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CHAPTER NOTES

Reproduction: How Life Continues Class 9 Notes | CBSE Science Chapter 11

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Ask me anything from this chapter. A concept, a numerical, or that one doubt you did not want to raise in class. Pick one to start:

Explain Reproduction: How Life Continues simply

What can the board exam ask?

Most important formulas

Quiz me on this chapter

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Reproduction: How Life Continues Class 9 Notes | CBSE Science Chapter 11

Reproduction: How Life Continues is Chapter 11 of CBSE Class 9 Science (Exploration, 2026-27). It explains how living beings produce new individuals of their own kind, so that life on the Earth carries on even though every organism has a definite life span. The chapter moves from asexual reproduction (vegetative propagation, budding and spore formation) to meiosis and variation, then to sexual reproduction in flowering plants, fertilisation strategies in animals, and finally reproduction, pregnancy and reproductive health in human beings.

School exams test this chapter through labelled parts (flower, male and female reproductive systems), sequences (pollination to seed, ovulation to implantation), comparisons (asexual versus sexual, self versus cross-pollination, external versus internal fertilisation) and data questions built on the textbook tables. It also lays the ground for the Class 10 chapters on reproduction and heredity, where meiosis,

Quick Answer - Reproduction: How Life Continues

Asexual reproduction needs one parent and produces genetically identical clones (cutting, grafting, hydra, spores in moulds). Sexual reproduction involves two parents. In plants, pollen from anther to stigma, a pollen tube forms, and a zygote is formed. In animals, the ovule becomes the seed and the egg has 23 chromosomes; sperm and egg have 23 chromosomes.



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All Key Terms at a Glance

Term	Meaning	Example or fact
Vegetative propagation	New plants arise from vegetative (growing) parts of a plant	Potato, ginger, sugarcane cuttings, Bryophyllum leaf plantlets
Budding	Repeated cell division at one site forms an outgrowth that separates	Yeast, hydra
Spore formation	Light, usually single-celled spores germinate into new individuals	Bread mould (Rhizopus), Aspergillus
Mitosis	Cell division giving two daughter cells with the same chromosomes as the parent	Basis of all asexual reproduction; offspring are
Meiosis	Cell division that halves chromosome number (diploid to haploid) to form gametes	
Pollination	Transfer of pollen from anther to stigma	
Fertilisation	Fusion of male and female gametes to form a zygote	
Zygote	The fertilised egg, which develops into an embryo	
Ovulation	Release of one matured egg from the ovary	
Implantation	Zygote (after mitosis) attaches to the thick wall of the uterus	
Menstruation	Shedding of the uterine lining and some blood when fertilisation does not occur	



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Term	Meaning	Example or fact
Contraception	Methods that prevent pregnancy	Condoms, oral pills, Copper-T (IUD), surgical methods

Key Concepts

1. Reproduction and Its Two Modes

Every 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; it is how life on the Earth continues. A mango tree may die, but its seeds grow into new mango plants.

Living beings reproduce in two main ways

Feature	Asexual reproduction
Number of parents	One
Gametes	Not formed
Type of cell division involved	Mitosis
Offspring	Almost exact copy of parent (clones)
Variation	Very little
Speed	Fast; population increases rapidly in favourable conditions

The mixing in sexual reproduction causes variation. Accumulated over many generations, this can lead to the formation of new species.



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2. Asexual Reproduction: Vegetative Propagation, Budding and Spores

Asexual reproduction is seen in many unicellular organisms (bacteria, amoeba, yeast), in simple multicellular organisms (hydra, sponge) and in many plants. It involves only one parent, and hence produces genetically identical individuals.

Vegetative propagation in plants

In **vegetative propagation**, new plants arise from the vegetative parts, that is, from the growing parts of a plant, without producing seeds.

- Plants with fleshy underground stems, such as **potato** and **ginger**, sprout new plants.
- Stem cuttings of **money plant** and **sugarcane** grow into new plants.
- **Bryophyllum** leaves sprout tiny plantlets, which eventually grow into new plants.

Scientists and horticulturists have adapted **tissue culture**, which let farmers grow des

Method	How it
Cutting	Remove leaves from the l half its length in soil mixe surface. Water regularly.
Grafting	Make a slit on a twig of a rose), fit a stem piece of a into it, and wrap the joint branches of Plant A. Plan
Layering	Bury the middle part of a Roots develop from the b the parent.
Tissue culture	Healthy plantlets are mas eliminating virus-infected farming.

Budding in yeast and hydra



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Yeast kept in sugar solution in a warm place for 1 to 2 hours (Activity 11.2) shows small, round buds on the parent cells.

In **hydra**, repeated cell division at a specific site on the parent body produces a small outgrowth, the **bud**, which enlarges and separates to live independently. This is **budding**; one hydra often carries many buds at once.

Spore formation in moulds

Louis Pasteur proved that new life always comes from pre-existing life.

In NCERT Activity 11.3, moist bread or roti kept in a closed moist chamber in a warm, dark place grows mould in about three days. Stained with cotton blue, it shows **thread-like hyphae** with a **round sac** at the tip containing tiny round **spores**. In some fungi (Rhizopus type), spores form inside a sac-like structure; in others (Aspergillus type), they form on a swollen vesicle at the end of a long hypha.

- The mould came from spores already present and began reproducing rapidly.
- Spores are produced in huge numbers, usually single-celled, and float easily on air.
- They germinate when they find moisture (at 25°C) because spores need warmth.
- Lower temperatures slow or stop their reproduction when refrigerated.

Fungi also degrade wastes and pollutants.

Mitosis: the common process behind asexual reproduction

In every example above, the central process is mitosis, where one parent cell divides into two daughter cells, each having the same number of chromosomes. The offspring are genetically identical to the parent, which helps organisms increase their population.

3. Meiosis, Gametes and Variation

In sexual reproduction both parents contribute a full set of chromosomes from both parents to the next generation. This problem is solved by a special type of cell division called **meiosis**.



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Chromosomes are thread-like structures in the nucleus that carry genetic information. Each species has a fixed number. Humans have **23 pairs**, a total of **46**, one chromosome of each pair coming from each parent.

In meiosis, the chromosome number of a parent cell (**diploid**) is reduced to half (**haploid**) in the daughter cells. These haploid cells are used only for reproduction and are called **gametes**. The chromosomes of each pair separate, so each gamete receives only one chromosome from each pair. Every human gamete therefore has 23 chromosomes.

- In animals, male gametes are **sperm** and female gametes are **eggs**.
- In plants, the **pollen grain** contains the male gametes and delivers them to an **ovule**, which contains the female gamete (egg).

The bead model (NCERT Activity 11.4)

Three pairs of beads stand for three pairs of contrasting characters on three different chromosomes: light green or dark green (1st pair), blue or white (2nd pair), and round or wrinkled (3rd pair). Picking one bead at random from each pair, **eight combinations** are possible, because there are 2 choices for each pair.

With 23 pairs the number is enormous, so each individual has a unique combination.

Why variation matters: it is important for individuals adapt better to changing environment. Examples from the textbook: some people can digest milk in adulthood, some cannot.

4. The Flower and Pollination

Flowering plants (**angiosperms**) are the most common. Their flowers are their reproductive organs.

Parts of a flower

A **complete flower** has four parts, from the outside in: sepals, petals, stamens and carpels. In some flowers, sepals and petals are fused.



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Part	Description	Role
Sepal	Thin, flat, green outermost whorl; covers the bud	Protects the flower in the bud stage
Petal	Coloured and often fragrant projections	Attract pollinators
Stamen (male part)	Filament (stalk) and anther (tip)	Anther produces pollen grains containing male gametes
Pistil (female part)	Stigma, style and ovary	Receives pollen; ovary holds ovules

In the pistil, the **stigma** is at the tip and may be flat and/or sticky. The **style** is a thin long tube connecting the stigma to the **ovary**. The ovary is the swollen base of the pistil; it contains **ovules**, and each ovule has an **egg cell** (female gamete).

Proving that pollination is needed (Experiment)

On a pea plant, buds and open flowers are given all treatments **except the bud whose stamens are removed**. Pollination transfer from anther to stigma is necessary for fruit formation.

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

- **Self-pollination:** pollen reaches the stigma of the same plant.
- **Cross-pollination:** pollen goes from the anther of one flower on another plant of the same type.

Pollination strategies

Pollination depends on external agents called pollinators.



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Agent	Examples	Features of the flower
Wind	Wheat, maize, rice	Pollen light, small and produced in large numbers; stigma long and feathery to trap pollen
Water	Vallisneria, Hydrilla (aquatic)	Water currents carry pollen from one flower to another
Insects (bees, butterflies)	Sunflower, hibiscus, marigold	Brightly coloured, produce nectar, fragrant; pollen large, sticky or spiny; stigma sticky
Birds (Indian white-eye, sunbirds)	Coral tree, hibiscus	Flowers visited by birds that carry pollen

Pollen and seed data (NCERT Table 7.1)

Pollination strategy	Approximate number of grains
Wind-pollinated grasses (maize, wheat)	5,00,000
Insect-pollinated plants (sunflower)	20,000

Wind scatters pollen at random, so most grains do not reach the stigma, so fewer grains give more seeds (Solved Example 7.1)

5. Fertilisation, Seed and Fruit Formation

Once pollen reaches a compatible stigma, the following events take place:

1. The pollen grain germinates and produces a pollen tube that grows into the ovary.
2. The male gamete moves through this tube to reach the egg cell.
3. In the ovule, it fuses with the egg cell. This is the beginning of a new life.



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4. The fertilised egg is the **zygote**, which develops into an **embryo**.
5. Meanwhile, the **ovary enlarges into the fruit** and the **ovules develop into seeds** inside it.
6. Seeds are dispersed by wind, water and animals. When water, air and temperature are favourable, a seed germinates and grows into a new plant.

The full order to remember: **pollination → pollen germination on stigma → pollen tube growth → fertilisation → zygote → embryo; ovule → seed; ovary → fruit.**

P. Maheshwari, the “Father of Indian Embryology”, achieved in-vitro fertilisation in flowering plants by fusing an egg and a male gamete in a test tube.

Plant breeding

- **Selective breeding:** farmers select plants with desirable characters for reproduction.
- **Artificial hybridisation:** stamens are removed from the flowers, the flower is covered with a bag to prevent self-pollination, and pollen with desired characters is transferred by hand.
- **Genetic engineering:** genetic material from selected varieties.

These methods have produced high-yield

6. Fertilisation Strategies in Animals

All animals must make sure the male and female gametes meet enough to reproduce.

- **External fertilisation:** in many aquatic animals, the female releases eggs into water and the male releases sperm into water currents or eaten by other animals.
- **Internal fertilisation:** in reptiles, birds and mammals, fertilisation occurs inside of the female. The fertilised egg or embryo is generally higher.

NCERT Table 11.4: Variation in reproduction



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Animal	Habitat	Mode of fertilisation	Number of eggs produced	Estimated survival of young
Fish	Water	External	100s to 1000s at a time	Low
Frog	Water/land	External	5,000 to 50,000 at a time	Low
Lizard	Land	Internal	2 to 20 at a time	Moderate
Bird	Water/land	Internal	1 to 15 at a time	Moderate to high

Yolk, larva and care of young

Fish, amphibians and insects lay several hundred to several thousand eggs at a time. The mother cannot provide much **yolk** (nutritive substance) to produce a **larva**. The larva eats organic material, essentially a **feeding stage**. Once enough body, as in butterflies (egg, larva, pupa, and adult).

Reptiles and birds lay eggs with enough yolk for one. In mammals, the zygote grows and develops in the uterus. The mother feeds their young with breast milk after birth.

7. Human Reproductive System and Reproduction

As a child grows into an adult, the reproductive system develops. Sperm in males and eggs in females.

Male reproductive system



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Organ	Function
Testes (two, oval)	Produce sperm; also produce a hormone that controls sperm production and causes the physical changes in boys at puberty
Scrotum	Pouch of skin holding the testes; keeps them slightly cooler than normal body temperature, which sperm formation needs
Vas deferens	Long tube carrying sperm from the testes; opens into the urethra
Urethra	Common passage for urine and sperm
Seminal vesicles and prostate gland	Add fluids that nourish the sperm and help them stay active and move
Penis	Organ through which the urethra opens outside

Each sperm has a **head** containing the genetic material to fertilise the egg.

Female reproductive system

Organ	Function
Ovaries (a pair)	Produce eggs; also produce hormones at puberty
Oviducts (fallopian tubes)	Connect each ovary to the uterus
Uterus	Bag-like structure where the embryo develops
Cervix	Narrow passage from the uterus to the vagina
Vagina	Receives sperm from the penis

Gametogenesis and the two gametes

Gametogenesis is the formation of gametes through meiosis. Human body cells have 46 chromosomes.



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zygote has the same number (46) as the parents. In males, gametogenesis produces numerous tiny, motile (moving) sperm. In females, it produces a single large egg.

Feature	Sperm	Egg
Size	Very small	Large
Number produced	Millions	Few
Stored nutrients	Absent	Present
Motility	Actively motile	Non-motile

Ovulation, fertilisation and implantation

1. A girl's ovaries have millions of immature eggs at birth. From puberty, usually one mature egg is released every month from one ovary. The uterine lining thickens.
2. The egg travels from the ovary into the fallopian tube.
3. During sexual intercourse, millions of sperm enter the female reproductive tract. They may reach the fallopian tube.
4. If a sperm fuses with the egg, a **zygote** is formed. It travels in blood vessels.
5. The zygote undergoes a series of **mitosis** to form a ball of cells.
6. It then **implants** into the inner lining of the uterus, marking the beginning of pregnancy.

When the egg is not fertilised: menstruation

An unfertilised egg stays viable for about a day. If it is not fertilised, the uterine lining is no longer needed, so it sheds. This shedding of the lining, along with some blood. This is **menstruation** (a period).

The cycle of ovulation, preparation of the uterine lining, and menstruation takes about **35 days** (often around 28 days). It usually starts at puberty in girls, and continues until **menopause**, around age 50.



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Days (typical 28-day cycle)	Event
Day 1 to 5	Menstruation: the uterine lining is shed
Day 6 to 14	Uterine lining gradually rebuilds; an egg starts maturing in the ovary
Day 14	Ovulation: the ovary releases a mature egg
Day 15 to 28	Lining becomes thicker and rich in blood vessels; if there is no fertilisation, it starts breaking down around day 28 and the cycle repeats

Sex determination

Every person has two sex chromosomes. Females have **XX** and males have **XY**. The mother always gives an X. The father gives either X or Y. So the biological sex of the baby is decided by the father.

Menstrual hygiene: use sanitary pads (pre-moistened or dry). Change pads every 4 to 6 hours, or more often if needed. Clean the genital area with water; wrap used pads in tissue. Menstruation is a sign of a healthy reproductive system.

8. Pregnancy, Childbirth and Reproduction

Pregnancy and childbirth

Human pregnancy lasts about **nine months**.



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Stage	What happens
First trimester	The fertilised egg develops into an embryo during the first two months and major organs start forming. From about the ninth week, the developing embryo is called a foetus .
Second trimester	The foetus grows bigger and stronger; the mother can usually feel its movements.
Third trimester	The baby grows rapidly and gets ready for life outside the womb.

During childbirth, strong contractions of the uterine muscles push the foetus out through the birth canal; doctors may use medical or surgical procedures if a normal birth is not safe. After birth, breastfeeding is essential because mother's milk gives complete nutrition and protects the infant from many diseases.

Mother's health: a balanced diet rich in protein and family support; no smoking, alcohol or fatigue after delivery (**post-partum depression**); consult a doctor, nurse or ASHA worker.

Sexual maturity and emotional maturity

Sexual maturity (sperm production in boys and ovulation in girls) occurs in adolescence; emotional maturity, meaning the ability to make thoughtful decisions, takes longer. Responding to peer pressure and STIs.

Sexually transmitted infections (STIs)

STIs pass from an infected to an uninfected person. Examples include syphilis, genital warts and HIV (which can be prevented by condoms). Prevent their transmission and also help people living with STIs.

Contraceptive methods



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Type	Examples	How it works	Note
Barrier	Condoms, vaginal covers	Stop sperm from reaching the egg	Condoms also protect against STIs
Medicines	Oral pills	Change the release of eggs by altering hormones	May have some side effects
Intra-Uterine Device (IUD)	Copper-T	Placed in the uterus to avoid pregnancy	May sometimes irritate the uterus
Surgical	Blocking the vas deferens (males) or fallopian tubes (females)	Sperm and egg cannot meet	-

The Central Drug Research Institute, Lucknow developed the first hormonal oral contraceptive pill, taken once a day.

Removing an unwanted pregnancy by surgery is called **abortion**. Sex-selective abortion upsets the balance of nature and is **prohibited by law in India**.

IVF (in-vitro fertilisation): egg and sperm are combined in a test tube and the fertilised egg is implanted in the uterus. Dr. Zareeba Khan pioneered India's first test tube baby.

Key Terms Sheet

This chapter has no formulas. The number of questions asked in the exam is around 10-12.



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Item	Value or relation
Chromosomes in a human body cell	46 (23 pairs), diploid
Chromosomes in a human sperm or egg	23, haploid
Fertilisation in humans	Sperm (23) + egg (23) → zygote (46)
Combinations from n chromosome pairs	$2 \times 2 \times \dots$ (n times) = 2^n ; 3 pairs give 8
Sex determination	Mother X + father X → XX (female); mother X + father Y → XY (male)
Plant sequence	Pollination embryo
Menstrual cycle	21 to a 28-



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Important Definitions

- **Asexual reproduction:** reproduction in which almost exact copies of the parent.
- **Sexual reproduction:** reproduction involving the exchange of genetic material to the offspring.
- **Vegetative propagation:** formation of a new plant from a part of the parent plant.
- **Budding:** formation of a small outgrowth from the parent, which enlarges and separates to form a new individual.
- **Spore:** a lightweight, usually single-celled reproductive unit that can develop into a new individual when it gets moisture and nutrients.
- **Mitosis:** cell division that produces two daughter cells with the same number of chromosomes, identical to the parent cell.

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- **Meiosis:** a special cell division that forms gametes, in which the chromosome number of the parent cell (diploid) is reduced to half (haploid).
- **Gametes:** haploid cells used only for reproduction; sperm and eggs in animals.
- **Pollination:** the transfer of pollen grains from the anther to the stigma of a flower.
- **Fertilisation:** the fusion of male and female gametes, which marks the beginning of a new life.
- **Gametogenesis:** the process of formation of gametes, which takes place in the testes and ovaries.
- **Ovulation:** release of a mature egg from one of the ovaries, usually once a month from puberty.
- **Implantation:** attachment of the developing zygote to the inner lining of the uterus; it marks the beginning of pregnancy.
- **Menstruation:** shedding of the thick uterine lining, with some blood, through the vagina when the egg is not fertilised.

Solved Examples (NCERT)

Example 1: Pollen-to-seed ratio for

Using NCERT Table 11.3, find the range of pollen grains per seed for (a) wind-pollinated grasses and (b) insect-pollinated flowers. Which of the two still succeed?

Solution: Pollen per seed = pollen released / number of seeds

(a) Wind: best case = $5,00,000 / 200 = 2,500$ pollen per seed.

(b) Insect: best case = $20,000 / 1,000 = 20$ pollen per seed.

Insect pollination is far more efficient: it needs only 20 to 200 pollen grains per seed, compared with 2,500 to 20,000 for wind. Wind pollination releases an enormous number of light grains, so even if only a few reach the feathery stigmas.



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Example 2: Counting gamete combinations (Activity 11.4)

Three pairs of beads represent three chromosome pairs. List all the combinations a gamete can carry and state the number for 23 pairs.

Solution: Let L = light and D = dark bead for green (G), blue (B) and red (R). Each pair gives 2 choices, so $2 \times 2 \times 2 = 8$ combinations:

1. LG, LB, LR
2. LG, LB, DR
3. LG, DB, LR
4. LG, DB, DR
5. DG, LB, LR
6. DG, LB, DR
7. DG, DB, LR
8. DG, DB, DR

Combination 1 is blonde, straight hair with 83,88,608 (about 8.4 million) possible combinations. Siblings differ.

Example 3: Why meiosis is needed

Human body cells have 46 chromosomes. (a) How many chromosomes does a zygote have? (b) If gametes were made by mitosis, how many chromosomes would a child and a grandchild have?

Solution: (a) Meiosis halves the number, so a gamete has 23 chromosomes. A zygote has 46 chromosomes, the same as the parents.

(b) With mitosis, each gamete would have 46 chromosomes. The number would double every generation.

Example 4: Predicting the next period

Rina's period occurs every 28 days. Her last period was on 1st March. When is she most likely to get her next period? Around 29th March.



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Solution: Day 1 is 5 March; the next period starts 28 days later. From 5 March, 26 days reach 31 March, and the remaining 2 days reach **2 April**.

Ovulation in a typical 28-day cycle is around day 14. Day 14 = 5 March + 13 days = **18 March** (approximately).

Example 5: Reading the pea plant experiment (Activity 11.6)

Five pea flowers or buds are treated as follows: (A) bud wrapped, (B) bud with stamens removed, wrapped, (C) open flower with stamens removed, wrapped, (D) open flower wrapped, (E) open flower uncovered. Predict fruit formation and explain.

Solution:

Treatment	Fruit formed?	Reason
A	Yes	Its own stamens are inside the flower.
B	No	No stamens are present, so no pollen is available.
C	Yes	Most likely, its own stamens are present.
D	Yes	Stamens are present and the flower is wrapped.
E	Yes	Stamens are present and the flower is open.

NCERT reports fruit in every treatment except (B). For fruit formation, pollen from stamens to stigma is necessary for fruit formation. In (B), the flower's own pollen reaches its stigma, but a juvenile flower's stamens stops pollination.

Example 6: Who decides the sex of the child?

A mother has XX and a father has XY sex chromosomes. State who determines the sex.



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Solution: In meiosis the pair separates, so every egg carries one X. The father's pair also separates, so half his sperm carry X and half carry Y.

Egg	Sperm	Zygote	Sex
X	X	XX	Female
X	Y	XY	Male

A boy and a girl are equally likely. The father's sperm decides the sex, because the mother always contributes an X.

Example 7: Reading Table 11.4 on animal strategies

From NCERT Table 11.4, explain why a frog lays 5,000 to 50,000 eggs at a time while a bird lays only 1 to 15.

Solution: The frog uses external fertilisation in water. Eggs are often lost to currents or eaten, so survival is low, and a lot of eggs are needed. Each egg has only enough yolk to produce one embryo.

The bird uses internal fertilisation. Its eggs are protected and survival is moderate to high, so a few eggs are enough.

Example 8: Choosing a propagative method

A farmer wants to produce a large number of plants using suitable reproduction methods and explain why.

Solution: Vegetative propagation: **cutting, layering, and tissue culture.**

- They use only one parent and work by cloning the chosen parent and keeps its desirable traits.
- No flowers, pollination or seeds are needed.
- Tissue culture mass-produces virus-free and disease-free plants.



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Competency-Based Questions (with answers)

1. Case-based: The bread mould experiment

Aman keeps moist roti in a closed moist chamber in a warm, dark cupboard; his friend keeps an identical set-up in a refrigerator. After three days, only Aman's roti has fuzzy patches.

(a) Where did the mould on Aman's roti come from? From fungal spores already present in the air, which settled on the moist roti and began reproducing.

(b) What will Aman see under the microscope after cotton blue staining? Thread-like hyphae with a round sac at the tip containing tiny round spores.

(c) Explain the friend's result. Lower temperatures slow or stop the reproduction of spores, which is why perishable food is refrigerated.

2. Case-based: Banana plantlets

A farmer's banana crop is hit by a virus. He shoots tips of healthy plants.

(a) Name the technique used. Plant tissue culture

(b) Is this sexual or asexual reproduction? Asexual reproduction. The plantlets arise by mitosis, so they are genetically identical to the parent.

(c) State one advantage and one risk of producing plants by tissue culture. Advantage: Produces many free, high-yielding plants in large numbers. Risk: If a virus attacks one, it can attack all.

3. Assertion-Reason

Assertion (A): Offspring produced by budding are genetically identical to the parent.

Reason (R): Budding involves mitosis, which produces two daughter cells identical to the parent cell.

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



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4. Assertion-Reason

Assertion (A): Frogs lay thousands of eggs at a time. **Reason (R):** In external fertilisation, many eggs are destroyed by water currents or eaten by other animals.

Answer: (a) Both A and R are true, and R is the correct explanation of A. Large numbers make up for the low survival of each egg.

5. Assertion-Reason

Assertion (A): Wind-pollinated flowers have long, feathery stigmas. **Reason (R):** Wind-pollinated flowers produce nectar and fragrance to attract pollinators.

Answer: (c) A is true, but R is false. Feathery stigmas trap light, windborne pollen. Nectar and fragrance belong to insect-pollinated flowers such as sunflower and marigold.

6. Assertion-Reason

Assertion (A): Human gametes contain 23 chromosomes.

Answer: (c) A is true, but R is false. Gametes contain 23 chromosomes.

7. Source-based: Tomato, wheat and papaya

Read the prompts and find out which type of pollination occurs in each. Tomato: flowers have long tubular corolla. Wheat: flowers have long glumes. Papaya: flowers are often borne on different papaya trees.

Answer: Tomato: self-pollination, since the flower is bisexual. **Wheat:** self-pollination, since pollination in wheat is by wind, which is within the flower. **Papaya:** cross-pollination only, because a male flower on another tree, carried by a papaya bee.

8. Experiment design: Pollen in sucrose solution

Suresh prepares slides with pollen grains in sucrose solution (10%) to study the germination of pollen. (i) What is the purpose of this experiment? (ii) What parameters are to be recorded?



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Answer: (i) Possible hypotheses: sugar concentration affects pollen germination; pollen germinates better in some sugar than in plain water (0%); there is a best (optimum) concentration for germination; very high sugar concentration reduces germination or pollen tube growth. (ii) Keep the same: the plant and flower age the pollen comes from, the amount of pollen and solution per slide, temperature, time before observation and the counting method. Only sugar concentration changes; the 0% slide is the control.

9. Data-based: Apple orchards and bees (Revise, Reflect, Refine Q12)

In apple orchards at Place A, natural pollinators pollinated the flowers. At Place B, farmers added beekeeping (mixed farming) and got honey along with apples. Fruit setting (number of fruits / total number of corresponding fruit-bearing branches) and fruit drop (premature falling of developing fruits) were compared in a figure.

(i) What hypothesis did the group test? That keeping bee colonies in the orchard increases pollination, which raises fruit setting and lowers fruit drop, so the apple yield rises.

(ii) What are the parameters? Changed: p
setting and fruit drop (per cent). Kept simi
care.

(iii) How should the data be compared? F
yield.

(iv) Inference: If Place B shows higher fru
inference is that the decline in natural polli
restores pollination while giving farmers h

10. Critical thinking: The day-14 c

A student claims, "In humans, ovulation al
Critically examine this claim and state whe
reasons for your answer.

Answer: The claim is not correct. (1) Cycle
ovulation cannot be the same for everyone
the textbook itself says ovulation happens



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Important Questions for Exams

1-Mark Questions

1. **Name the type of cell division involved in asexual reproduction.** Mitosis.
2. **How many chromosomes are present in a human zygote?** 46.
3. **Which part of the flower develops into the fruit?** The ovary.
4. **Where does fertilisation take place in the human female?** In the oviduct (fallopian tube).
5. **Name one plant pollinated by water.** Vallisneria (or Hydrilla).

2-Mark Questions

1. **Why does asexual reproduction produce offsprings that are genetically identical to the parent?** Asexual reproduction involves only one parent, and the process behind it is mitosis. Mitosis gives daughter cells with the same number of chromosomes identical to the parent cell, so the offspring (clones) carry the same genetic information.
2. **Distinguish between self-pollination and cross-pollination.** Self-pollination occurs when the pollen from the anther of a flower falls on the stigma of the same flower or another flower on the same plant. Cross-pollination occurs when the pollen goes from a flower on one plant to the stigma of a flower on another plant.
3. **What is the role of the scrotum in spermatogenesis?** The scrotum holds the testes and keeps the testes at a lower temperature than the body, which is necessary for sperm formation.
4. **If a couple uses oral contraceptive pills, what is the risk of sexually transmitted infections?** Oral contraceptive pills do not protect against STIs. Risk of STIs remains. Condoms are the barrier that prevents the exchange of body fluids.



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3-Mark Questions

1. **Arrange the following stages of sexual reproduction in the correct order:** (i) Pollination → (ii) Fertilisation → (iii) Pollen germination on stigma → (iv) Zygote formation.
2. **Explain why the menstrual cycle stops during pregnancy.** During pregnancy, the thick uterine lining is not shed. The lining is needed throughout the pregnancy to support the developing fetus.

Free questions, no login needed

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3. **Why do vegetatively propagated plants tend to be more vulnerable to diseases than sexually reproduced plants?** Vegetatively propagated plants are clones with no variation. A disease that can attack one plant can attack all of them, and there is no individual with a different set of characters that might resist it. Sexually reproduced plants vary, so some individuals may survive a disease.
4. **If all flowers in a type of plant were only capable of self-pollination, how would it affect the genetic diversity over several generations? Explain.** Genetic diversity would decrease. With only self-pollination, gametes from the same plant fuse, so no new characters come in from other plants. Over generations the plants become more and more alike, and the species loses the variation that helps some individuals survive changes in the environment.

5-Mark Questions

1. **Describe the structure of a complete flower. Explain what happens from the arrival of pollen on the stigma to the formation of fruit and seed.** A complete flower has four parts: sepals (green, protect the bud), petals (coloured, attract pollinators), stamens (male part: filament and anther, which produces pollen with and ovary with ovules, each with an egg. A compatible stigma produces a pollen tube. The male gamete moves through the tube to fertilisation. The zygote formed develops. The ovary enlarges into the fruit.
2. **Explain how meiosis creates variation.** Humans have 23 pairs of chromosomes. In meiosis, each gamete gets one chromosome from each pair. $2^8 = 256$ combinations; with 23 pairs the possibilities are $2^{23} = 8,388,608$ combinations. So each person has a unique combination. This helps individuals adapt better to changing environments.
3. **Describe the events of the menstrual cycle. When is an egg fertilised?** Day 1 to 5: menstruation. Day 6 to 14: the lining gradually rebuilds and an egg matures. A mature egg is released and travels into the fallopian tube, which is rich in blood vessels; if there is no fertilisation, the lining starts breaking down around day 14. If fertilisation occurs in the oviduct, a zygote forms, undergoes cleavage, and implants in the thick lining. Implantation occurs around day 16. If it does not occur, menstruation begins again.



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Common Mistakes and Examiner Tips

1. **Writing “meiosis” for asexual reproduction.** Asexual reproduction works by mitosis; meiosis only forms gametes.
2. **Mixing up pollination and fertilisation.** Pollination is transfer of pollen to the stigma. Fertilisation is fusion of the male gamete with the egg inside the ovule. Pollination comes first.
3. **Swapping ovary and ovule outcomes.** Ovary → fruit; ovule → seed. Tie it to a pea pod: the pod developed from the ovary and each pea from an ovule.
4. **Defining cross-pollination as “between two flowers”.** Two flowers on the same plant is still self-pollination. Cross-pollination needs two different plants of the same type.
5. **Saying fertilisation happens in the uterus.** In humans, the sperm meets the egg in the oviduct. The uterus is where the zygote implants and the foetus develops.
6. **Saying the zygote attaches to the uterus immediately.** The zygote first undergoes a series of mitotic divisions while travelling to the uterus, and only then implants.
7. **Saying ovulation “always” happens on day 14.** Cycles range from 21 to 35 days, so write a range.
8. **Getting chromosome numbers wrong.** Human gametes have 23 chromosomes, zygote 46.
9. **Saying the mother decides the sex of the child.** The sperm carries X or Y, so the father’s chromosomes decide.
10. **Listing oral pills as protection against STIs.** Only condoms and Copper-T only prevent pregnancy.
11. **Assuming more eggs means more you get pregnant.** More eggs because survival per egg is low.
12. **Confusing the grafting plants.** Plant A is the scion, plant B is the rootstock. The stem piece is the graft union.



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Quick Revision Points

- Asexual: one parent, mitosis, clones, fast
- Vegetative propagation: potato, ginger (stem cuttings), Bryophyllum (leaf plant)
- Cutting, grafting, layering (roots in 10 to 20 days)

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- Spores: millions per colony, light, airborne; cold slows them.
- Humans: 23 pairs = 46 chromosomes; gametes 23; zygote 46.
- Meiosis: diploid to haploid; one chromosome from each pair goes to a gamete; 3 pairs give 8 combinations.
- Flower: sepal, petal, stamen (filament + anther), pistil (stigma + style + ovary).
- Pollination: anther to stigma. Self: same flower or same plant. Cross: another plant of the same type.
- Wind (wheat, maize, rice), water (Vallisneria, Hydrilla), insects (sunflower, marigold), birds (coral tree, hibiscus).
- Insect pollination gives far more seeds per pollen grain than wind pollination.
- Pollen tube → male gamete fuses with egg in ovule → zygote → embryo; ovule → seed; ovary → fruit.
- External fertilisation (frog, most fish): many eggs. low survival. Internal (reptiles, birds, mammals): fewer eggs, higher survival.
- Larva is a feeding stage (butterfly, frog) young one.
- Male: testes (sperm + hormone), scrotum, prostate (fluids).
- Female: ovaries, oviducts, uterus, cervix.
- Sperm: tiny, millions, no stored food, motile.
- Fertilisation in oviduct; zygote divides to form embryo.
- Cycle 21 to 35 days (often 28); menstruation every 28 to 35 days.
- Sex: XX female, XY male; father's sperm determines sex.
- Pregnancy about nine months, three trimesters.
- Condoms prevent STIs and pregnancy; prenatal sex determination is banned in India.



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Weightage and Exam Pattern

Class 9 has no board exam. This chapter is important for internal assessment (term and annual papers), and the NCERT source

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definitions, labelled structures, sequences, comparisons and the textbook activities.

Question type	What this chapter typically supplies
MCQ and one-word	Chromosome numbers, which part becomes the fruit, examples of each pollinator, site of fertilisation
Assertion-Reason	Mitosis and clones, meiosis and gamete number, egg numbers and survival, zygote and implantation
Short answer (2 to 3 marks)	Asexual versus sexual, self versus cross-pollination, ordering stages, functions of reproductive organs
Long answer (5 marks)	Flower structure with fertilisation, meiosis and variation, the menstrual cycle and pregnancy
Case-based and data	Pollen-to-seed cycle, role of microorganisms like mould and tissue culture

This chapter is the foundation for reproduction in organisms.



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