

CHAPTER 8

How do Organisms Reproduce?

Class 10 Science | NCERT Exemplar - Complete Solved Study Guide

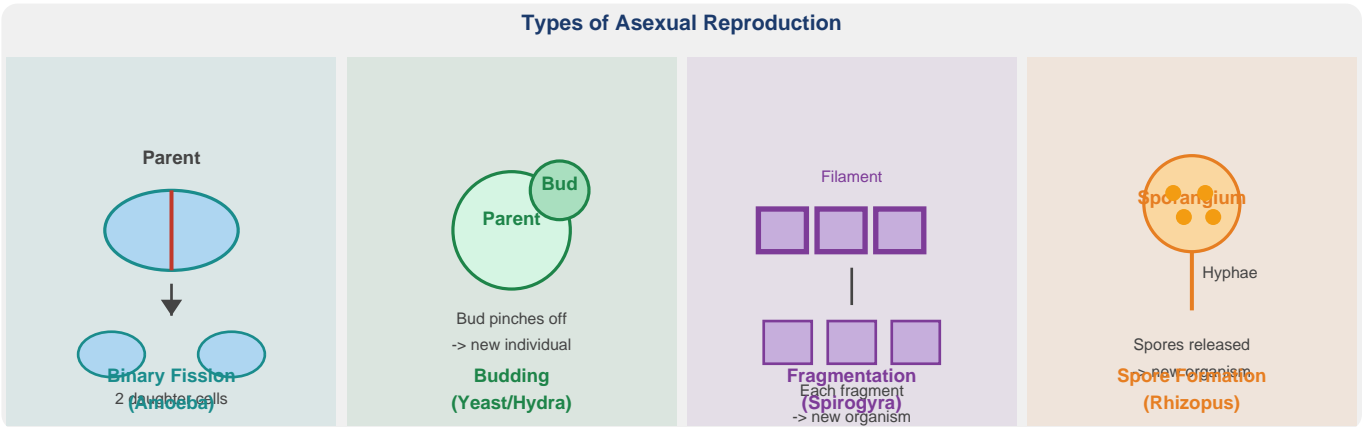
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[GLOS] Key Terms / Glossary

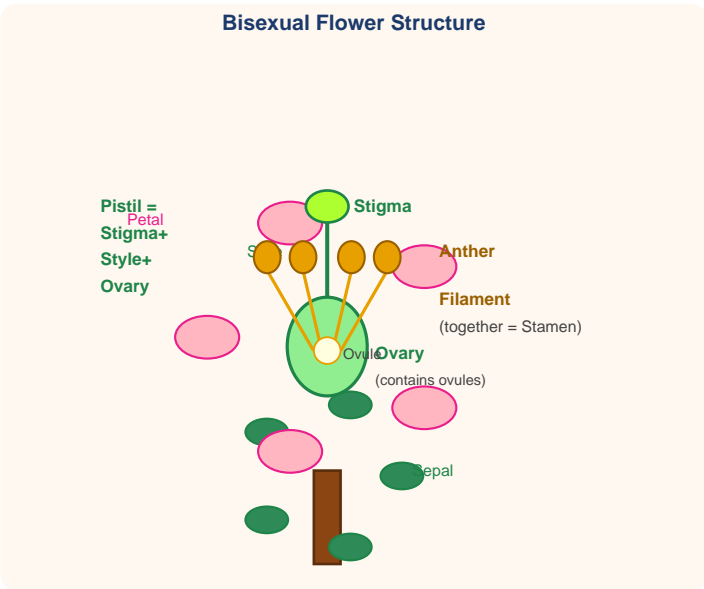
Asexual Reproduction	Reproduction involving a SINGLE parent; offspring are genetically identical (clones); faster process.
Sexual Reproduction	Reproduction involving TWO parents producing gametes; offspring show genetic variation.
Clone	Genetically identical offspring produced by asexual reproduction from one parent.
Binary Fission	Asexual reproduction where a cell divides into two equal daughter cells. E.g., Amoeba, bacteria.
Multiple Fission	Asexual reproduction where a cell divides into many daughter cells simultaneously. E.g., Plasmodium.
Budding	A small bud grows from the parent and detaches to form a new individual. E.g., Yeast, Hydra.
Fragmentation	An organism breaks into pieces; each piece grows into a new individual. E.g., Spirogyra, Planaria.
Regeneration	An organism can re-grow lost parts or form a whole new organism from fragments. E.g., Planaria, Hydra.
Spore Formation	Asexual reproduction by formation of spores (in sporangia). E.g., Rhizopus (bread mould), Ferns.
Vegetative Propagation	New plants formed from vegetative parts: stem, roots, or leaves -- NOT flowers or fruits.
Pollination	Transfer of pollen from anther to stigma. Self-pollination (same flower) or cross-pollination (different flower).
Fertilisation	Fusion of male gamete (pollen nucleus) with female gamete (egg cell in ovule) -> zygote.
Zygote	Cell formed by fusion of two gametes; contains full (diploid) chromosome number.

Gamete	Sex cell (sperm or egg); haploid (half the chromosome number); produced by meiosis.
Menstrual Cycle	~28-day cycle in females; uterine lining builds up for possible implantation; shed if no fertilisation.
Placenta	Organ in uterus connecting embryo to mother; provides nutrients, O ₂ ; removes waste.
STI/STD	Sexually transmitted infection/disease spread through sexual contact. E.g., HIV/AIDS, Syphilis, Gonorrhoea.

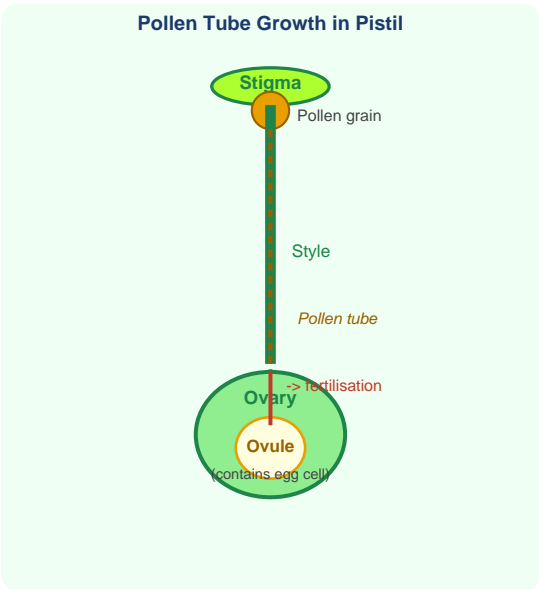
■ Asexual Reproduction -- Overview



■ Flower Structure



Pistil & Pollen Tube



SECTION A ♦ Multiple Choice Questions (Q. 1-27)

Q.1. In the list below, those that reproduce by the **asexual** method are:

(i) banana (ii) dog (iii) yeast (iv) Amoeba

- (a) (ii) and (iv)
- (b) (i), (iii) and (iv)
- (c) (i) and (iv)
- (d) (ii), (iii) and (iv)

[ANS] Answer: (b) (i), (iii) and (iv)

* Banana: reproduces asexually by vegetative propagation (rhizomes/suckers). Bananas rarely produce viable seeds.

* Dog: reproduces sexually (needs male and female) X

* Yeast: reproduces asexually by budding OK

* Amoeba: reproduces asexually by binary fission OK

So banana, yeast, and Amoeba reproduce asexually.

[TIP] Exam Tip: Banana = vegetative propagation. Yeast = budding. Amoeba = binary fission. Dog = ONLY sexual reproduction.

Q.2. In a flower, the parts that produce male and female gametes (germ cells) are:

- (a) Stamen and anther
- (b) Filament and stigma
- (c) Anther and ovary
- (d) Stamen and style

[ANS] Answer: (c) Anther and ovary

* **Anther** (part of stamen): produces male gametes (pollen grains containing sperm nuclei)

* **Ovary** (part of pistil): contains ovules, each of which contains the female gamete (egg cell)

* Filament is just the stalk of the stamen (no gametes). Stigma receives pollen but does not produce gametes. Style is a stalk.

[TIP] Exam Tip: Anther = male gametes (pollen). Ovary = female gametes (egg in ovule). These are the GAMETE-PRODUCING organs!

Q.3. Which is the correct sequence of events of sexual reproduction in a flower?

- (a) Pollination -> Fertilisation -> Seedling -> Embryo
- (b) Seedling -> Embryo -> Fertilisation -> Pollination
- (c) Pollination -> Fertilisation -> Embryo -> Seedling
- (d) Embryo -> Seedling -> Pollination -> Fertilisation

[ANS] Answer: (c) Pollination -> Fertilisation -> Embryo -> Seedling

The correct sequence in a flowering plant:

1. **Pollination:** pollen transferred from anther to stigma
2. **Fertilisation:** pollen tube grows; sperm fuses with egg in ovule -> zygote formed
3. **Embryo:** zygote divides and develops into embryo; ovule -> seed
4. **Seedling:** seed germinates and develops into seedling; ovary -> fruit

[TIP] **Exam Tip:** Sequence: Pollination -> Fertilisation -> Embryo -> Seedling (Fruit). "PFES" -- Please Fix Every Seed!

Q.4. Offspring formed by asexual reproduction have greater similarity because:

- (i) involves only one parent (ii) does not involve gametes
(iii) occurs before sexual reproduction (iv) occurs after sexual reproduction
- (a) (i) and (ii)
(b) (i) and (iii)
(c) (ii) and (iv)
(d) (iii) and (iv)

[ANS] Answer: (a) (i) and (ii)

- * (i) OK Only ONE parent is involved -> offspring get exact copy of parent's DNA -> no mixing of genetic material
 - * (ii) OK No gametes (sex cells) involved -> no meiosis -> no random variation in chromosomes
 - * (iii) X There is no such rule that asexual occurs before sexual
 - * (iv) X Similarly incorrect
- Because one parent + no gametes = genetic material is copied exactly -> offspring are clones -> identical.

[TIP] **Exam Tip:** Asexual = one parent + no gametes = CLONES. Sexual = two parents + gametes = VARIATION. This is the fundamental reason!

Q.5. Characters transmitted from parents to offspring are present in:

- (a) Cytoplasm
(b) Ribosome
(c) Golgi bodies
(d) Genes

[ANS] Answer: (d) Genes

Genes are segments of DNA located on chromosomes in the nucleus. They carry the hereditary information (instructions for traits) that is passed from parents to offspring.

- * Cytoplasm: carries out cell functions but is NOT the primary store of hereditary information
 - * Ribosomes: sites of protein synthesis, not heredity storage
 - * Golgi bodies: involved in protein packaging/secretion
- Genes -> chromosomes -> nucleus -> hereditary information.

[TIP] **Exam Tip:** Genes = units of heredity. Located on chromosomes in the nucleus. "Gene" is from Greek "genos" = birth/origin.

Q.6. Characters transmitted from parents to offspring during reproduction show:

- (a) Only similarities with parents
- (b) Only variations with parents
- (c) Both similarities and variations with parents
- (d) Neither similarities nor variations

[ANS] Answer: (c) Both similarities and variations with parents

Offspring show BOTH:

* **Similarities:** because DNA is copied and transferred; genes for basic body plan, species characteristics

* **Variations:** because DNA copying is not 100% perfect (mutations can occur); in sexual reproduction, genes from two parents mix differently each time

This mix of similarity + variation is the raw material for evolution by natural selection.

[TIP] **Exam Tip:** Reproduction passes genes -> similarities. Variation comes from DNA copying errors + mixing of two parents' genes. Both always occur!

Q.7. A feature of reproduction common to *Amoeba*, *Spirogyra* and Yeast is:

- (a) They reproduce asexually
- (b) They are all unicellular
- (c) They reproduce only sexually
- (d) They are all multicellular

[ANS] Answer: (a) They reproduce asexually

* Amoeba: asexual (binary fission) OK

* Spirogyra: asexual (fragmentation) OK -- also sexual (conjugation) but they all share asexual

* Yeast: asexual (budding) OK

Options (b) is wrong: Spirogyra is multicellular (filamentous algae); Yeast is unicellular. So they are NOT all unicellular. The common feature is asexual reproduction.

[TIP] **Exam Tip:** Spirogyra is MULTICELLULAR (filament of cells). Amoeba and Yeast are unicellular. But all three can reproduce asexually!

Q.8. In *Spirogyra*, asexual reproduction takes place by:

- (a) Breaking up of filaments into smaller bits (fragmentation)
- (b) Division of a cell into two cells (binary fission)
- (c) Division of a cell into many cells (multiple fission)
- (d) Formation of young cells from older cells

[ANS] Answer: (a) Breaking up of filaments into smaller bits (fragmentation)

Spirogyra is a filamentous green alga. Its asexual reproduction occurs by **fragmentation**: the filament breaks into smaller pieces, and each piece grows into a new complete filament.

Spirogyra also reproduces sexually by **conjugation** -- but the asexual method is fragmentation.

Amoeba = binary fission. Plasmodium = multiple fission. Yeast = budding.

[TIP] Exam Tip: Spirogyra = fragmentation (filament breaks). Amoeba = binary fission (one -> two). Plasmodium = multiple fission (one -> many). Know all three!

Q.9. The ability of a cell to divide into several cells during reproduction in *Plasmodium* is called:

- (a) Budding
- (b) Reduction division
- (c) Binary fission
- (d) Multiple fission

[ANS] Answer: (d) Multiple fission

Plasmodium (malaria parasite) reproduces by **multiple fission**:

- * The nucleus divides many times inside the cell
- * Then the cytoplasm divides around each nucleus
- * Many daughter cells (merozoites) are produced at once
- * Binary fission = one nucleus divides -> 2 cells (Amoeba)
- * Multiple fission = nucleus divides many times -> many cells simultaneously (Plasmodium)

[TIP] Exam Tip: Multiple fission = Plasmodium (many daughter cells at once). Binary fission = Amoeba (two equal daughter cells). Budding = Yeast/Hydra.

Q.10. The correct sequence of reproductive stages in flowering plants is:

- (a) Gametes -> Zygote -> Embryo -> Seedling
- (b) Zygote -> Gametes -> Embryo -> Seedling
- (c) Seedling -> Embryo -> Zygote -> Gametes
- (d) Gametes -> Embryo -> Zygote -> Seedling

[ANS] Answer: (a) Gametes -> Zygote -> Embryo -> Seedling

- * **Gametes:** pollen (male) + egg (female) are produced
 - * **Zygote:** fertilisation -- gametes fuse -> zygote (2n)
 - * **Embryo:** zygote divides repeatedly -> embryo inside seed
 - * **Seedling:** seed germinates -> seedling -> new plant
- The sequence always goes: Gamete -> Zygote (fertilisation) -> Embryo -> Seedling.

[TIP] Exam Tip: GZES sequence: Gametes -> Zygote -> Embryo -> Seedling. Never put zygote before gametes or embryo before zygote!

Q.11. The number of chromosomes in parents and offspring of a species remains constant due to:

- (a) Doubling of chromosomes after zygote formation
- (b) Halving of chromosomes DURING gamete formation
- (c) Doubling of chromosomes after gamete formation
- (d) Halving of chromosomes after gamete formation

[ANS] Answer: (b) Halving of chromosomes DURING gamete formation

Meiosis (reduction division) occurs during gamete formation:

- * Parent cell ($2n = \text{diploid}$) \rightarrow gametes ($n = \text{haploid}$) -- chromosomes are HALVED
 - * Fertilisation: egg (n) + sperm (n) \rightarrow zygote ($2n$) -- chromosomes are RESTORED to full number
 - * This halving during gamete formation + doubling at fertilisation ensures species chromosome number stays constant.
- If gametes were NOT halved, each generation would double the chromosome count!

[TIP] Exam Tip: Meiosis halves chromosomes ($2n \rightarrow n$). Fertilisation doubles them ($n + n \rightarrow 2n$). Together they maintain constant chromosome number. Classic exam question!

Q.12. In *Rhizopus*, tubular thread-like structures bearing sporangia at their tips are called:

- (a) Filaments
- (b) Hyphae
- (c) Rhizoids
- (d) Roots

[ANS] Answer: (b) Hyphae

In **Rhizopus** (bread mould):

- * **Hyphae:** the thread-like filamentous structures that make up the fungal body; some grow upward (sporangiophores) bearing sporangia at their tips
- * **Rhizoids:** root-like structures that anchor the fungus and absorb nutrients from the substrate
- * **Sporangia:** spherical structures at the tips of sporangiophores; contain spores for asexual reproduction
- * Filaments is a general term; Hyphae is the specific term for fungal threads.

[TIP] Exam Tip: Rhizopus structure: Rhizoids (anchor) + Hyphae (thread body) + Sporangia (spore sacs at tips). Know all three!

Q.13. Vegetative propagation refers to formation of new plants from:

- (a) Stem, roots and flowers
- (b) Stem, roots and leaves
- (c) Stem, flowers and fruits
- (d) Stem, leaves and flowers

[ANS] Answer: (b) Stem, roots and leaves

Vegetative propagation uses **vegetative parts** (non-reproductive parts) of a plant:

* **Stem:** stem cuttings (rose), runners (grass), rhizomes (ginger), tubers (potato), bulbs (onion)

* **Roots:** root cuttings (sweet potato, carrot), root suckers (banana)

* **Leaves:** leaf cuttings (Bryophyllum -- adventitious buds on leaf margins)

Flowers and fruits are **REPRODUCTIVE** parts -- they are not used in vegetative propagation.

[TIP] Exam Tip: Vegetative propagation = stem + roots + leaves **ONLY**. **NOT** flowers, **NOT** fruits, **NOT** seeds.
Flowers/seeds = sexual reproduction.

Q.14. Factors responsible for rapid spread of bread mould on moist bread are:

- (i) Large number of spores
 - (ii) Availability of moisture and nutrients in bread
 - (iii) Presence of tubular branched hyphae
 - (iv) Formation of round shaped sporangia
- (a) (i) and (iii)
 - (b) (ii) and (iv)
 - (c) (i) and (ii)
 - (d) (iii) and (iv)

[ANS] Answer: (c) (i) and (ii)

* (i) OK **Large number of spores:** each sporangium contains thousands of spores; released into air; land on bread

* (ii) OK **Moisture and nutrients:** moist bread provides water for spore germination + starch/sugars/proteins as food -> rapid growth

* (iii) Hyphae help absorb food but don't directly cause **RAPID SPREAD**

* (iv) Round sporangia shape alone doesn't cause rapid spread

The **KEY** reasons for rapid spread are: many spores (easy dispersal) + ideal growth conditions (moisture + food).

[TIP] Exam Tip: Bread mould spreads fast because: millions of tiny spores + moist bread (water + food). Dry bread = no growth = moisture is essential!

Q.15. Length of pollen tube depends on the distance between:

- (a) Pollen grain and upper surface of stigma
- (b) Pollen grain on upper surface of stigma and ovule
- (c) Pollen grain in anther and upper surface of stigma
- (d) Upper surface of stigma and lower part of style

[ANS] Answer: (b) Pollen grain on upper surface of stigma and ovule

After pollination, the pollen grain germinates on the **stigma surface** and grows a **pollen tube** that travels down through the **style** into the ovary to reach the **ovule**.

The length of pollen tube = distance from where pollen lands (stigma surface) to the ovule inside the ovary.

The path in anther -> stigma is **BEFORE** pollination; the tube grows **AFTER** pollination.

[TIP] **Exam Tip:** Pollen tube grows from STIGMA to OVULE (after pollination). Length = stigma surface to ovule. Not from anther!

Q.16. Which of the following statements are true for flowers?

- (i) Flowers are always bisexual
- (ii) They are the sexual reproductive organs
- (iii) They are produced in all groups of plants
- (iv) After fertilisation they give rise to fruits

- (a) (i) and (iv)
- (b) (ii) and (iii)
- (c) (i) and (iii)
- (d) (ii) and (iv)

[ANS] Answer: (d) (ii) and (iv)

- * (i) X WRONG: Flowers can be unisexual (only male OR female parts) e.g., papaya, watermelon
- * (ii) OK Flowers ARE the sexual reproductive organs of flowering plants (angiosperms)
- * (iii) X WRONG: Flowers are found ONLY in angiosperms (flowering plants), NOT in ferns, mosses, conifers
- * (iv) OK After fertilisation: ovary -> fruit; ovules -> seeds

[TIP] **Exam Tip:** (ii) and (iv): flowers = sexual organs of angiosperms only. After fertilisation: ovary -> fruit, ovule -> seed!

Q.17. Which statements are TRUE for unisexual flowers?

- (i) They possess both stamen and pistil
- (ii) They possess either stamen or pistil
- (iii) They exhibit cross pollination
- (iv) Unisexual flowers with only stamens cannot produce fruits

- (a) (i) and (iv)
- (b) (ii), (iii) and (iv)
- (c) (iii) and (iv)
- (d) (i), (iii) and (iv)

[ANS] Answer: (b) (ii), (iii) and (iv)

- * (i) X WRONG: That's BISEXUAL (hermaphrodite) flowers. Unisexual = only one type
- * (ii) OK Unisexual flowers have EITHER stamen (male flower) OR pistil (female flower), not both
- * (iii) OK Since male and female flowers are on different plants or same plant (different positions), pollen must be transferred between them = CROSS pollination
- * (iv) OK Only stamens = only male flower = no ovary = no fruit production from that flower. Fruits come from the female flower (pistil/ovary).

[TIP] **Exam Tip:** Unisexual flowers: one sex only. MUST cross-pollinate. Only female flower (with pistil/ovary) produces fruit!

Q.18. Which statements are TRUE for sexual reproduction in flowering plants?

- (i) Requires two types of gametes
 - (ii) Fertilisation is compulsory
 - (iii) Always results in zygote
 - (iv) Offspring formed are clones
- (a) (i) and (iv)
(b) (i), (ii) and (iv)
(c) (i), (ii) and (iii)
(d) (i), (ii) and (iv)

[ANS] Answer: (c) (i), (ii) and (iii)

- * (i) OK Two gametes: male (pollen) + female (egg cell)
- * (ii) OK Fertilisation is essential in sexual reproduction (without it, no embryo/seed/fruit)
- * (iii) OK Fertilisation always results in zygote (by definition)
- * (iv) X WRONG: Clones (genetically identical offspring) come from ASEXUAL reproduction. Sexual reproduction produces varied offspring (NOT clones) due to mixing of two parents' genes.

[TIP] Exam Tip: Sexual reproduction: 2 gametes + fertilisation -> zygote -> genetic variation. CLONES = asexual only. IV is the trap option!

Q.19. In Figure 8.1, the parts A, B and C are sequentially:

- (a) cotyledon, plumule and radicle
- (b) plumule, radicle and cotyledon
- (c) plumule, cotyledon and radicle
- (d) radicle, cotyledon and plumule

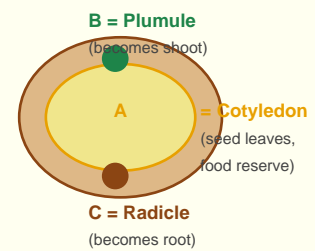
[ANS] Answer: (c) Plumule, Cotyledon and Radicle

In the seed diagram:

- * **A (top, small green bud) = Plumule** -- develops into the shoot
- * **B (large central body) = Cotyledon** -- seed leaves storing food
- * **C (bottom, small point) = Radicle** -- develops into the primary root

Memory tip: Top = Plumule (P = top of alphabet for shoot), Bottom = Radicle (R = bottom of alphabet for root)

Seed Structure (Fig 8.1)



Q.20. Offspring from sexual reproduction show more variation because:

- (a) Sexual reproduction is a lengthy process
- (b) Genetic material comes from two parents of the same species
- (c) Genetic material comes from two parents of different species
- (d) Genetic material comes from many parents

[ANS] Answer: (b) Genetic material comes from two parents of the same species

Sexual reproduction creates variation because:

- * TWO parents of the **same species** contribute genetic material via gametes
- * Each gamete has a unique combination of genes (due to meiosis and crossing over)
- * Fusion of two different gametes -> unique combination each time -> variation in offspring

Option (c) is wrong: sexual reproduction in a species involves the **SAME** species. Option (d) is wrong: only **TWO** parents, not many.

[TIP] Exam Tip: Sexual variation = 2 parents -> 2 different gametes -> unique gene combinations -> variable offspring. Two parents = KEY!

Q.21. Reproduction is essential for living organisms in order to:

- (a) Keep the individual organism alive
- (b) Fulfill their energy requirement
- (c) Maintain growth
- (d) Continue the species generation after generation

[ANS] Answer: (d) Continue the species generation after generation

Reproduction does **NOT** help the individual organism survive (an organism can live without reproducing). The **PRIMARY** purpose of reproduction is:

- * To ensure **continuation of the species**
- * To maintain population numbers
- * To allow evolution through variation in offspring

Energy requirements are met by nutrition. Growth is maintained by cell division. Individual survival does not require reproduction.

[TIP] Exam Tip: Reproduction = for the **SPECIES**, not the individual. An organism that cannot reproduce will still survive; its species dies without it.

Q.22. During adolescence, one change associated with sexual maturation in boys is:

- (a) Loss of milk teeth
- (b) Increase in height
- (c) Cracking of voice
- (d) Weight gain

[ANS] Answer: (c) Cracking of voice

Cracking/deepening of voice in boys is a **SEXUAL MATURATION** change caused by testosterone:

- * Testosterone causes the larynx (voice box) to grow larger
- * The vocal cords lengthen -> voice deepens/cracks during adolescence
- * Loss of milk teeth: happens around age 6-12 (before puberty) -- **NOT** sexual maturation
- * Height increase and weight gain: general growth changes, not specifically sexual maturation

Voice cracking is specifically triggered by sex hormones.

[TIP] **Exam Tip:** Voice cracking = testosterone effect on larynx = sexual maturation in boys. Height increase = general growth (not specific to sexual maturation).

Q.23. In human females, the event that reflects onset of reproductive phase is:

- (a) Growth of body
- (b) Changes in hair pattern
- (c) Change in voice
- (d) Menstruation

[ANS] Answer: (d) Menstruation

Menstruation (the first menstrual period = **menarche**) is the key indicator that a female has entered her reproductive phase. It signals that:

- * The ovaries have begun releasing eggs (ovulation)
- * The uterus is now preparing for possible pregnancy each month
- * The hormonal (estrogen/progesterone) cycle has begun

Body growth and hair/voice changes are general puberty changes, not specific to reproductive onset.

[TIP] **Exam Tip:** Menarche = first menstruation = start of female reproductive phase. This is the specific reproductive event being asked about!

Q.24. In human males, the testes lie in the scrotum because it helps in the:

- (a) Process of mating
- (b) Formation of sperm
- (c) Easy transfer of gametes
- (d) All of the above

[ANS] Answer: (b) Formation of sperm

The testes are located outside the body cavity in the scrotum because:

* **Sperm formation (spermatogenesis) requires a temperature 2-3 degC LOWER than core body temperature**

- * The scrotum maintains this cooler temperature
 - * If testes remain inside the body (undescended testes = cryptorchidism), sperm production fails -> infertility
- The primary reason is temperature regulation for sperm production.

[TIP] **Exam Tip:** Scrotum keeps testes 2-3 degC cooler than body temperature = essential for sperm production. Undescended testes -> infertility. Important fact!

Q.25. Which is NOT the function of testes at puberty?

- (i) Formation of germ cells
 - (ii) Secretion of testosterone
 - (iii) Development of placenta
 - (iv) Secretion of estrogen
- (a) (i) and (ii)
 - (b) (ii) and (iii)

- (c) (iii) and (iv)
(d) (i) and (iv)

[ANS] Answer: (c) (iii) and (iv)

Functions of testes at puberty:

- * (i) OK Formation of germ cells (sperm by spermatogenesis) -- YES this IS a function of testes
- * (ii) OK Secretion of testosterone (by Leydig/interstitial cells) -- YES this IS a function of testes
- * (iii) X Development of placenta -- NOT a function of testes! Placenta forms in the UTERUS during pregnancy
- * (iv) X Secretion of estrogen -- NOT a function of testes! Estrogen is produced by OVARIES

[TIP] **Exam Tip:** Testes = sperm + testosterone. Ovaries = eggs + estrogen. Placenta = formed in uterus during pregnancy. Simple gland-hormone matching!

Q.26. The correct sequence of organs in the male reproductive system for sperm transport is:

- (a) Testis -> Vas deferens -> Urethra
(b) Testis -> Ureter -> Urethra
(c) Testis -> Urethra -> Ureter
(d) Testis -> Vas deferens -> Ureter

[ANS] Answer: (a) Testis -> Vas deferens -> Urethra

Path of sperm in the male reproductive system:

Testis -> Epididymis -> Vas deferens (sperm duct) -> Ejaculatory duct -> Urethra -> Outside

- * Ureter carries URINE from kidney to bladder -- NOT sperm
- * Vas deferens = sperm duct (the correct tube for sperm)
- * Urethra is the final common passage for both urine and semen (not simultaneously)

[TIP] **Exam Tip:** Sperm path: Testis -> Vas deferens -> Urethra. NEVER through ureter! Ureter = urine from kidney. Classic confusion!

Q.27. Which among the following diseases is NOT sexually transmitted?

- (a) Syphilis
(b) Hepatitis
(c) HIV-AIDS
(d) Gonorrhoea

[ANS] Answer: (b) Hepatitis

Hepatitis (particularly Hepatitis A) is primarily transmitted through:

- * Contaminated food and water (oral-fecal route)
- * Not primarily through sexual contact (though Hepatitis B and C can be sexually transmitted)

Classic STDs that are sexually transmitted:

- * **Syphilis:** bacterial (*Treponema pallidum*)
- * **HIV/AIDS:** virus transmitted via body fluids
- * **Gonorrhoea:** bacterial (*Neisseria gonorrhoeae*)

Note: Hepatitis A and E = water-borne. Hepatitis B, C = can be sexually transmitted but primarily blood-borne.

[TIP] **Exam Tip:** Hepatitis (A & E) = water-borne, NOT primarily STD. Syphilis, Gonorrhoea, HIV-AIDS = classic STDs. The question asks for the ODD ONE OUT.

SECTION B ♦ Short Answer Questions (Q. 28-48)

Q.28. In a bisexual flower, even though young stamens are removed, the flower produces fruit. Explain.

The flower was cross-pollinated before the stamens were removed.

Even if the stamens (male parts) of a bisexual flower are removed, the flower can still produce fruit if:

Cross-pollination had already occurred -- pollen from a DIFFERENT flower (of the same species) had already landed on the stigma before the stamens were removed.

The sequence:

1. Pollen from another flower (wind/insect-pollinated) lands on the stigma
2. Pollen germinates; pollen tube grows toward ovule
3. Fertilisation occurs -> zygote -> embryo -> seed
4. Ovary develops into fruit

The stamens (for making male gametes) are no longer needed once cross-pollination is done.

[TIP] **Exam Tip:** Cross-pollination can happen at any time. Removing stamens after pollen from another flower has already reached the stigma won't stop fruit formation!

Q.29. Can you consider cell division as a type of reproduction in unicellular organism? Give one reason.

YES -- cell division IS reproduction in unicellular organisms.

Reason:

In a unicellular organism (like Amoeba, Paramecium, bacteria), the **entire organism IS a single cell**. When this cell divides (binary fission), it produces two complete new organisms. The original organism no longer exists as a separate entity -- it has become two individuals.

This cell division results in:

- * An increase in the number of organisms (population increase)
- * Each new cell is a complete, independent organism
- * This fulfils the definition of reproduction: producing new individuals of the same kind

Therefore, cell division = asexual reproduction (binary fission) in unicellular organisms.

[TIP] **Exam Tip:** For unicellular organisms, the organism IS the cell. When it divides -> two new organisms. This IS reproduction (binary fission)!

Q.30. What is a clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity?

Clone: An organism (or group of organisms) that is genetically identical to its parent.

Why asexual offspring are remarkably similar:

1. **Single parent:** Only one parent is involved; no mixing of genetic material from two different individuals.
2. **No gametes:** Asexual reproduction does NOT involve gametes (sex cells). There is no meiosis, so there is no random shuffling of chromosomes.
3. **DNA is copied exactly:** The parent's DNA is replicated through mitosis, producing exact copies. The offspring inherit the same genes as the parent.
4. **Result:** All offspring are genetically identical clones of the parent -- same traits, same appearance.

Examples of clones: offspring from budding in Hydra; vegetatively propagated plants (potato plants from tubers).

[TIP] **Exam Tip:** Clone = genetically identical copy. Asexual = mitosis (exact copy) + one parent + no gamete mixing = perfect clones every time!

Q.31. Explain how offspring and parents of sexually reproducing organisms have the same number of chromosomes.

Through the complementary processes of Meiosis and Fertilisation.

Step 1 -- Gamete Formation (Meiosis):

During the formation of gametes (sperm and egg), **meiosis** (reduction division) occurs. The parent cell (diploid, $2n$) divides to produce gametes (haploid, n). Chromosome number is HALVED: $2n \rightarrow n$

Step 2 -- Fertilisation:

During fertilisation, a sperm (n) fuses with an egg (n) to form a zygote ($2n$). Chromosome number is RESTORED: $n + n = 2n$

Result:

The zygote ($2n$) has the same chromosome number as the parents ($2n$).
Human example: Parent = 46 ($2n$). Sperm = 23 (n). Egg = 23 (n). Zygote = 46 ($2n$) OK

[TIP] **Exam Tip:** Meiosis halves ($2n \rightarrow n$). Fertilisation doubles ($n + n = 2n$). Together they maintain the species chromosome number. Draw a simple diagram for 5 marks!

Q.32. Colonies of yeast fail to multiply in water, but multiply in sugar solution. Give one reason.

Yeast requires a carbon/energy source (sugar) for metabolic activities to support budding.

Yeast reproduces asexually by **budding**. For budding to occur, yeast cells need:

- * Energy (ATP) for cell division and growth
- * Carbon source (sugar) as raw material to build new cell structures

In plain water: No sugar/nutrients available -> yeast cannot carry out sufficient metabolism -> no energy for budding -> cells fail to multiply.

In sugar solution: Yeast ferments sugar (glucose -> ethanol + CO₂ + energy) -> generates ATP -> has energy and carbon for building new cells -> buds form -> colony multiplies.

[TIP] **Exam Tip:** Yeast NEEDS sugar for energy (fermentation). No sugar = no energy = no budding. This also explains why yeast is used in baking/brewing (sugar fermentation)!

Q.33. Why does bread mould grow profusely on a moist slice of bread rather than on a dry slice?

Moisture is essential for spore germination, growth, and reproduction of bread mould.

Bread mould (*Rhizopus*) requires moisture because:

- * **Spore germination:** Spores need water to swell, germinate, and develop into hyphae
- * **Enzyme activity:** *Rhizopus* secretes digestive enzymes (amylase, protease) outside its body to break down bread. Enzymes work only in aqueous (water) medium
- * **Nutrient absorption:** Dissolved nutrients are absorbed through hyphae; this requires water as solvent
- * **Growth and reproduction:** Cell expansion, hyphae growth, and spore formation all require water

On **dry bread:** No water -> spores cannot germinate -> no enzymatic activity -> no growth.

[TIP] **Exam Tip:** Moist bread = water available = spore germination + enzyme activity + nutrient absorption = mould grows. Dry = none of these -> no growth!

Q.34. Give two reasons for the appearance of variations among progeny formed by sexual reproduction.

Two reasons for variation in sexually produced offspring:

Reason 1: Genetic material comes from TWO different parents

Each parent contributes half the chromosomes (via gametes). Since both parents have different versions of genes (alleles), the offspring gets unique combination of alleles from both -> variation.

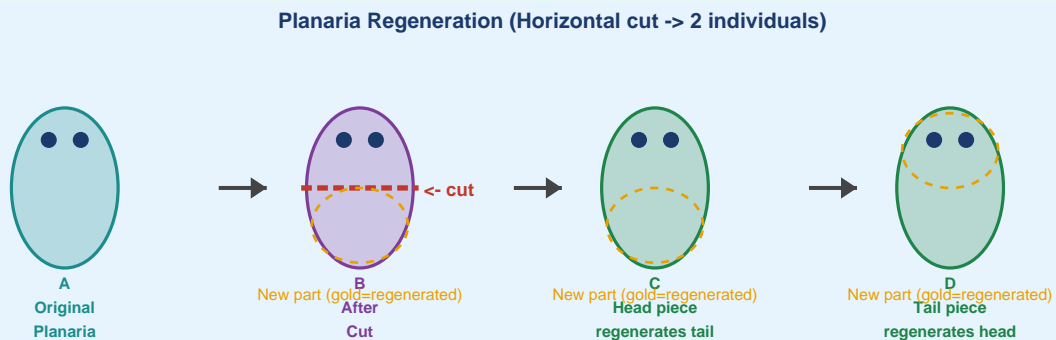
Reason 2: Random shuffling of chromosomes during Meiosis (crossing over)

During meiosis (gamete formation), homologous chromosomes exchange segments in a process called **crossing over**. This creates new combinations of genes that are different from either parent. Additionally, which chromosome of each pair goes into which gamete is random (independent assortment).

[TIP] **Exam Tip:** Two sources of variation: (1) Two different parents = different alleles mixed. (2) Meiosis = random shuffling + crossing over. Both create unique gene combinations!

Q.35. Would a *Planaria* cut VERTICALLY into two halves regenerate into two individuals? Complete Fig. 8.2 D and E by indicating regenerated regions.

YES -- a Planaria cut vertically (left-right halves) into two pieces will regenerate into TWO individuals.



Explanation:

Planaria has remarkable regenerative ability. Each piece contains specialized cells called **neoblasts** (pluripotent stem cells) that can differentiate into any cell type needed.

In the Fig 8.2 sequence:

- * A: Original Planaria
- * B: Cut horizontally -- dashed line shows cut
- * C: Head piece (top half) regenerates a new tail
- * D: Tail piece (bottom half) regenerates a new head -> two complete Planaria
- * E: For a vertical cut -- each left/right half regenerates the missing side -> two complete Planaria

This remarkable ability is called **regeneration** -- a form of asexual reproduction.

Q.36. From internet data, correlate chromosome number with organism size:

- (a) Do larger organisms have more chromosomes?
- (b) Can organisms with fewer chromosomes reproduce more easily?
- (c) More chromosomes = more DNA content. Justify.

Chromosome data comparison (examples):

Organism	Chromosomes (2n)	Size
Human (Homo sapiens)	46	Large
Mosquito	6	Very small
Carp (fish)	104	Medium
Fern (Ophioglossum)	1260	Small plant!
Onion (Allium cepa)	16	Small plant
Rice (Oryza sativa)	24	Grass-sized

(a) Do larger organisms have more chromosomes?

NO -- Chromosome number does NOT correlate with organism size. Fern (*Ophioglossum*) is a tiny plant yet has 1260 chromosomes, while humans have only 46. A carp fish has 104 chromosomes but is not "larger" than a human.

(b) Fewer chromosomes -> easier reproduction?

NO -- The ability to reproduce is not determined by chromosome number. A mosquito (6 chromosomes) and a fern (1260 chromosomes) both reproduce successfully. Reproductive ease depends on environmental conditions, biology, and life strategy.

(c) More chromosomes = more DNA? Justified!

YES -- Each chromosome is a long DNA molecule. More chromosomes = more DNA strands = greater total DNA content. However, the amount of DNA is not always proportional to chromosome number (some have larger chromosomes). Generally: more chromosomes -> more DNA content in the nucleus.

Q.37. In tobacco plant, male gametes have 24 chromosomes. What is the number in (a) female gamete, (b) zygote?

Female gamete = 24 chromosomes

Both male and female gametes (germ cells) are formed by meiosis -> both are haploid (n).

If male gamete has 24 (n), then female gamete also has **24 chromosomes (n)** -- they must be equal since both come from the same species with the same meiosis.

Zygote = 48 chromosomes

Zygote is formed by fertilisation: male gamete (24) + female gamete (24) = **48 chromosomes (2n)**

The zygote has the full diploid number = twice the haploid number of gametes.

[TIP] **Exam Tip:** Female gamete = male gamete (both = n = 24). Zygote = 2n = 24 + 24 = 48. Always: zygote = 2 x gamete number!

Q.38. Why cannot fertilisation take place in flowers if pollination does not occur?

Because fertilisation requires the male gamete to reach the female gamete -- and this journey depends entirely on pollination.

Chain of dependency:

1. **Pollination:** pollen (containing male gamete nucleus) is transferred from anther to stigma
2. Without pollination -> pollen never reaches stigma
3. Pollen germinates on stigma -> grows **pollen tube** down through style toward ovule
4. Without a pollen tube -> male gamete has no way to travel to the egg cell inside the ovule
5. Without male gamete reaching egg -> fertilisation (fusion of gametes) CANNOT occur

Pollination is the essential **FIRST STEP** that makes fertilisation possible. One cannot happen without the other.

[TIP] **Exam Tip:** Pollination -> pollen tube -> male gamete reaches egg -> fertilisation. Pollination is **PREREQUISITE** for fertilisation. Skip step 1 = skip all!

Q.39. Is the chromosome number of zygote, embryonal cells and adult constant? How is constancy maintained?

YES -- the chromosome number is ALWAYS CONSTANT and the same (2n) in all three stages.

Zygote:

Formed by fertilisation ($n + n = 2n$). Has the full diploid chromosome number.

Embryonal cells:

Formed by repeated MITOSIS of the zygote. Mitosis produces exact copies with the same chromosome number (2n). Every cell in the embryo has the same 2n chromosomes.

Adult cells:

All somatic (body) cells are formed by mitosis from the zygote. All have the same 2n chromosome number.

How constancy is maintained:

- * Zygote -> embryo -> adult: all through **MITOSIS** (exact chromosome copying)
- * Adult -> gametes: through **MEIOSIS** (halving to n)
- * Gametes -> zygote: through **FERTILISATION** ($n + n = 2n$ restored)

[TIP] **Exam Tip:** Zygote = embryo = adult = all 2n (through mitosis). Only gametes are n (through meiosis). Meiosis + fertilisation maintain the cycle!

Q.40. Where is the zygote located in the flower after fertilisation?

The zygote is located inside the OVULE, which is within the OVARY of the flower.

Exact location:

- * The ovule is a small structure inside the ovary
- * Inside the ovule is the embryo sac (female gametophyte)
- * The egg cell is inside the embryo sac
- * Pollen tube delivers male gamete to the egg -> fertilisation -> zygote formed
- * **Zygote = inside the ovule -> inside the ovary**

After fertilisation:

- * Ovule develops into SEED (containing the embryo/zygote)
- * Ovary develops into FRUIT
- * So the seed (with embryo) is inside the fruit

[TIP] **Exam Tip:** Zygote location: inside ovule -> inside ovary. After development: ovule -> seed, ovary -> fruit. Seed inside fruit!

Q.41. Reproduction is linked to stability of population of a species. Justify.

Reproduction maintains population numbers -- too little or too much disrupts stability.

How reproduction maintains stability:

- * Every organism eventually DIES. Without reproduction, the population would continuously decline until extinction.
- * Reproduction replenishes the population, replacing individuals lost to death, disease, predation, and accidents.
- * When birth rate = death rate -> population remains STABLE

Population stability:

- * Too little reproduction -> population declines -> species may go extinct
- * Too much reproduction -> overpopulation -> resource depletion -> competition -> population crash
- * Natural selection ensures reproduction rate matches environmental carrying capacity

Therefore, reproduction is not for individual survival but for maintaining stable species population.

[TIP] **Exam Tip:** Reproduction = replace dying individuals = maintain population size = species survival. Birth rate = death rate -> stable population!

Q.42. How are general growth and sexual maturation different from each other?

See comparison table below:

Feature	General Growth	Sexual Maturation
Definition	Increase in size, height, weight, and complexity of body	Development of reproductive organs and secondary sexual characteristics
Cause	Growth hormone from pituitary; nutrition	Sex hormones (testosterone in males; estrogen in females)
Timing	From birth to adulthood; continuous	Starts at puberty (~10-14 years)
Examples	Increase in height, weight, organ development	Male: voice deepens, beard grows; Female: breasts develop, menstruation begins
Purpose	Overall body development	Prepares body for reproduction

Q.43. Trace the path of sperm during ejaculation and mention the glands and their functions.

Path of sperm during ejaculation:

Testes -> Epididymis -> Vas deferens -> Ejaculatory duct -> Urethra -> Out

Gland	Location	Function
Seminal vesicles	Behind bladder	Secrete fructose-rich fluid for energy supply to sperm; most of semen volume
Prostate gland	Below bladder	Secretes alkaline fluid that protects sperm from acidic environment of urethra and vagina

Cowper's gland (Bulbourethral)	Below prostate	Secretes mucus to lubricate urethra and neutralise acidity before sperm passage
Epididymis	On testis	Storage and maturation of sperm; sperm become motile here

Q.44. What changes are observed in the uterus if fertilisation does not occur?

If fertilisation does NOT occur, the thickened uterine lining is shed -- this is called MENSTRUATION.

Sequence of events (Menstrual Cycle):

1. After ovulation, the uterine lining (endometrium) thickens with extra blood vessels, preparing for possible embryo implantation
2. If the egg is NOT fertilised within ~24 hours of release:
 - * The corpus luteum (in ovary) degenerates
 - * Progesterone levels drop sharply
 - * The thickened uterine lining breaks down
 - * Blood vessels rupture
 - * The uterine lining is shed as menstrual flow (blood + tissue) -> MENSTRUATION
3. Menstruation lasts approximately 3-5 days
4. The cycle restarts -> uterus begins building up again for the next cycle (~28 days)

[TIP] **Exam Tip:** No fertilisation -> progesterone drops -> uterine lining sheds = MENSTRUATION. Duration ~3-5 days. Cycle = ~28 days. This is how the menstrual cycle works!

Q.45. What changes are observed in the uterus subsequent to implantation of a young embryo?

After implantation, the uterus undergoes major structural and functional changes to support the developing embryo.

Changes in uterus after implantation:

1. **Endometrium thickens further:** rich blood supply develops to nourish the embryo
2. **Placenta develops:** disc-shaped organ forms at the implantation site; connects embryo to mother via umbilical cord
3. **Placental functions:**
 - * Provides oxygen and nutrients from mother's blood to embryo
 - * Removes CO₂ and waste products from embryo to mother's blood
 - * Secretes hormones (hCG, progesterone) to maintain pregnancy
4. **Uterus grows larger** as embryo develops into foetus
5. **Menstruation stops:** progesterone remains high -> lining is not shed
6. **Amniotic sac forms:** fluid-filled sac protecting the foetus

[TIP] **Exam Tip:** After implantation: placenta forms -> provides nutrition + removes waste. Menstruation stops. Uterus grows. All from progesterone maintaining the lining!

Q.46. What are the benefits of using mechanical barriers during sexual act?

Mechanical barriers (e.g., condom, diaphragm) provide TWO main benefits:

1. Contraception (Pregnancy Prevention):

- * Create a physical barrier between sperm and egg
- * Prevent sperm from entering the female reproductive tract
- * No fertilisation -> no pregnancy
- * Example: Male condom prevents sperm from reaching egg; female condom/diaphragm covers cervix

2. Protection against Sexually Transmitted Infections (STIs):

- * Barrier prevents direct contact between partner's body fluids
- * Reduces risk of HIV/AIDS, Syphilis, Gonorrhoea, Chlamydia transmission
- * Condom is the ONLY contraceptive method that also provides STI protection
- * Hormonal methods (pills, injections) prevent pregnancy but NOT STIs

[TIP] **Exam Tip:** Condom = DUAL benefit: prevents pregnancy AND STIs. No other contraceptive prevents STIs. This "dual protection" point is frequently asked!

Q.47. Label the parts of Fig 8.3 (female reproductive system) and give their functions:

- (a) Production of egg (b) Site of fertilisation
(c) Site of implantation (d) Entry of sperms

Labels and Functions:

(a) Production of egg -> OVARY

Two ovaries release one egg per month (alternately). Egg released from ovary.

(b) Site of fertilisation -> FALLOPIAN TUBE (Oviduct)

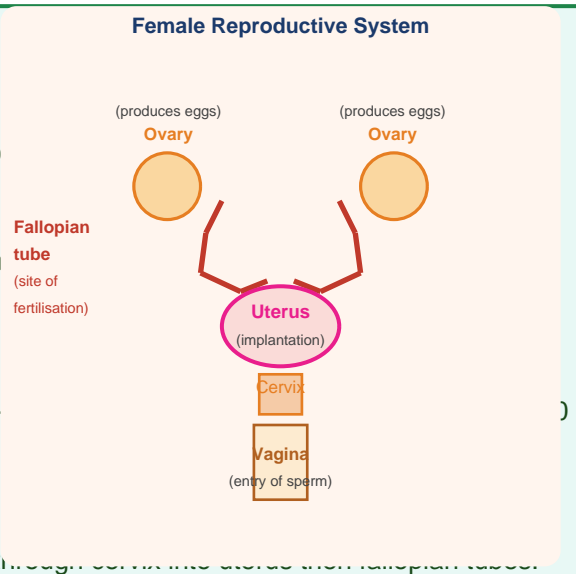
Sperm travel up from vagina; egg travels from ovary. Fertilisation occurs in the upper third (ampulla).

(c) Site of implantation -> UTERUS

Zygote divides -> forms blastocyst -> travels down to uterus - 6-7 days after fertilisation.

(d) Entry of sperms -> VAGINA

Semen deposited in vagina during intercourse. Sperm swim through cervix into uterus then fallopian tubes.



Q.48. What would be the ratio of chromosome number between an egg and its zygote? How is the sperm genetically different from the egg?

Ratio of chromosomes: Egg : Zygote = 1 : 2 (n : 2n)

- * Egg (female gamete): haploid = n chromosomes (e.g., 23 in humans)
- * Zygote: diploid = 2n chromosomes (e.g., 46 in humans) = egg(n) + sperm(n)
- * Ratio = n : 2n = 1 : 2

How sperm is genetically different from egg:

Sex chromosome difference:

- * Egg (from mother): always contains **X chromosome** (females are XX)
- * Sperm (from father): contains **EITHER X chromosome OR Y chromosome** (males are XY -> meiosis produces 50% X-sperm and 50% Y-sperm)

If X-sperm fertilises egg -> XX -> FEMALE offspring

If Y-sperm fertilises egg -> XY -> MALE offspring

Therefore, the father's sperm determines the sex of the child!

[TIP] **Exam Tip:** Egg:Zygote = 1:2 (n:2n). Egg always has X chromosome. Sperm has X or Y. Sperm determines sex of child! Father's sperm = sex determination.

SECTION C ♦ Long Answer Questions (Q. 49-58)

Q.49. Why are budding, fragmentation and regeneration all considered asexual types of reproduction? With neat diagrams, explain the process of regeneration in Planaria.

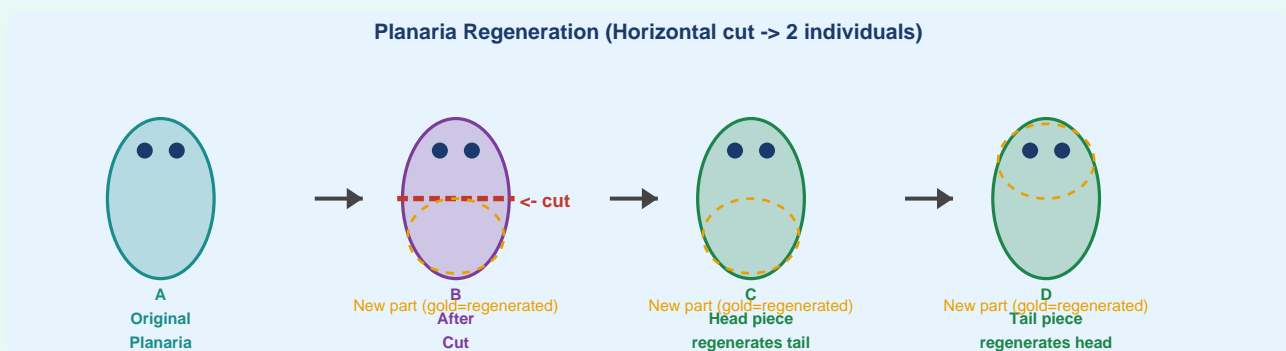
All three are ASEXUAL because:

- * Only ONE parent is involved
- * No gametes (sex cells) are produced
- * Offspring are genetically identical clones to the parent
- * Reproduction occurs through mitotic cell division only

Budding: A small outgrowth (bud) forms on parent body, grows, and detaches to form a new individual. e.g., Yeast (budding from cell surface), Hydra (bud from body wall). ONE parent -> ONE new organism.

Fragmentation: Organism breaks into fragments; each fragment grows into a complete new organism. e.g., Spirogyra filament fragments, Planaria pieces. Each fragment = genetically identical to parent.

Regeneration: Ability of an organism to regrow lost or damaged body parts, or to form a completely new organism from a fragment.



Process of Regeneration in Planaria:

1. **Specialised cells:** Planaria contains a large population of undifferentiated cells called **neoblasts** (pluripotent stem cells) distributed throughout its body
2. **Cutting:** When Planaria is cut into pieces (horizontally or vertically), each piece remains viable
3. **Cell proliferation:** Neoblasts at the wound site begin to rapidly divide (mitosis)
4. **Differentiation:** Newly divided cells differentiate into all the specific cell types needed (muscle cells, nerve cells, gut cells, etc.)
5. **Regeneration complete:** Each piece rebuilds the missing structures:
 - * Head piece: regrows a tail -> complete Planaria
 - * Tail piece: regrows a head -> complete Planaria
6. **Result:** ONE Planaria cut into 2 pieces -> **TWO complete, identical Planaria**

[TIP] **Exam Tip:** Neoblasts = Planaria's regeneration secret. Each cut piece = complete new organism. This is why Planaria is used in regeneration research!

Q.50. Write two differences between asexual and sexual reproduction. Describe why variations are observed in offspring of sexual reproduction.

Comparison table:

Feature	Asexual Reproduction	Sexual Reproduction
Number of parents	ONE parent only	TWO parents (male + female)
Gametes	No gametes involved	Gametes essential (sperm + egg)
Offspring genetics	Genetically identical (clones)	Genetically unique (variations)
Speed	Fast	Slower
Examples	Amoeba (binary fission), Yeast (budding)	Humans, flowering plants

Why variations occur in offspring of sexual reproduction:

1. Two different parents contribute genes:

Each parent passes half their chromosomes (via haploid gametes). Since the two parents have different versions of genes (alleles), their offspring receive unique combinations.

2. Meiosis creates variation (crossing over and independent assortment):

During meiosis (gamete formation):

* **Crossing over:** homologous chromosomes exchange genetic segments -> new combinations of alleles

* **Independent assortment:** chromosomes of each pair are randomly distributed into gametes

Each gamete is therefore genetically unique.

3. Random fertilisation:

Any sperm can fertilise any egg -> random combination of parental chromosomes -> further variation.

Q.51. Distinguish between pollination and fertilisation. Mention site and product of fertilisation. Draw a labelled diagram of a pistil showing pollen tube growth and entry into ovule.

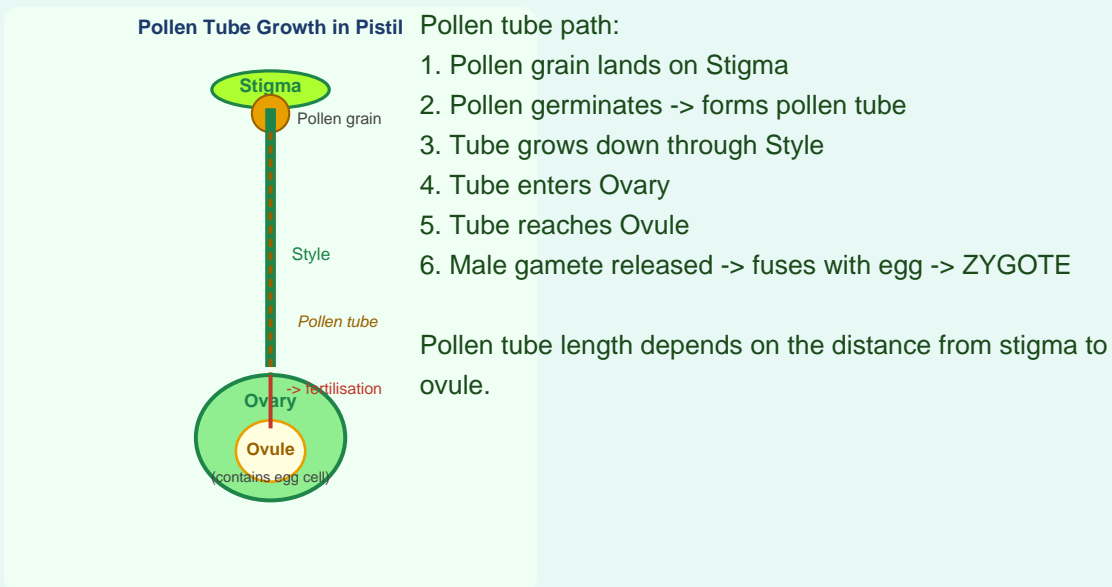
Comparison:

Feature	Pollination	Fertilisation
Definition	Transfer of pollen from anther to stigma	Fusion of male gamete with female gamete (egg)
Type of process	Physical transfer (mechanical)	Biological fusion (chemical)
Agents	Wind, insects, water, birds	Pollen tube grows; no external agent
Product	Pollen lands on stigma	ZYGOTE (2n) is formed
Location	External -- stigma surface	Internal -- inside ovule (in ovary)

Site of fertilisation: Inside the OVULE (within the ovary) of the flower.

Product of fertilisation: ZYGOTE (2n) -- which develops into the embryo (inside the seed).

Labelled diagram of pistil with pollen tube:



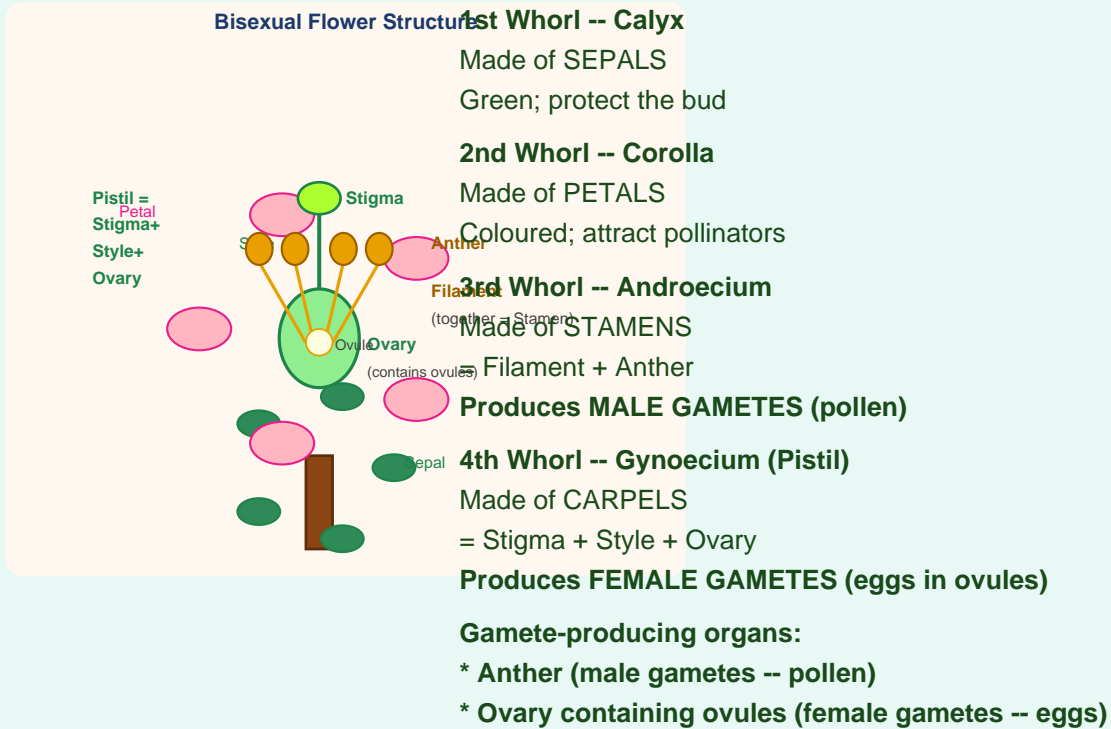
Q.52. Distinguish between a gamete and zygote. Explain their roles in sexual reproduction.

Comparison table:

Feature	Gamete	Zygote
Definition	Sex cell (sperm or egg) involved in reproduction	Cell formed by fusion of two gametes during fertilisation
Chromosome number	Haploid (n) -- half the normal number	Diploid (2n) -- full chromosome number
Formation	By meiosis (reduction division)	By fertilisation (fusion of sperm + egg)
Types	Male (sperm) and Female (egg)	Single type; forms embryo
Role	Unite to form zygote; carry genetic information from parents	First cell of new organism; develops into embryo by mitosis

Q.53. Draw a diagram of a flower and label the four whorls. Write names of gamete-producing organs.

Four whorls of a bisexual flower (from outside to inside):



Q.54. What is placenta? Mention its role during pregnancy.

PLACENTA:

The placenta is a special disc-shaped organ that develops in the uterus during pregnancy. It connects the developing embryo/foetus to the mother's uterine wall via the umbilical cord.

Roles of placenta during pregnancy:

1. **Nutrition supply:** Transfers glucose, amino acids, fatty acids, vitamins, minerals from mother's blood to foetal blood through a thin membrane (without blood mixing)
2. **Oxygen supply:** Oxygen diffuses from mother's blood to foetal blood through placenta
3. **Waste removal:** CO₂ and metabolic waste from foetus diffuse across placenta into mother's blood for elimination
4. **Hormone secretion:**
 - * hCG (human Chorionic Gonadotropin) -- maintains corpus luteum -> maintains progesterone -> maintains pregnancy
 - * Progesterone and Estrogen -- maintain uterine lining; prepare for childbirth
5. **Protective barrier:** Prevents most harmful substances, bacteria, and maternal immune cells from reaching the foetus (though some viruses like HIV and Rubella can cross)
6. **Immune protection:** Transfers maternal antibodies (IgG) to foetus -> passive immunity

[TIP] **Exam Tip:** Placenta = nutritional + gas exchange + waste removal + hormonal organ. Foetal and maternal blood DO NOT mix. Exchange across thin membrane!

Q.55. What are various ways to avoid pregnancy? Elaborate any one method.

Methods of contraception (birth control):

Category	Method	How it works
Barrier methods	Condom (male/female) Diaphragm Cervical cap	Physical barrier prevents sperm reaching egg
Chemical/Hormonal	Oral contraceptive pills Injection Implant	Hormones prevent ovulation; alter cervical mucus
Intrauterine	IUD (copper-T, hormonal)	Prevents implantation; some prevent fertilisation
Surgical	Vasectomy (male) Tubal ligation (female)	Permanent; vas deferens/fallopian tube cut/blocked
Emergency	Morning-after pill	High-dose hormones after unprotected sex; prevents implantation
Natural	Rhythm method Breastfeeding (partial)	Avoiding sex during fertile period; less reliable

Elaboration: Condom (Mechanical/Barrier Method)

- * A condom is a sheath made of thin rubber (latex) or polyurethane worn over the penis during intercourse
- * It physically prevents semen (containing sperm) from entering the vagina
- * No sperm -> no fertilisation -> no pregnancy

Advantages:

- * DUAL protection: prevents both PREGNANCY and STIs (HIV, Syphilis, Gonorrhoea)
- * No hormonal side effects
- * Easily available without prescription
- * Disposable; single-use

Limitation:

- * Must be used correctly every time; can fail if torn or incorrectly applied

Q.56. How does fertilisation take place? Fertilisation occurs once in a month. Comment.

Process of Fertilisation in Humans:

1. **Ovulation:** One egg is released from the ovary (~day 14 of 28-day cycle)
2. **Egg travels:** Egg moves into the fallopian tube; viable for ~12-24 hours
3. **Sperm travel:** Sperm deposited in vagina swim through cervix -> uterus -> fallopian tubes; survive up to 3-5 days
4. **Fusion:** One sperm penetrates the egg membrane -> sperm nucleus fuses with egg nucleus
5. **Zygote formed:** The fused cell (zygote, 2n) immediately changes its surface to prevent other sperm from entering (zona reaction)
6. **Cleavage:** Zygote divides (mitosis) -> morula -> blastocyst
7. **Implantation:** Blastocyst travels to uterus (~5-6 days) and implants in endometrium

"Fertilisation occurs once in a month" -- Comment:

This statement is TRUE but with important qualifications:

- * Females typically release ONE egg per month (during ovulation)
- * Since only one egg is available at a time, fertilisation can occur at most ONCE per menstrual cycle (~28 days)
- * The "fertile window" is approximately days 11-16 of a 28-day cycle (around ovulation)
- * Outside this window, sperm cannot fertilise an egg (none available)
- * Exception: sometimes two eggs are released -> can lead to fraternal (non-identical) twins if both fertilised

Q.57. "Reproduction is not for survival of an individual but for stability of a species." Justify.

This statement is completely true. Reproduction is a population-level phenomenon, not individual-level.

Reproduction does NOT help the individual organism survive:

- * An organism can live its entire life without reproducing
- * Reproduction requires energy, time, and resources from the individual
- * In many species, reproduction actually shortens the individual's life (e.g., salmon die after spawning)
- * Conclusion: reproduction does NOT benefit the individual organism

Reproduction IS essential for species stability:

- * Every organism eventually dies (due to age, disease, predation, accidents)
- * Without reproduction, populations would continuously decline until the species becomes EXTINCT
- * Reproduction replaces dying individuals -> maintains population numbers -> species continues
- * Variations from sexual reproduction allow some individuals to be better adapted -> evolution -> species survives changing environments
- * Population stability requires: birth rate \approx death rate (achieved through reproduction)

Examples:

- * Cheetah: low reproductive rate -> endangered (too few new cheetahs born to replace those dying)
- * Bacteria: high reproduction rate -> species thrives even when many individuals are killed by antibiotics
- * Conclusion: it is the SPECIES, not the individual, that benefits from reproduction

[TIP] **Exam Tip:** Key argument: Individual can survive without reproduction. Species CANNOT survive without it. Reproduction = for species continuity, not personal survival!

Q.58. Describe sexually transmitted diseases (STDs) and mention ways to prevent them.

Sexually Transmitted Infections/Diseases (STIs/STDs):

Diseases that spread from one person to another through sexual contact (exchange of body fluids, genital contact, or blood-to-blood contact during sex).

Disease	Causative Agent	Key Symptoms
HIV/AIDS	HIV virus (Human Immunodeficiency Virus)	Destroys immune system; AIDS is final stage; opportunistic infections
Syphilis	Treponema pallidum (bacterium)	Painless sore (chancre); later rash; can affect heart/brain
Gonorrhoea	Neisseria gonorrhoeae (bacterium)	Discharge from genitals; burning urination; can cause infertility
Chlamydia	Chlamydia trachomatis (bacterium)	Often no symptoms; pelvic inflammatory disease; infertility
Herpes	Herpes Simplex Virus (HSV)	Painful sores on genitals; recurrent; no cure
Warts (HPV)	Human Papillomavirus	Genital warts; linked to cervical cancer

Ways to prevent STDs:

- 1. Use of condoms:** Male or female condoms during every sexual act -- most effective prevention of STIs and unintended pregnancy
- 2. Mutual fidelity / faithful relationship:** Having one sexual partner who is STI-free reduces risk dramatically
- 3. Abstinence:** Avoiding sexual contact entirely is the only 100% effective prevention
- 4. Regular testing:** Get tested for STIs regularly, especially with new partners; early detection = early treatment
- 5. Vaccination:** Hepatitis B and HPV vaccines available; prevent virus-caused STDs
- 6. Avoid sharing needles:** HIV spreads through contaminated blood; avoid shared syringes
- 7. Education and awareness:** Understanding transmission routes and safe sex practices

[WARN] Common Mistakes & Exam Tips

[ERR] Vegetative propagation uses stem+roots+leaves ONLY

Not flowers, not fruits, not seeds. Potato (tuber=modified stem), onion (bulb), ginger (rhizome) = stem. Bryophyllum = leaf. Sweet potato = root.

[ERR] Anther makes pollen; Ovary contains eggs

Anther = male gametes. Ovary = female gametes (inside ovules). Stigma only receives pollen; it does NOT make gametes.

[ERR] Pollination is NOT fertilisation

Pollination = pollen reaches stigma. Fertilisation = male gamete fuses with egg inside ovule. Pollination happens FIRST; fertilisation comes after pollen tube grows.

[ERR] Zygote = 2n; Gamete = n

Gamete (sperm/egg) = haploid (n = half). Zygote = diploid ($2n$ = full). Ratio egg:zygote = 1:2. Father's sperm determines sex (X or Y sperm)!

[ERR] Multiple fission = Plasmodium (not binary)

Amoeba = binary fission (\rightarrow 2 cells). Plasmodium = multiple fission (\rightarrow many cells simultaneously). Yeast = budding. Spirogyra = fragmentation. Know all four!

[ERR] Condom prevents BOTH pregnancy AND STIs

Only barrier methods (condom) prevent STIs. Pills/hormonal methods prevent pregnancy only. Condom = dual protection. This point is almost always in exams!

[ERR] Asexual offspring = clones (identical)

Asexual = one parent + no gametes = exact DNA copy = CLONES. Sexual = two parents + gametes = VARIATION. Variation is important for evolution!

[ERR] Meiosis halves; Fertilisation restores chromosomes

Meiosis (gamete formation): $2n \rightarrow n$. Fertilisation: $n + n = 2n$. Together they maintain species chromosome number across generations. Don't mix up meiosis and mitosis!

[REV] Quick Revision -- Chapter 8 at a Glance

Topic	Key Facts
Asexual reproduction types	Binary fission (Amoeba), Multiple fission (Plasmodium), Budding (Yeast/Hydra), Fragmentation (Spirogyra), Spore formation (Rhizopus), Regeneration (Planaria)
Vegetative propagation	Stem (potato, ginger, onion), Roots (sweet potato), Leaves (Bryophyllum)

Flower parts	Calyx (sepals) -> Corolla (petals) -> Androecium (stamens: anther + filament) -> Gynoecium (pistil: stigma + style + ovary)
Gamete-producing organs	Anther = male gametes. Ovary (ovule) = female gametes (egg)
Sexual reproduction sequence	Pollination -> Fertilisation -> Embryo -> Seedling. Or: Gametes -> Zygote -> Embryo -> Seedling
Chromosome maintenance	Meiosis: $2n \rightarrow n$ (gametes). Fertilisation: $n + n = 2n$ (zygote). Species chromosome number stays constant.
Female reproductive system	Ovaries (eggs) -> Fallopian tube (fertilisation) -> Uterus (implantation/development) -> Vagina (sperm entry)
Male sperm path	Testis -> Epididymis -> Vas deferens -> Urethra
Menstrual cycle	~28 days. No fertilisation -> uterine lining sheds (menstruation, 3-5 days). Fertilisation -> no menstruation -> pregnancy.
Placenta function	Nutrition + O ₂ to foetus, CO ₂ + waste removal, hormone secretion (hCG, progesterone), immune transfer
STDs	HIV/AIDS (virus), Syphilis/Gonorrhoea (bacteria). Prevented by condoms (dual: pregnancy + STI).

[KEY] MCQ Answer Key Summary (Q. 1-27)

Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans	Q.No	Ans
Q.1	(b)	Q.2	(c)	Q.3	(c)	Q.4	(a)	Q.5	(d)
Q.6	(c)	Q.7	(a)	Q.8	(a)	Q.9	(d)	Q.10	(a)
Q.11	(b)	Q.12	(b)	Q.13	(b)	Q.14	(c)	Q.15	(b)
Q.16	(d)	Q.17	(b)	Q.18	(c)	Q.19	(c)	Q.20	(b)
Q.21	(d)	Q.22	(c)	Q.23	(d)	Q.24	(b)	Q.25	(c)
Q.26	(a)	Q.27	(b)						

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