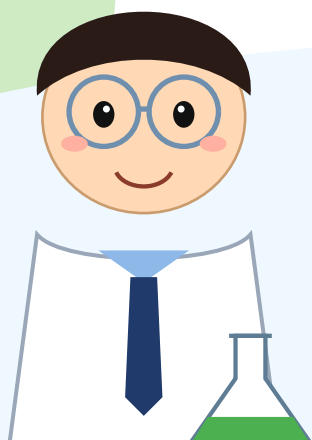
ASEXUAL

HOW DO ORGANISMS REPRODUCE?

SEXUAL

ZYGOTE

CLASS
10th
SCIENCE
NOTES



DNA

Zygote

How do Organisms Reproduce?



REPRODUCTION

Reproduction is the biological process by which an organism produces new individuals of its own kind.

Why do organisms reproduce?

- It ensures the **continuity of the species** from one generation to the next.
- It is **not essential for the survival of an individual**, but a species would disappear without it.
- It keeps the population of a species stable and passes the body design (blueprint) to the offspring.

DNA copying: the basic event

- The **basic event in reproduction is the copying of DNA**. DNA in the nucleus carries the information (blueprint) for building the body.
- Cells use **biochemical reactions** to make copies of DNA. The copies separate and the cell divides.
- DNA copying is **not perfectly accurate**, so small **variations** arise and some are inherited.

Importance of variation

- Variations help a species **survive changes in its environment**. Example: if a heat wave warms a pond, most bacteria die but a few **heat-resistant variants** survive and multiply.
- Variation is the **basis of evolution**.
- **Asexual** reproduction gives very little variation; **sexual** reproduction gives much more.

Modes of reproduction

Feature	Asexual reproduction	Sexual reproduction
Parents	One parent	Usually two parents (male and female)
Gametes	Not involved	Male and female gametes fuse (fertilisation)
Offspring	Genetically identical (clones)	Genetically different from parents
Variation	Very little	Much greater
Examples	Amoeba, Hydra, Rhizopus, potato	Flowering plants, humans, most animals

How do Organisms Reproduce?



ASEXUAL REPRODUCTION

A single parent produces new individuals without gametes. The offspring are genetically identical to the parent.

Types of asexual reproduction

Type	What happens	Examples
Fission	The parent cell divides into two (binary) or many (multiple) daughter cells	Amoeba, Leishmania, Plasmodium
Fragmentation	The body breaks into pieces; each piece grows into a new individual	Spirogyra
Regeneration	Cut or lost parts regrow into a complete organism	Hydra, Planaria
Budding	An outgrowth (bud) forms on the parent, grows and detaches	Hydra, Yeast
Vegetative propagation	New plants grow from roots, stems or leaves	Potato, Bryophyllum, rose
Spore formation	Tiny spores burst out of sporangia and grow on a moist surface	Rhizopus (bread mould)

Fission

Binary fission: The cell divides into **two** daughter cells. **Amoeba** can divide in any plane. **Leishmania** (causes kala-azar) divides in a definite plane, related to the whip-like structure at one end.

Multiple fission: The nucleus divides many times and the cytoplasm then splits around each nucleus, giving **many daughter cells** at the same time. Example: **Plasmodium** (malaria parasite).

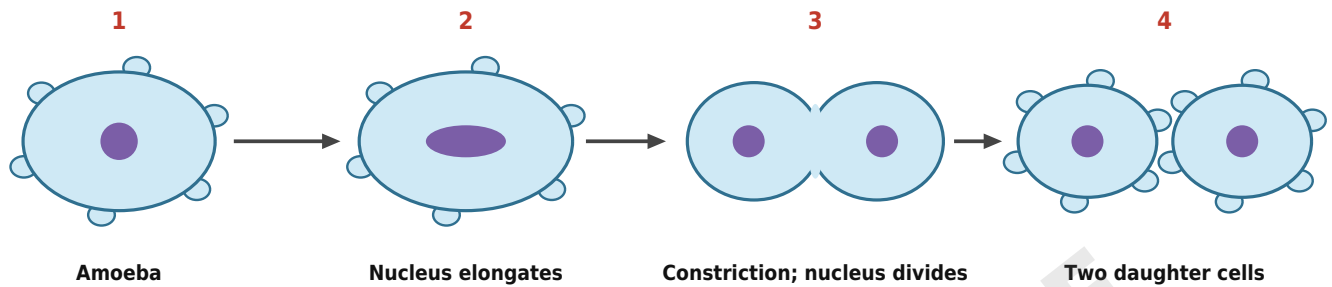
Remember: In binary fission, the nucleus divides first and then the cytoplasm divides. Fission is common in **unicellular** organisms.

How do Organisms Reproduce?



ASEXUAL REPRODUCTION

Binary fission in Amoeba



Fragmentation

Simple multicellular organisms with a simple body organisation break into **two or more pieces** on maturing. Each piece grows into a new individual.

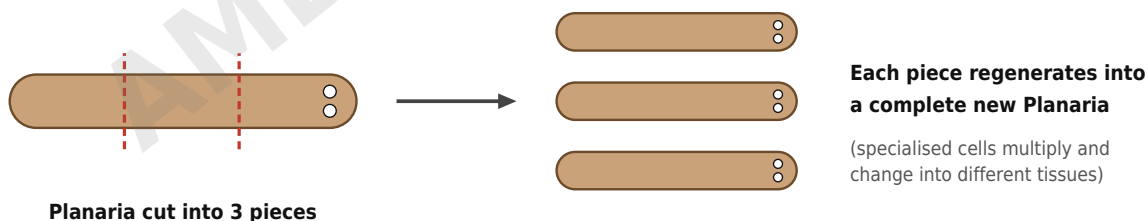
Example: **Spirogyra** (a filamentous alga). This is possible only in organisms with a simple body design.

Regeneration

Some organisms can give rise to new individuals from their **cut body parts**. Examples: **Hydra** and **Planaria**.

Specialised cells multiply to form many cells, which then change into different cell types and tissues.

Note: Regeneration is **not the same as reproduction**. Most organisms cannot regrow after being cut, and an organism does not normally break itself up to reproduce.



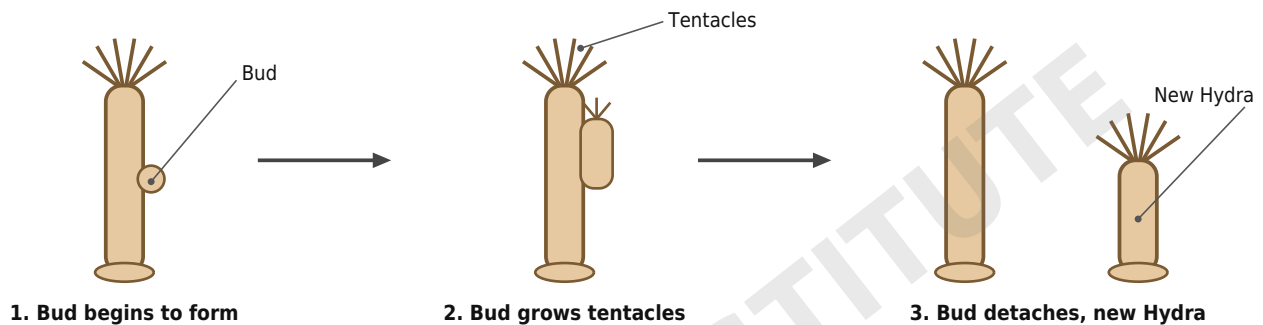
How do Organisms Reproduce?

ASEXUAL REPRODUCTION

Budding

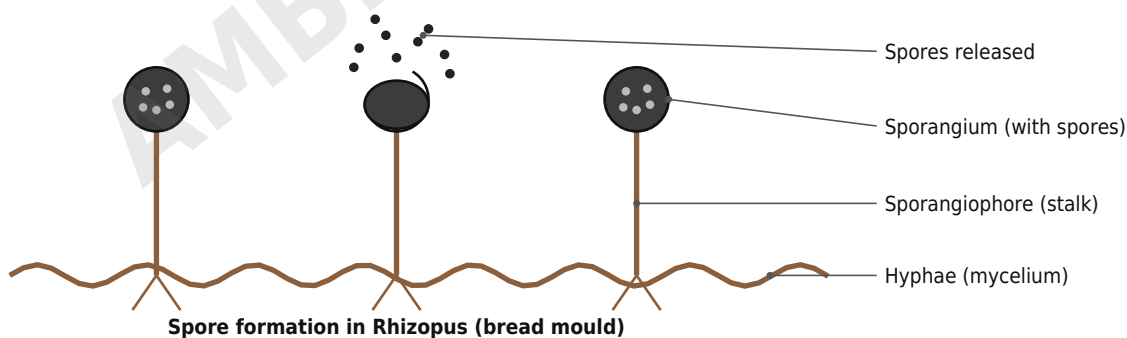
A **bud** develops as an outgrowth because of **repeated cell division at one specific site**. The bud grows into a tiny individual and, when it is fully mature, **detaches** from the parent body and becomes a new independent individual.

Examples: **Hydra** and **Yeast**.



Spore formation

- Many simple multicellular organisms, such as **Rhizopus**, have thread-like **hyphae** that grow upright and bear round blob-like **sporangia**.
- Sporangia contain **spores**, which are tiny cells covered by a **thick protective wall**.
- Spores can survive harsh conditions. When they land on a **moist surface**, they germinate and grow into new Rhizopus.
- Spores are light and are carried by air, so they spread easily.



How do Organisms Reproduce?



VEGETATIVE PROPAGATION

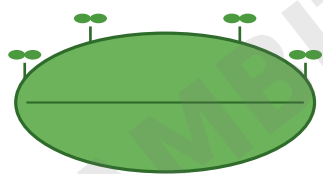
New plants are obtained from the vegetative parts (roots, stems, leaves) of the parent plant, not from seeds.

Natural methods

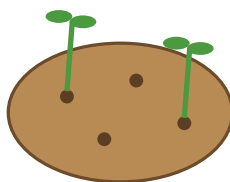
Plant part	How it works	Examples
Roots	New plants arise from roots	Sweet potato, Dahlia
Stem	Buds ("eyes") on tubers; runners; rhizomes give new plants	Potato, grass, strawberry, ginger
Leaves	Buds in leaf notches fall to the soil and grow	Bryophyllum

Artificial methods

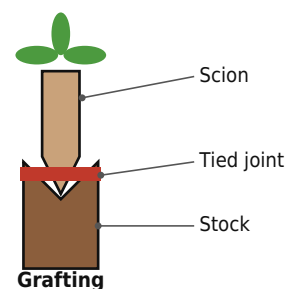
Method	Description	Examples
Cutting	A piece of stem with nodes is planted in moist soil	Rose, sugarcane, grapes
Layering	A branch is bent and buried in soil while still attached to the parent plant; roots form	Jasmine
Grafting	The cut stem (scion) of one plant is joined to the rooted stem (stock) of another	Mango
Tissue culture	A small piece of tissue from the growing tip is grown in a sterile nutrient medium to form a callus, then moved to hormone medium and finally to soil	Orchids, ornamental plants



Bryophyllum: plantlets on leaf notches



Potato: shoots grow from "eyes"



Grafting

Advantages of vegetative propagation

- Plants such as banana, orange, rose and jasmine have **lost the capacity to produce viable seeds**, so they are propagated vegetatively.
- Plants **bear flowers and fruits earlier** than those grown from seeds.
- Offspring are **genetically identical** to the parent plant.

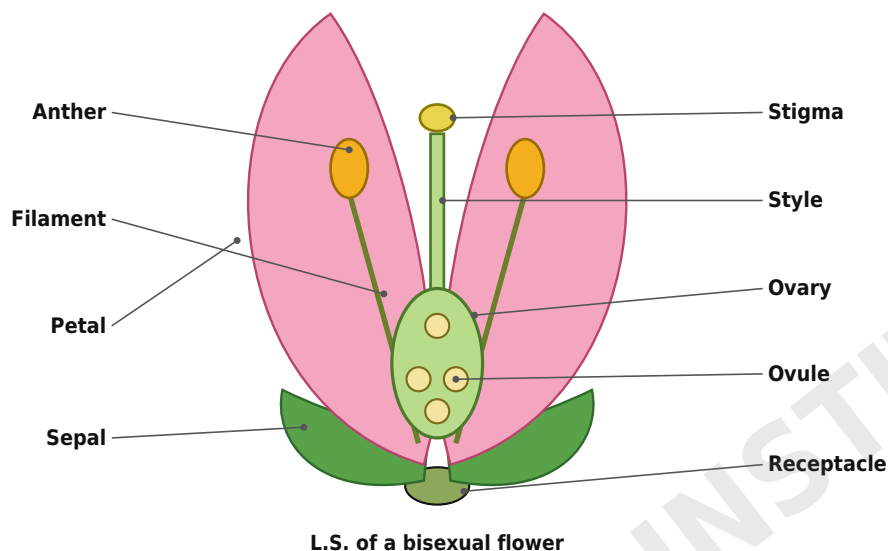
How do Organisms Reproduce?



SEXUAL REPRODUCTION IN PLANTS

Two gametes (male and female) fuse to form a zygote. In flowering plants, the flower is the reproductive organ.

Structure of a flower



Parts of a flower

- **Sepals** (calyx): green, protect the bud
- **Petals** (corolla): coloured, attract insects
- **Stamen** (male): anther + filament. Anther makes **pollen grains** (male gametes)
- **Pistil / carpel** (female): stigma + style + ovary. The ovary has **ovules**, each with an egg cell

Parts and functions

Part	Function
Stigma	Sticky tip of the pistil; receives pollen grains
Style	Stalk that connects the stigma to the ovary; pollen tube grows through it
Ovary	Swollen base that contains ovules; becomes the fruit after fertilisation
Ovule	Contains the female gamete (egg cell); becomes the seed
Anther	Produces pollen grains containing male gametes
Filament	Stalk that holds the anther

Types of flowers

Unisexual flowers: have either stamens or pistil, not both. Examples: **papaya, watermelon.**

Bisexual flowers: have both stamens and pistil. Examples: **Hibiscus, mustard.**

How do Organisms Reproduce?



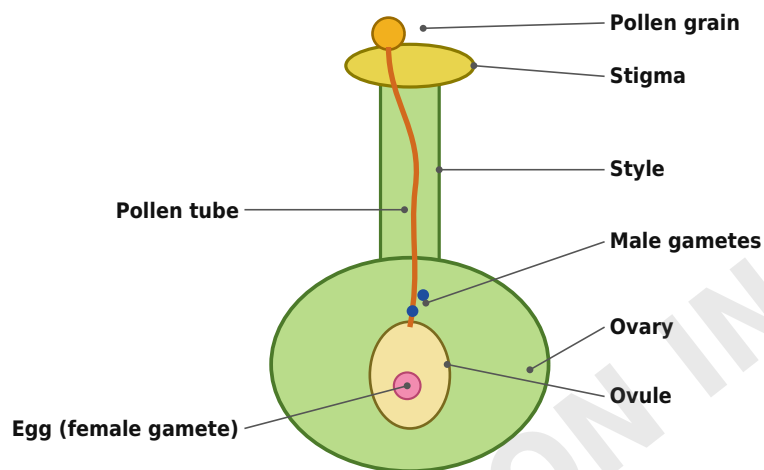
SEXUAL REPRODUCTION IN PLANTS

Pollination

Pollination is the transfer of pollen from the **anther** to the **stigma**.

- **Self-pollination:** pollen goes to the stigma of the same flower (or another flower of the same plant).
- **Cross-pollination:** pollen goes to a flower of a **different plant**; gives more variation.
- **Agents of pollination:** wind, water, insects and other animals.

Fertilisation



- A pollen grain lands on the stigma and grows a **pollen tube** through the style.
- The tube reaches the **ovule** in the ovary.
- **Male gamete + female gamete (egg)** fuse to form a **zygote**. This is **fertilisation**.

After fertilisation

Before	After
Zygote	Divides repeatedly to form the embryo inside the ovule
Ovule	Develops a tough coat and becomes the seed
Ovary	Grows rapidly and ripens to become the fruit
Petals, sepals, stamens, style, stigma	Wither and fall off

Seed germination

The seed contains the **embryo** (future plant). Under suitable conditions (**water, air, warmth**) the seed **germinates**: the embryo grows into a seedling, with the root and shoot developing.

How do Organisms Reproduce?



REPRODUCTION IN HUMANS

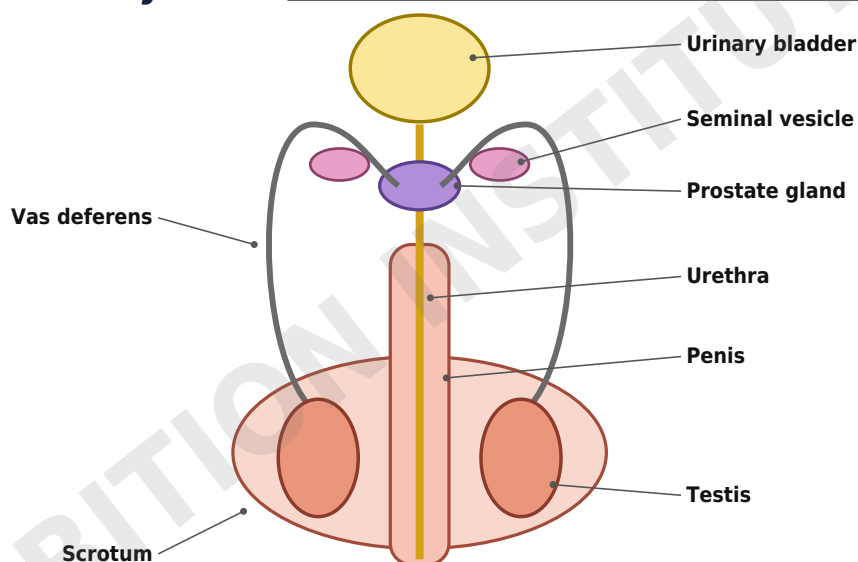
Humans reproduce sexually. Males and females have different reproductive organs.

Puberty

Puberty is the period of sexual maturation, in the early teens, when the reproductive organs become functional. Hormones trigger the changes.

- **Both:** thick hair in armpits and genital area; skin becomes oily and pimples may appear.
- **Girls:** breast development, start of menstruation.
- **Boys:** facial hair, deepening of voice.

Male reproductive system



Human male reproductive system (schematic)

Part	Function
Testis	Makes sperms and the hormone testosterone
Scrotum	Sac holding the testes outside the body; sperm formation needs a lower temperature
Vas deferens	Carries sperms from the testes
Seminal vesicle, prostate	Add fluids that nourish sperms; sperms + fluids = semen
Urethra	Common passage for urine and semen
Penis	Delivers sperms into the female body

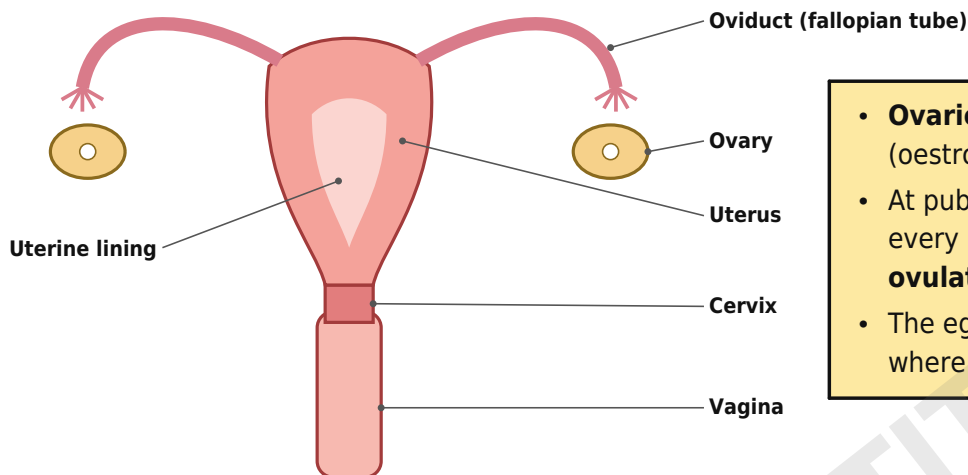
Sperm: a tiny cell with genetic material and a long **tail** that helps it swim towards the egg.

How do Organisms Reproduce?



REPRODUCTION IN HUMANS

Female reproductive system



Human female reproductive system (schematic)

- **Ovaries** make **eggs** and hormones (oestrogen, progesterone).
- At puberty, **one egg** matures about every month, released by one ovary: **ovulation**.
- The egg travels through the **oviduct**, where **fertilisation** takes place.

Part	Function
Ovary	Produces eggs (ova) and female hormones
Oviduct (fallopian tube)	Carries the egg to the uterus; site of fertilisation
Uterus	Muscular bag where the embryo implants and grows into a baby
Cervix	Narrow neck of the uterus opening into the vagina
Vagina	Receives sperms; also the birth canal

Sperm and egg compared

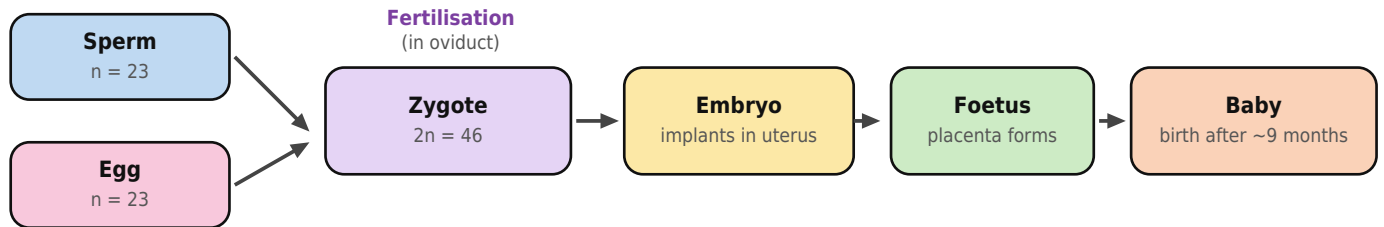
Feature	Sperm (male gamete)	Egg / ovum (female gamete)
Size	Very small	Large
Movement	Motile (has a tail)	Non-motile
Food store	Almost none	Contains stored food
Number	Millions produced	One released every month
Chromosomes	23 (half the number)	23 (half the number)

Why half? Each gamete carries **half** the number of chromosomes. When they fuse, the full number is restored ($23 + 23 = 46$ in humans), so the species keeps a constant chromosome number.

How do Organisms Reproduce?



FERTILISATION AND DEVELOPMENT



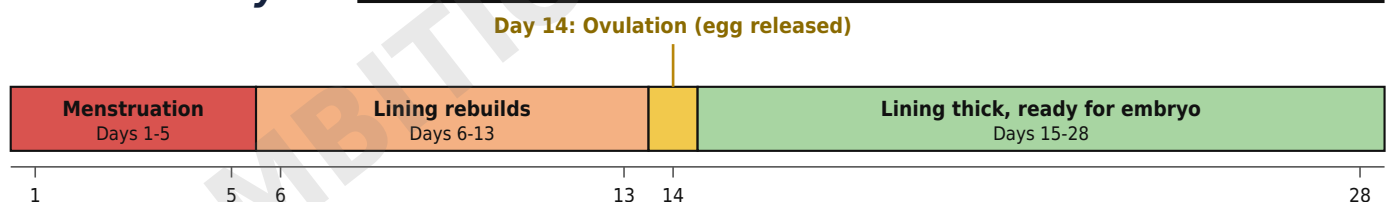
Development inside the uterus (gestation)

- During copulation, millions of sperms enter the vagina and travel up to the **oviducts**.
- If an egg is present, **one sperm fuses with it: fertilisation** forms the **zygote**.
- The zygote divides repeatedly into an **embryo**, which **implants** in the thick, soft uterine lining.
- Gestation lasts about **nine months**, ending in birth.

Placenta

- A disc-like tissue embedded in the uterine wall, with many finger-like **villi** that give a large surface area.
- Provides **nutrients and oxygen** from the mother's blood to the embryo.
- Removes **waste** (such as carbon dioxide) from the embryo into the mother's blood.

Menstrual cycle



Typical 28-day menstrual cycle (varies from person to person)

- Each month the uterus prepares for a possible embryo: its lining becomes **thick and spongy, rich in blood**.
- If the egg is **not fertilised**, the lining breaks down and leaves the body with blood through the vagina: **menstruation** (about 2 to 8 days).
- If fertilisation occurs, the lining is retained and menstruation does not occur.

How do Organisms Reproduce?



REPRODUCTIVE HEALTH

Good reproductive health means a healthy reproductive system, and the ability to plan the number and spacing of children.

Contraception (birth control)

Method	Examples	How it works
Mechanical barrier	Condom, diaphragm, cervical cap	Stops sperms reaching the egg. Condoms also reduce the spread of STDs
Chemical	Oral pills (hormonal)	Change the hormonal balance so eggs are not released. May have side effects
Intrauterine device	Copper-T, loop	Placed in the uterus; prevents implantation. May cause irritation
Surgical	Vasectomy (males), tubectomy (females)	Vas deferens or oviducts are blocked so gametes cannot meet

Sexually transmitted diseases (STDs)

- **Bacterial:** gonorrhoea, syphilis.
- **Viral:** warts, HIV-AIDS.
- They spread through **sexual contact**. Using a **condom** reduces the risk.

Female foeticide and sex ratio

- Abortion of a foetus because it is a girl is called **female foeticide**. It is illegal and unethical.
- Tests to find the sex of an unborn baby are **prohibited by law** in India.
- Female foeticide lowers the **sex ratio** and harms society. Boys and girls are equal.

Population

Rapid population growth strains food, water and other resources. Contraception and small families help control growth. Methods must be safe and chosen with medical advice.

How do Organisms Reproduce?



QUICK REVISION

Key points

- Reproduction = production of new individuals; the **basic event is DNA copying**; it creates **variation**.
- Asexual: **fission, fragmentation, regeneration, budding, vegetative propagation, spore formation**.
- Amoeba = binary fission; Plasmodium = multiple fission; Spirogyra = fragmentation; Hydra = budding/regeneration; Rhizopus = spores; Bryophyllum = leaf buds.
- Flower: **stamen** (male) and **pistil** (female). Pollination → pollen tube → fertilisation → zygote.
- After fertilisation: ovule → **seed**; ovary → **fruit**.
- Human male: testes, vas deferens, prostate, urethra, penis. Female: ovaries, oviducts, uterus, vagina.
- Fertilisation in the **oviduct**; implantation in the **uterus**; **placenta** nourishes the embryo.
- No fertilisation → **menstruation**. Contraception: barrier, hormonal, IUCD, surgical.

1-mark questions

- Q1.** Name the part of the flower that becomes the fruit. *Ans: Ovary.*
- Q2.** Which organism reproduces by multiple fission? *Ans: Plasmodium.*
- Q3.** Where does fertilisation occur in humans? *Ans: Oviduct (fallopian tube).*
- Q4.** Why are the testes located outside the abdominal cavity? *Ans: Sperm formation needs a lower temperature.*
- Q5.** Name one method of vegetative propagation in Bryophyllum. *Ans: Buds on leaf notches.*

Short and long answer practice

1. Why is variation important for the survival of a species? (2 marks)
2. Distinguish between budding and regeneration. (3 marks)
3. What is the function of the placenta? (2 marks)
4. What happens to the uterine lining if the egg is not fertilised? (2 marks)
5. Describe the process of fertilisation in a flower, with a labelled diagram. (5 marks)
6. Explain the human male and female reproductive systems, with labelled diagrams. (5 marks)