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GRADE 10 / SCIENCE

Chapter 7

How do Organisms Reproduce?



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DNA copying and variation

Copying DNA preserves inherited information. Differences can arise when DNA changes or when existing alleles come together in new combinations.



Inherited variation



Self-fertilisation is possible



Alleles pass to seeds

Genetic variation gives a population a range of inherited traits.

Asexual reproduction

A single parent produces offspring without gamete fusion. DNA copying usually preserves a close genetic resemblance.

Sexual reproduction

Gamete formation reshuffles inherited alleles. Fertilisation combines two gametes, which can come from two individuals or from one self-fertilising plant.

New variants

A change in DNA can create a new allele. A change in a reproductive cell can pass to offspring. A mutation confined to a skin cell in a sexually reproducing animal usually cannot.

Selection

An inherited difference can help in one environment and be neutral or disadvantageous in another. Survival advantages depend on conditions.

WORKED EXAMPLE

Can a self-fertilising pea plant produce offspring that differ genetically?

Yes. A Tt plant can form T or t gametes. Their fusion can produce TT, Tt or tt offspring.

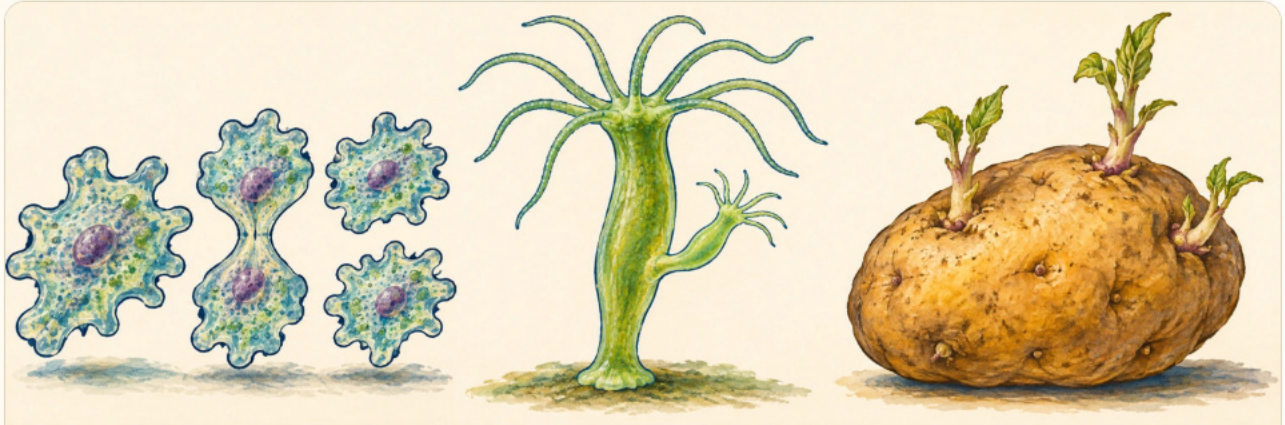
SELF-CHECK

Do moths change colour because they need camouflage?

An inherited colour variant may already be present. If it improves survival and reproduction, it can become more common over generations.

Asexual reproduction

Several routes produce offspring without gamete fusion. Identify what happens to the parent or to the piece that grows.



Amoeba · fission	Hydra · budding	Potato · vegetative growth

One parent → growth and cell division → offspring without gamete fusion

Binary fission • Amoeba	The nucleus divides, followed by division of the cell. Two daughter organisms result.
Budding • Hydra	A small outgrowth forms on the parent, develops tentacles and can detach as a new individual.
Fragmentation • Spirogyra	A filament breaks into pieces. Each viable fragment can grow into a new filament.
Regeneration • Planaria	In suitable planarians, a body piece can regenerate missing parts and become a whole individual.

WORKED EXAMPLE

A potato piece sprouts from an eye. Which method is this?

Vegetative propagation. A bud on the tuber grows into a shoot without seed formation.

SELF-CHECK

A Hydra bud stays attached as it grows. How is that different from fragmentation?

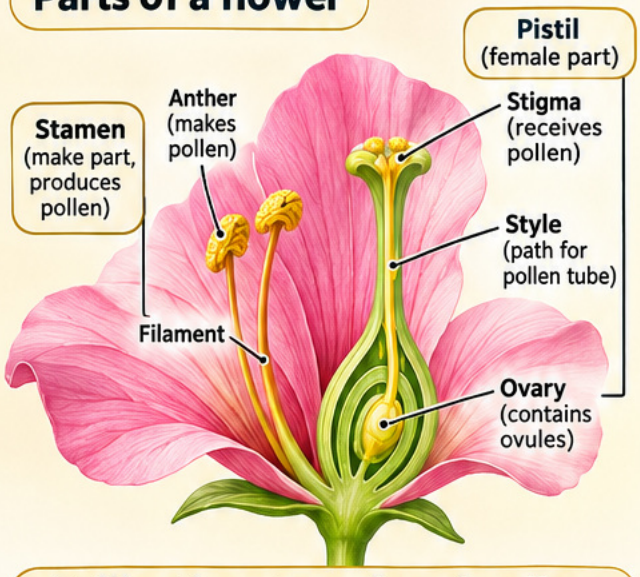
A bud begins as an outgrowth. In fragmentation the existing body breaks into pieces that then grow independently.

How do Organisms Reproduce? — Sheet 3 of 5

Flowers to seeds

In flowering plants, reproduction in the flower leads to seed and fruit formation. The flower has two main reproductive parts: stamen (male) and pistil (female). It occurs through pollination, fertilisation and development of seed and fruit.

Parts of a flower



Pollination: transfer of pollen

Self-pollination



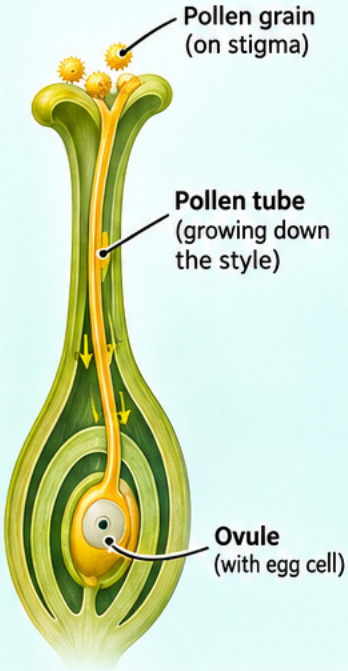
Pollen from the anther reaches the stigma of the same flower (or same plant).

Cross-pollination



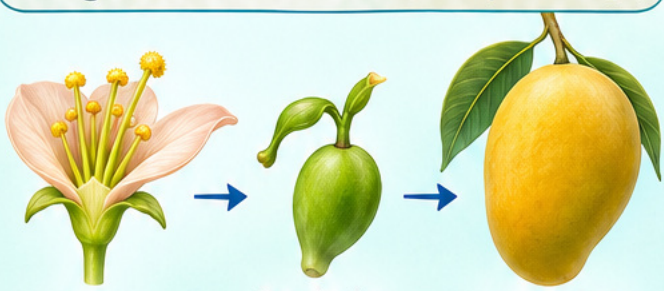
Pollen from the anther of one flower reaches the stigma of a flower on another plant of the same species.

From pollination to seed and fruit



1. **Pollination:** transfer of pollen to the stigma (self or cross).
2. **Pollen tube:** a tube grows from the pollen grain through the style to an ovule in the ovary.
3. **Fertilisation:** fusion of the male gamete (from pollen) with the egg cell in the ovule to form a zygote.
4. **Development:** each fertilised ovule develops into a seed, and the ovary develops into a fruit.

Stages: flower to fruit (example: mango)



Flower (with ovules in ovary)

Developing fruit (enlarged ovary)

Mature fruit (with seeds developed from ovules)

Worked example (Reasoning)

A flower is pollinated, and later a fruit with many seeds is formed. Explain the observation.

Answer: After pollination, a pollen tube grows from the pollen grain through the style to an ovule in the ovary. The male gamete travels through the tube and fuses with the egg cell (fertilisation) to form a zygote. Each fertilised ovule develops into a seed, and the ovary develops into a fruit. Many ovules, therefore, produce many seeds.

Self-check (Answered)

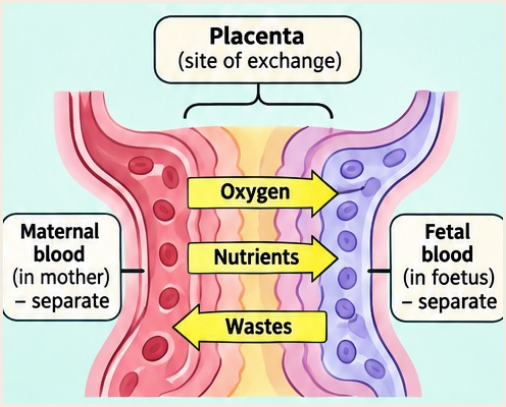
Q. A pollen grain lands on the stigma. List the main events in correct order and state the final products.

Answer: Pollination → growth of pollen tube through style → fertilisation (fusion of male gamete with egg cell) → ovule develops into seed and ovary develops into fruit.

How do Organisms Reproduce?

From one cell to an embryo

Fertilisation and implantation are different events. They usually happen in different parts of the reproductive system.



Across the placenta

Oxygen and nutrients pass towards the fetus. Carbon dioxide and some other wastes pass towards the mother.

Fertilisation

A sperm and an egg normally unite in an oviduct. Together they form one zygote with genetic material from both parents.

Early development

The zygote divides into more cells as it moves towards the uterus. During early cleavage, cell number increases while overall size changes little.

WORKED EXAMPLE

Where does implantation take place, and what implants?

The blastocyst, an early stage of the embryo, attaches to and begins to embed in the uterine lining. An unfertilised egg does not implant there.

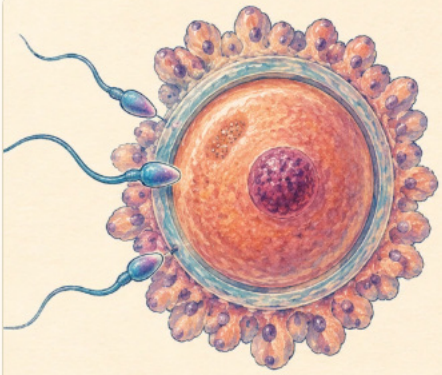
SELF-CHECK

How can oxygen reach the fetus while the two blood supplies stay largely separate?

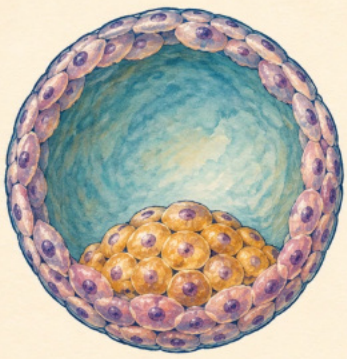
Oxygen crosses the placental exchange surface. Carbon dioxide passes towards maternal blood. Normal exchange does not require the two circulations to mix directly.

Reproductive health

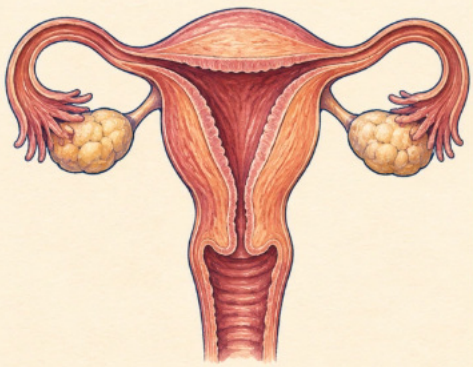
Separate the biological events first. Then ask which event a contraceptive method affects and whether it reduces infection risk.



Egg and sperm



Blastocyst



Implantation in uterine lining



Ovulation → fertilisation, if it occurs → early divisions → implantation

Two stages in different locations

Fertilisation

A sperm and egg fuse, usually in the oviduct, producing a zygote. The developing embryo travels towards the uterus.

Implantation

At implantation the embryo, now a blastocyst, attaches to and embeds in the uterine lining. Fertilisation and implantation occur at different stages and locations.

Contraception

Condoms form a barrier. Combined oral contraceptive pills usually suppress ovulation. A copper IUD releases copper ions that impair sperm function and prevent fertilisation.

Cycle timing

Day 1 is the first day of menstrual bleeding. Cycle length and ovulation timing vary. A calendar date alone cannot establish the day of ovulation.

WORKED EXAMPLE

Which method here also reduces the risk of sexually transmitted infections?

Correct, consistent condom use reduces the risk of many STIs. A copper IUD and contraceptive pills do not provide this protection.

SELF-CHECK

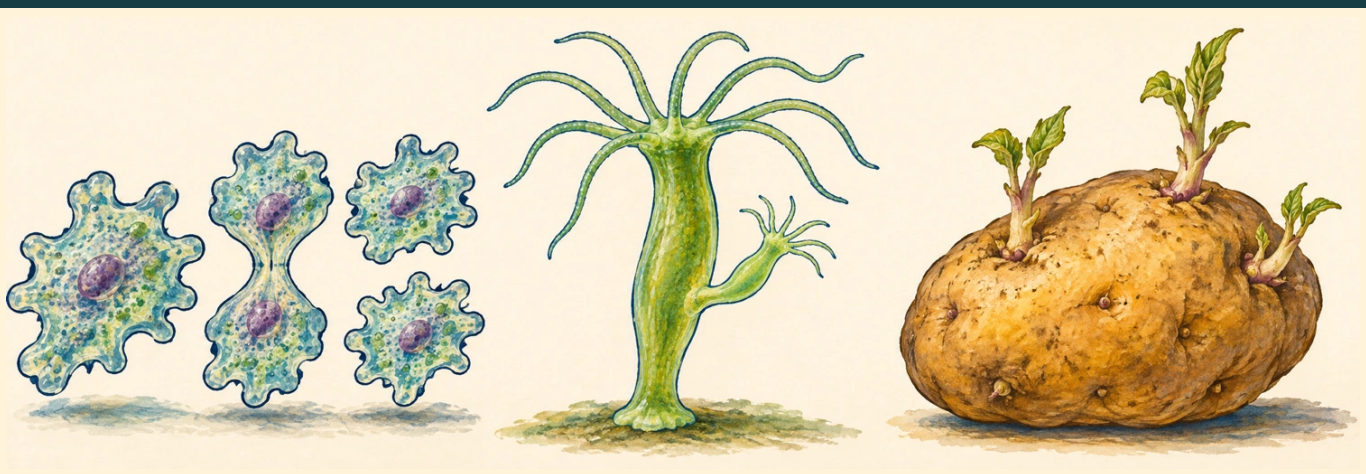
Is day 14 a universal ovulation day?

No. It is a simplified teaching example for a 28-day cycle. Actual timing varies.

ONE LAST CHALLENGE

Can an eye grow a plant?

A potato has no seeds on its surface. How can one of its eyes produce a shoot?



THE REVEAL

An eye contains a bud.

A potato is a stem tuber. A viable bud can grow into a new plant through vegetative propagation.

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