6
Chapter

Reproduction in Animals

We'll cover the following key points:

- Reproduction and its Types
- Asexual Reproduction
- Sexual Reproduction

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 7th we learnt

- Modes of reproduction
- Sexual reproduction

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Grasp the concept of reproduction as a fundamental aspect of life.
- Distinguish between different modes of reproduction, specifically asexual and sexual reproduction.
- Define sexual reproduction, understand the roles of gametes (sperm and egg), and learn about fertilization and the formation of a zygote.
- Gain knowledge of the human reproductive system, covering both male and female aspects.

Guidelines for Teachers

The teacher can initiate the chapter by emphasizing the importance of reproduction for species survival. Engaging students through interactive methods such as discussions, diagrams, and multimedia resources can enhance learning. Encouraging critical thinking by posing analytical questions and providing hands-on activities will further deepen their understanding.

To evaluate understanding, teachers can use a range of assessment tools, offer constructive feedback, and lead discussions on the ethical aspects of reproduction. This approach will foster a comprehensive and engaging learning environment.

NCF Curricular Goals and Competencies

- CG-3 (C) 3.2): Examines the living world and its interactions with non-living elements through a scientific lens.
- CG-6 (C) 6.2): Explores scientific inquiry by understanding natural processes and the evolution of scientific knowledge.

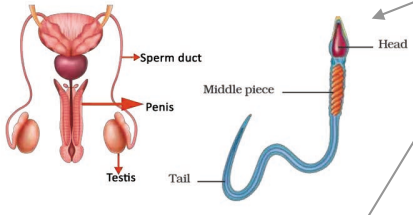
REPRODUCTION IN ANIMALS

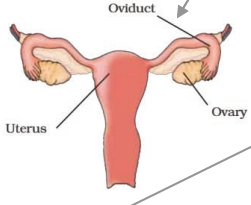
Mind Map

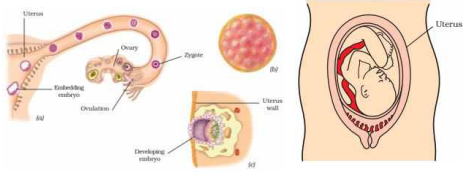
Modes of Reproduction

i. **Sexual reproduction**

ii. **Asexual reproduction**







Sexual Reproduction

Defination

This type of reproduction beginning from the fusion of male and female gametes is called sexual reproduction.

- **Male Reproductive Organs** :- The male reproductive organs include a pair of testes (singular, testis), two sperm ducts and a penis.
- **Female Reproductive Organs:-** The female reproductive organs are a pair of ovaries, oviducts (fallopian tubes) and the uterus.
- **Fertilisation :-**
  - i. Definition **:-** The fusion of the egg and the sperm is called fertilization.
  - ii. Types :-

    Internal fertilisation Ex: humans, cows, dogs and hens etc.

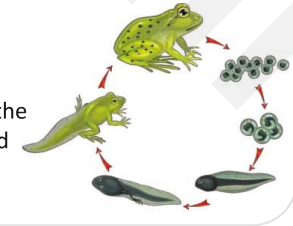
    External fertilisation Ex: fish, starfish, etc.

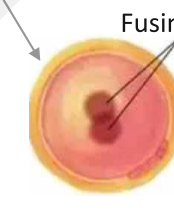
    NOTE: This results in the formation of a fertilised egg or zygote.
- **Development of Embryo :-**
- **Viviparous and Oviparous Animals :-** The animals which give birth to young ones are called viviparous animals.

  Those animals which lay eggs are called oviparous animals.
- **Young Ones to Adults :-**

  Life cycle of frog

NOTE: The tadpoles transform into adults capable of jumping and swimming. The transformation of the larva into an adult through drastic changes is called metamorphosis.



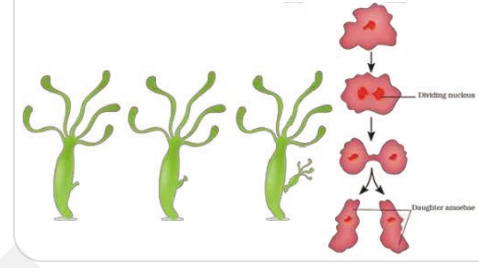


Asexual Reproduction

The type of reproduction in which only a single parent is involved is called asexual reproduction.

Types

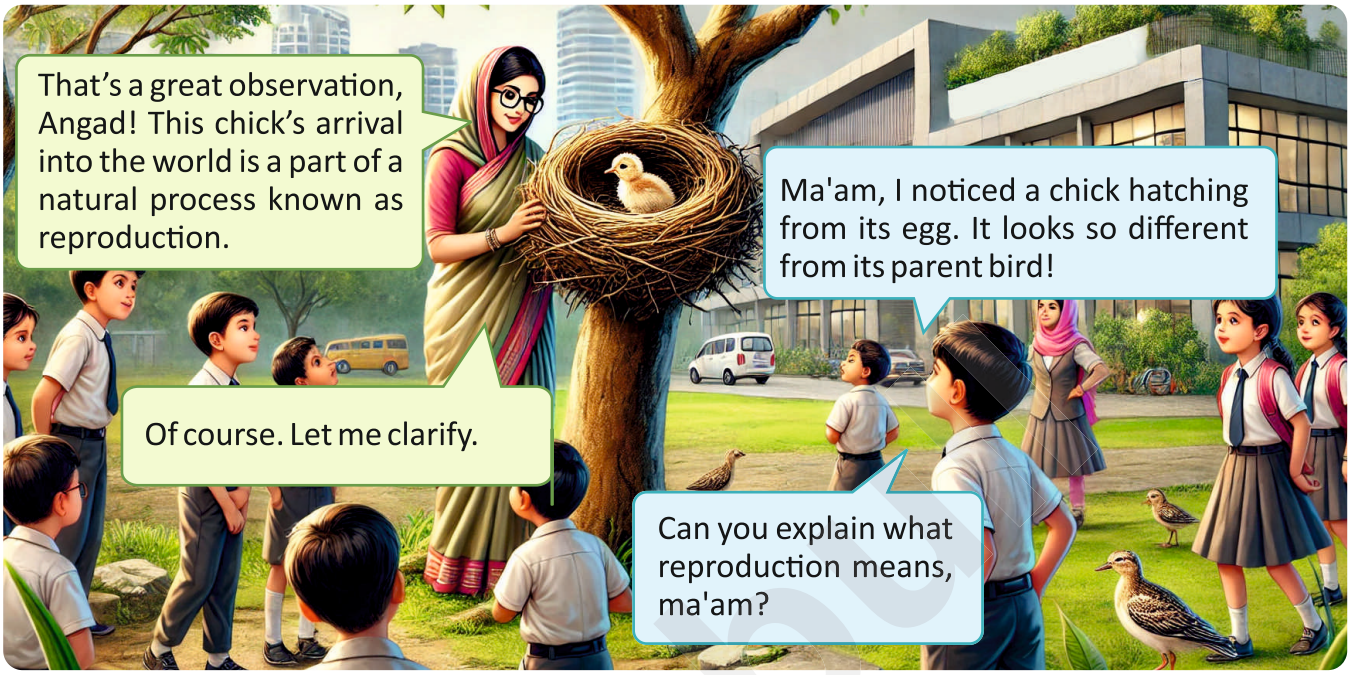
- Budding :- The new individuals develop from the buds is called budding.
- Binary fission :- In which an animal reproduces by dividing into two individuals is called binary fission.



Based on NCERT*

Reproduction and Its Types

Miss Anamika introduces a new topic in the classroom. This topic is about animal reproduction. She guides the students to observe a nest with a newly hatched chick on a tree in the schoolyard.



Reproduction is the biological process by which an organism produces more of its own kind, ensuring the survival and continuity of its species. It is a fundamental aspect of life, as it enables the creation of new individuals that grow, develop, and eventually reproduce, sustaining and often increasing the population of the species over time. Without reproduction, a species would face extinction as older generations die out.

A species is defined as a group of organisms that share similar physical and genetic traits and are capable of interbreeding to produce fertile offspring. This ability to produce fertile young is crucial for maintaining the genetic lineage of the species. Through reproduction, specific characteristics and traits of organisms are passed down from parents to their offspring. These traits, encoded in genetic material, ensure that the unique features and abilities of a species are preserved and adapted to their environment.

In History...

The study of animal reproduction dates back to ancient times. Aristotle (384-322 BCE), one of the first to systematically observe and describe animal reproduction, believed that both male and female contribute to the creation of life. His works laid the foundation for later discoveries.

However, it wasn't until the 17th century that scientists like Antonie Van Leeuwenhoek observed sperm cells under a microscope, advancing our under-standing of fertilization. The discovery of the process of internal fertilization and the understanding of embryonic develop-ment came later in the 19th century, with scientists such as Karl Ernst von Baer making groundbreaking contributions to the study of animal reproduction.

In animals, reproduction occurs through two primary modes:

Asexual Reproduction

Asexual reproduction involves a single organism giving rise to offspring without the involvement of another individual. The offspring are genetically identical to the parent, as no genetic material is exchanged. This method is common in simpler organisms like certain types of invertebrates, bacteria, and unicellular organisms. It allows for rapid population growth in stable environments but lacks genetic diversity.

Sexual Reproduction

Sexual reproduction, on the other hand, involves the combination of genetic material from two parents—one male and one female. This process results in offspring that are genetically unique, inheriting traits from both parents. Sexual reproduction enhances genetic diversity within a species, allowing for better adaptation to changing environments and improving survival chances in the long term.

Both modes of reproduction play a vital role in sustaining life on Earth, with each having its advantages and disadvantages depending on the organism and its environmental conditions.

Let's recall what we know

Applying Concepts

Apply

1. Why is it essential for organisms to reproduce, and how does reproduction contribute to species survival?
2. How do environmental factors influence the type of reproduction an organism might use?

Skills Focused: Critical and logical thinking, brainstorming, application, problem-solving

Further Exploration

Analyse

1. What are the advantages and disadvantages of sexual reproduction compared to asexual reproduction?
2. How do different types of reproduction impact genetic diversity within a population?

Skills Focused: Critical and logical thinking, brainstorming, application, problem-solving, responsibility

Self-Assessment Questions

Evaluate

1. What is reproduction, and why is it important for life?
2. Describe the primary differences between asexual and sexual reproduction.

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

3. Give examples of organisms that reproduce asexually and those that reproduce sexually.
4. How does sexual reproduction contribute to genetic variation?
5. What are some specific methods of asexual reproduction, and how do they work?

Creative Project

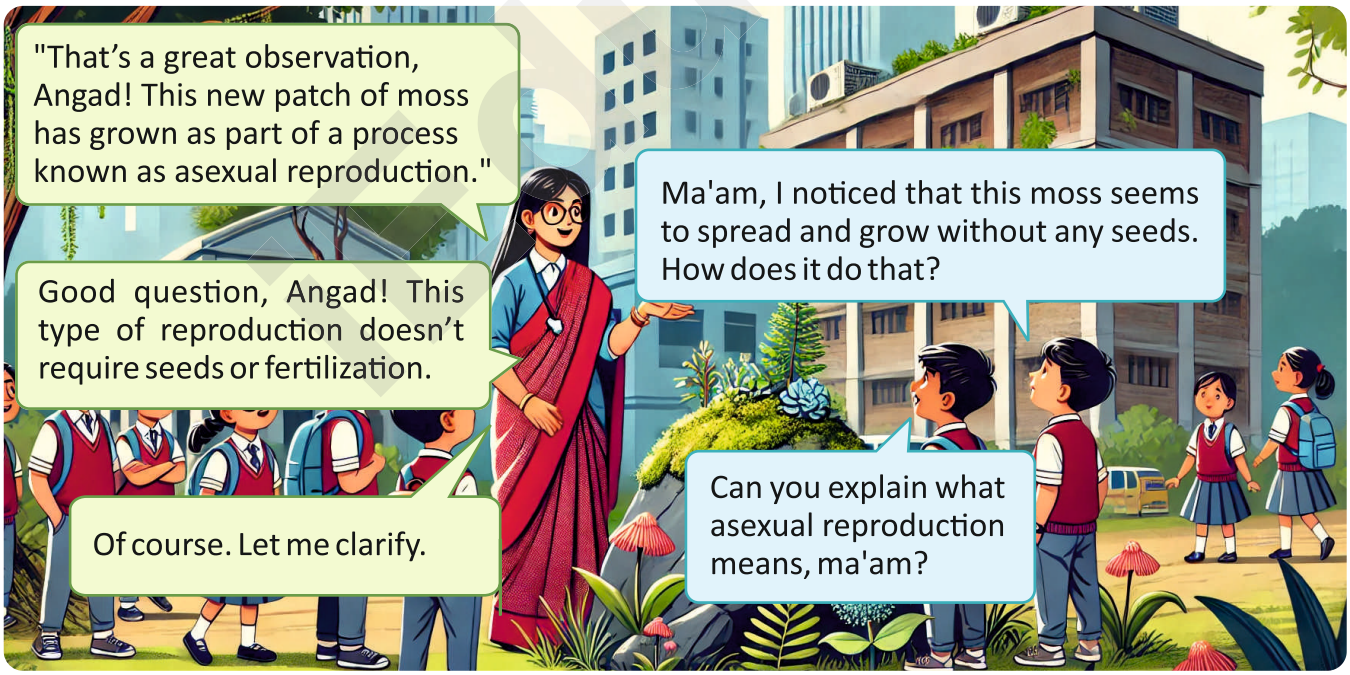
Create

Create a presentation using MS PowerPoint or LibreOffice Impress that explains different types of reproduction in plants and animals, highlighting examples and explaining the benefits of each method in different environments.

Skills Focused: Creativity, critical and logical thinking, brainstorming, research, digital literacy

Asexual Reproduction

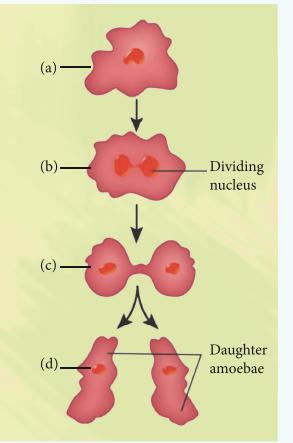
Miss Anamika introduces a new topic in the classroom. This topic is about asexual reproduction. She guides the students to observe a small patch of moss growing on a rock in the schoolyard.



Unicellular animals such as amoeba, starfish, hydra and other organisms reproduce asexually in various ways. Some of them are discussed :

Binary Fission

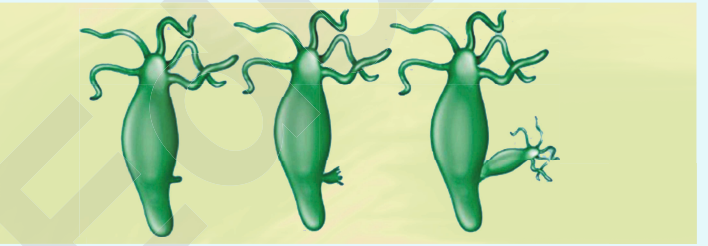
Some unicellular animals like amoeba and paramoecium reproduce asexually by binary fission. The process involves division of the parent cell into two similar daughter cells. The process begins by the elongation of the nucleus as well as the cell. The nucleus keeps elongating and finally gets pinched off in the centre to produce two daughter nuclei. Once this has happened, the cell further elongates and eventually gets pinched off in the centre to ultimately form two daughter cells.



Binary fission in Amoeba

Budding

Hydra reproduces asexually by producing buds. This is called budding. A bud is a small protuberance or a bulge that appears on the body of the animal by repeated division of cells. Gradually this bud differentiates into different types of cells and begins to look like the adult or the parent hydra. When the young animal is fully formed, it detaches itself from the parent and begins its life as an independent animal. The newly developed hydra is an exact replica of the parent animal as it involves only one parent.

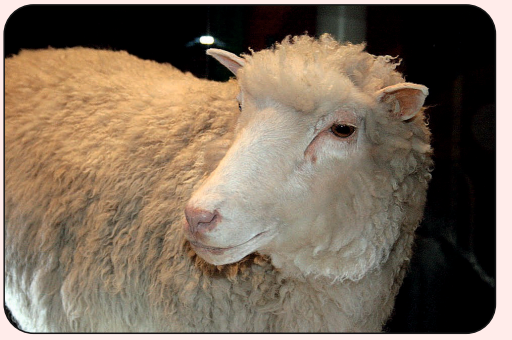


Budding in Hydra

Cloning

A clone is created by inserting the complete genetic material of a regular body cell from a donor into a recipient. Dolly was the first cloned mammal which was genetically identical to its parent sheep.

Cloning may lead to several abnormalities which could impact the mental development of the clone. Advocates of human therapeutic cloning believe that cloning could help in producing organs for transplantation and in regenerative medicine.



Dolly

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

Applying Concepts

Apply

1. How does asexual reproduction benefit certain organisms in stable environments?
2. In what ways does asexual reproduction differ from sexual reproduction in terms of genetic variation?

Skills Focused: Critical and logical thinking, brainstorming, application, comparative analysis

Further Exploration

Analyse

1. What are the advantages and limitations of asexual reproduction for species survival?
2. How do environmental factors influence the success of asexual reproduction in organisms?

Skills Focused: Critical and logical thinking, brainstorming, application, problem-solving, scientific inquiry

Self-Assessment Questions

Evaluate

1. What is asexual reproduction, and how does it work?
2. Can you list and describe different types of asexual reproduction methods, such as binary fission and budding?
3. How does asexual reproduction lead to identical offspring, and what are the implications of this?
4. What are some examples of organisms that reproduce asexually?
5. Why might asexual reproduction be more efficient for certain organisms compared to sexual reproduction?

Creative Project

Create

Create a poster or presentation explaining various types of asexual reproduction, such as binary fission and budding. Illustrate each method with examples and highlight their unique characteristics.

Skills Focused: Creativity, critical thinking, research, comparative analysis, digital literacy

Sexual Reproduction

Miss Anamika introduces a new topic in the classroom, focusing on sexual reproduction. She guides the students to observe a flowering plant in the school garden.

In sexual reproduction, two parents (a male and a female) are needed to produce a new individual. Both the male and female have different reproductive parts. Each parent produces special sex cells known as gamete. The male produces the sperm and the female produces egg or ovum.

Unisexual and bisexual animals

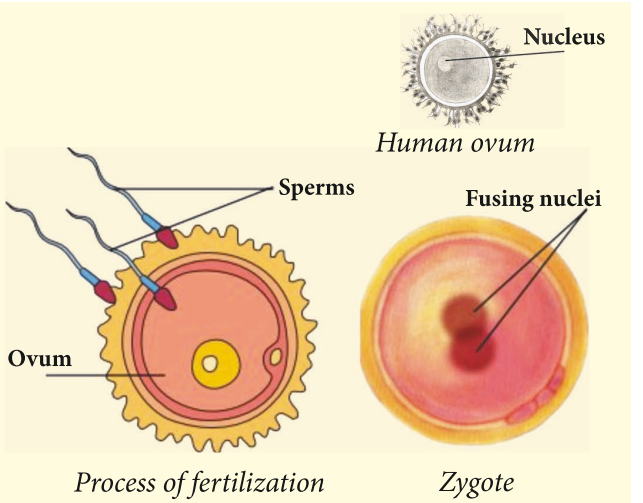
Majority of animals have separate male and female individuals. The male produces sperm and female produces egg or ovum. Such organisms are called unisexual.

However some organisms such as earthworm, and leech, have both male and female sex organs in the same organism. Such organisms are called hermaphrodite or bisexual organisms.

Fertilization

The process of fusion of sperm nucleus and ovum nucleus is called fertilization or the union of male and female gametes is called fertilization. When a sperm and an ovum fuse together, they form the zygote. This is the first cell of the new organism.

External and internal fertilization: Fertilization takes place in two different ways: external fertilization and internal fertilization. When the fusion of male and female gametes takes place

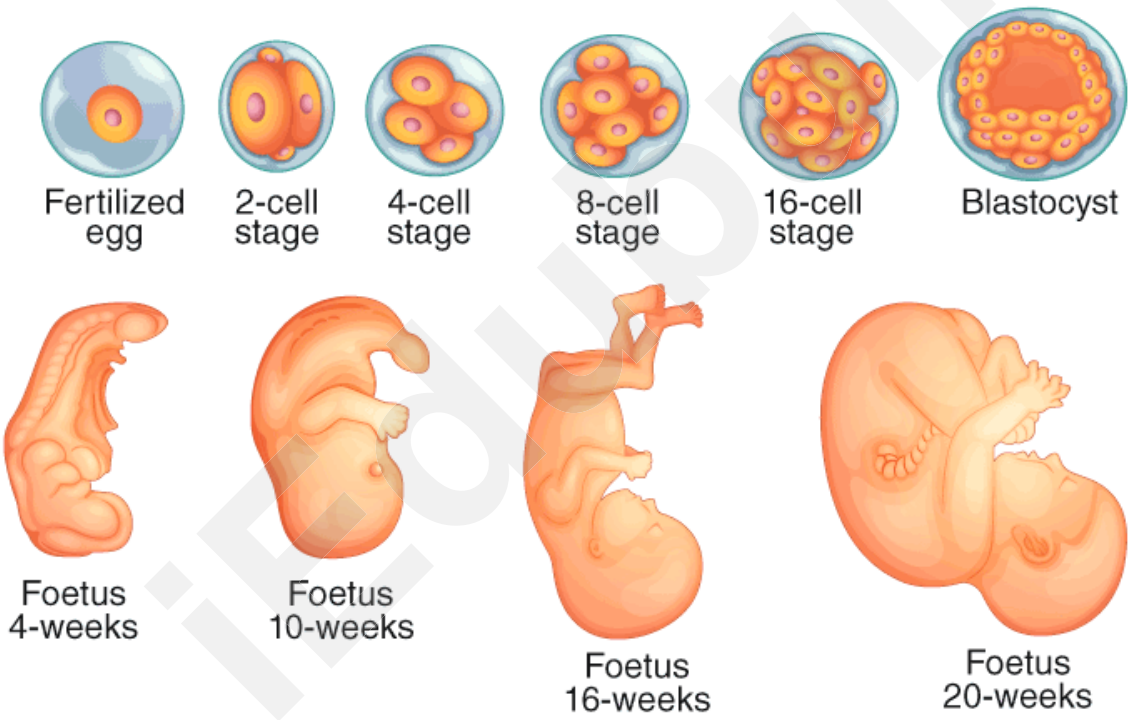


outside the body of the female, it is called external fertilization. This type of fertilization takes place in water e.g. frog and aquatic animals such as fish and starfish.

When the fusion of male and female gametes takes place inside the female body, the fertilization is called internal fertilization. Internal fertilization occurs in many animals including reptiles, insects, birds, cats, dogs, cattle and man.

Development of Embryo

Fertilization results in the formation of zygote, which begins to develop into an embryo. The zygote divides repeatedly to give rise to a ball of cells. The cells then begin to form groups that develop into different tissues and organs of the body. This developing structure is termed an embryo. The embryo gets embeded in the wall of the uterus for further development. The embryo continues to develop in the uterus. It gradually develops body parts such as hands, legs, head, eyes, ears etc. The stage of the embryo in which all the body parts can be identified is called a foetus. When the development of foetus is complete, the mother gives birth to the baby.



Internal fertilization takes place in hens also but do hens give birth to babies like human beings and cows? Your know that they do not, then how are chicks born? Let us find out. Soon after fertilization, the zygotes divide repeatedly, layers are formed around it. The hard shell is one of the protective layers. After the hard cell is formed around the developing embryo, the hen finally lays the eggs. The embryo takes about three weeks to develop into a chick. You must have seen the hen sitting on the eggs to provide sufficient warmth. Did you know the development of chick takes place inside the egg shell during this period?

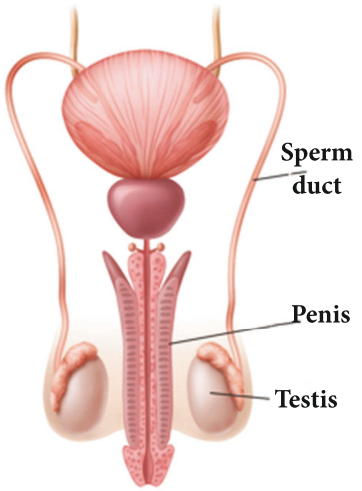
In animals, which undergo external fertilization, development of the embryo takes place outside the female body. The embryos continue to grow within their egg coverings. After the embryo develops, the eggs hatch.

Human Reproductive System

Before describing the process of reproduction in humans, we should know about the male and female reproductive systems.

Male Reproductive System

The male reproductive system consists of the following organs :



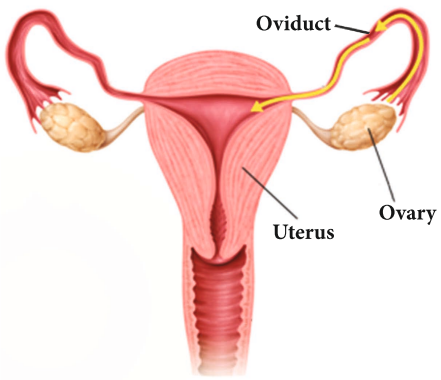
Male reproductive system

- **Testes** — These are two in numbers and oval shaped. They lie within the scrotum outside the abdominal cavity. Due to the process of gametogenesis, testes produce gametes called sperms.
- **Sperm ducts** — A pair of sperm ducts carries sperms to the urethra during discharge of gametes.
- **Penis** — It is a muscular and erectile tissue used in sexual intercourse. It delivers the sperms into the vagina of female.

Female Reproductive System

The reproductive system of a female consisting of the following parts :

- **Ovaries** — A pair of ovaries is situated in the abdominal cavity. In human beings, only one egg is released every month by either of the two ovaries.
- **Oviduct or fallopian duct** — These are thin and called muscular tubes which join the uterus and the ovaries.
- **Uterus** — It is a broad muscular chamber where the fertilized ovum develops into a baby.
- **Vagina** — The uterus opens into a wide muscular tube called vagina, which receives sperms.



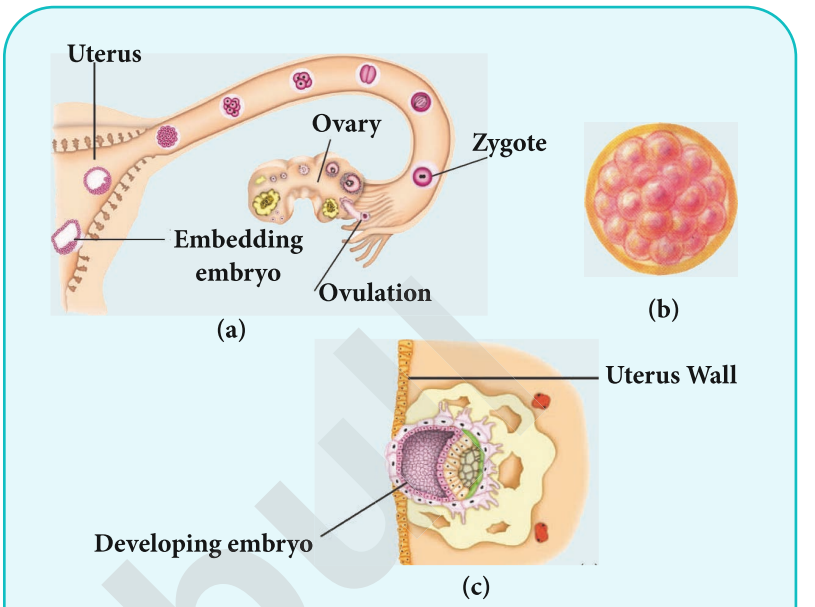
Female reproductive system

Fertilization In Humans

In human beings, the fertilization or union of sperms and ovum occurs in the anterior part of oviduct. This is the first step in the process of reproduction.

Development of human embryo

After fertilization the zygote develops into an embryo. While descending down through the oviduct, the zygote divides repeatedly and gives rise to a ball of cells. These cells multiply and differentiate to develop into tissues, organs and organ systems of the body. This developing structure is known as embryo.

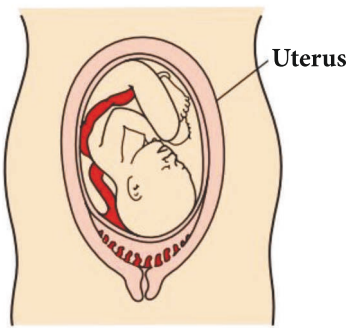


(a) Zygote formation and development of an embryo from the zygote; (b) Ball of cells (enlarged); (c) Embedding of the embryo in the uterus (enlarged)

On reaching the uterus, the embryo attaches to the wall of uterus by placenta. This is called implantation. The embryo obtains nutrients and oxygen from mother's blood through placenta and continues to grow and develop all its body parts. At two months', the embryo starts resembling the human form and is called foetus. The development and growth of foetus is completed by the end of 280 days and the mother gives birth to a baby.

Invitro fertilization

It is a technique in which ovum collected from a female's body is allowed to fuse with sperms collected from a male's body in an external medium or outside the body of the female. The zygote is allowed to grow in vitro for about a week and then implanted in the female's uterus where it further develops as a normal embryo. This technique is employed to set pregnancy in a female who has problems related to the oviduct that does not allow fertilization to happen normally. A baby born to this technique is called Test Tube baby.



Foetus in the uterus

Viviparous and oviparous animals

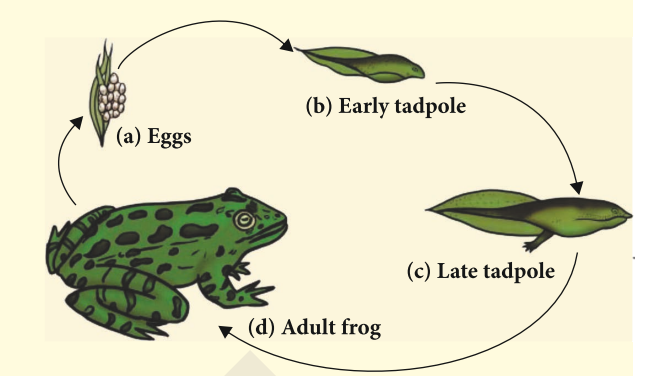
Animals which give birth to young ones or babies are called viviparous animals. Cats, dogs, horses, lions, monkeys and men are viviparous animals.

The animals which lay eggs are called oviparous animals. Insects, fishes, frogs, birds and reptiles are oviparous. In some oviparous animals such as fishes and frogs, the eggs are fertilized outside

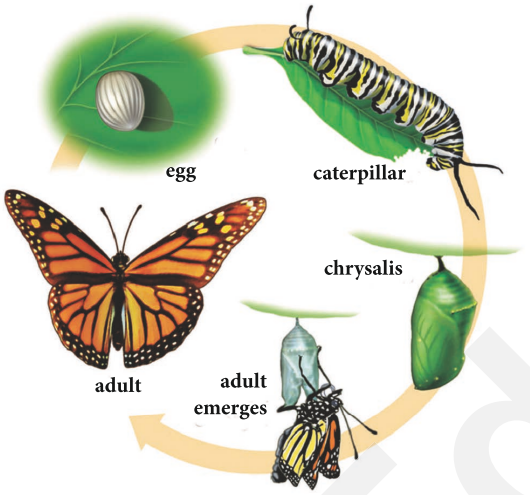
the body. But in reptiles and birds, the eggs are fertilized inside the body of the female (internal fertilization)

Life cycle of a frog

In frogs, the development of the embryo takes place outside the female body. The embryo continues to grow within the egg. After the embryo develops, eggs hatch into larva, called tadpole. The tadpoles are seen swimming in ponds. They are much different from adults. A tadpole undergoes several changes in form and structure and changes into an adult frog. Thus there are three distinct stages in the life cycle of a frog.



Life cycle of frog



Metamorphosis

Metamorphosis is the process of transformation of larva into an adult through drastic changes. In human beings and all other viviparous animals, metamorphosis does not occur because the young one resembles the adult at the time of birth.

Did you know

Human reproduction is a miraculous and incredibly complex process where timing, cellular precision, and even chemistry play crucial roles?

Sperm Production: A healthy male produces about 1,500 sperm per second, totaling up to 100-300 million sperm per ejaculation! Yet, only a few hundred survive the arduous journey through the female reproductive tract to reach the egg.

Egg Rarity: Women, on the other hand, are born with all the eggs they'll ever have — about 1-2 million at birth, but only around 300-400 will be ovulated in their lifetime. This makes the egg one of the rarest cells in the human body!

Chemical Communication: Once the sperm reach the egg, a fascinating phenomenon occurs. The egg emits chemical signals to guide the sperm, and only one sperm gets through, triggering the egg to create a "biological shield" that blocks any other sperm from entering.

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

Apply Concept in Real-Life Context

Apply

1. Why is sexual reproduction essential for genetic diversity in a species?
2. How does the process of fertilization contribute to the formation of a new organism?

Skills Focused: Critical and logical thinking, brainstorming, application, problem-solving

Examine Further

Analyse

1. How do environmental factors influence reproductive behavior and success in different species?
2. What role does sexual reproduction play in the process of evolution and natural selection?

Skills Focused: Critical and logical thinking, brainstorming, application, problem-solving, understanding responsibility

Self-Assessment Questions

Evaluate

1. What is sexual reproduction, and how does it differ from asexual reproduction?
2. Define gametes and explain their role in sexual reproduction.
3. What are the key stages in the process of sexual reproduction in animals?
4. How does sexual reproduction contribute to variations within a population?
5. What are some examples of species that rely exclusively on sexual reproduction, and why is this method advantageous for them?

Think like a scientist

Create

Create a presentation using MS PowerPoint or LibreOffice that explains the stages of sexual reproduction in plants or animals, detailing how genetic material is combined and passed to the next generation.

Skills Focused: Creativity, critical and logical thinking, brainstorming, research, digital literacy

SUMMARY

1. Reproduction and Its Types

Reproduction is a biological process by which organisms produce offspring, ensuring the survival of their species. It plays a crucial role in maintaining biodiversity and ecological balance. The two main types of reproduction are:

- **Sexual Reproduction:** Involves the fusion of male and female gametes, leading to genetic variation.
- **Asexual Reproduction:** A single organism produces offspring without gamete fusion, leading to genetically identical offspring.

2. Asexual Reproduction

Asexual reproduction is common in simpler organisms and allows rapid population growth. Types of asexual reproduction include:

- **Binary Fission:** A single organism divides into two identical organisms (e.g., bacteria, amoeba).
- **Budding:** A new organism develops from an outgrowth or bud on the parent organism (e.g., yeast, hydra).
- **Fragmentation:** The parent organism breaks into fragments, each capable of growing into a new organism (e.g., sponges, starfish).
- **Spore Formation:** Spores are produced and dispersed to grow into new organisms (e.g., fungi, mosses).

Advantages of Asexual Reproduction:

- Rapid reproduction ensures quick population growth.
- No need for a mate, making it energy-efficient.
- Beneficial in stable environments where genetic variation is less critical.

2. Sexual Reproduction

Gamete Formation: Male and female gametes are formed in specialized reproductive organs (e.g., pollen in plants, sperm in animals).

Fertilization: Fusion of male and female gametes to form a zygote, which develops into a new organism.

Advantages:

- Introduces genetic variation, which enhances adaptability and survival.
- Ensures the continuation of species in changing environments.

Importance of Reproduction in Conservation

Biodiversity Preservation

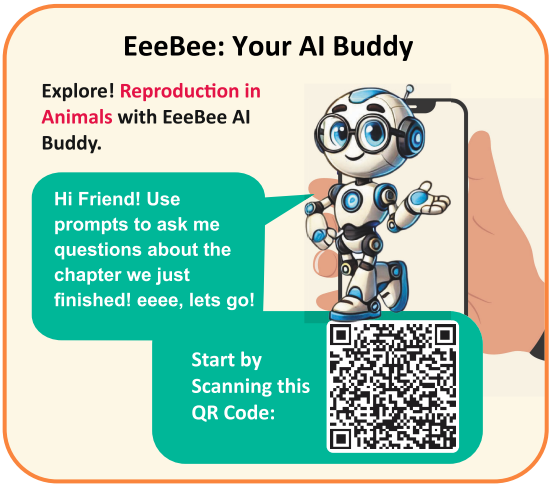
Sexual reproduction contributes to genetic diversity, helping species adapt to environmental changes.

Asexual Methods for Restoration:

Techniques like vegetative propagation can aid in reforestation and conserving rare plant species.

Sustainability:

Understanding reproductive processes supports effective conservation programs, such as breeding endangered species in captivity and restoring ecosystems.



Gap Analyzer™
Take a Test

EXERCISE

That turn curiosity into confidence—let's begin!

A. Choose the correct answer.

1. Which type of reproduction involves only one parent?
   (a) Sexual reproduction ☐ (b) Asexual reproduction ☐
   (c) Fertilization ☐ (d) Pollination ☐
2. In sexual reproduction, the male gamete is called:
   (a) Zygote ☐ (b) Sperm ☐
   (c) Egg ☐ (d) Embryo ☐
3. Which of the following is an example of asexual reproduction?
   (a) Budding in Hydra ☐ (b) Birth of a kitten ☐
   (c) Pollination in flowers ☐ (d) Egg hatching in birds ☐
4. The union of a sperm and an egg is known as:
   (a) Fragmentation ☐ (b) Fertilization ☐
   (c) Budding ☐ (d) Fission ☐
5. Binary fission is a form of reproduction observed in:
   (a) Mammals ☐ (b) Birds ☐
   (c) Amoeba ☐ (d) Reptiles ☐

B. Fill in the blanks.

1. The process by which living organisms produce offspring is called _____.
2. Sexual reproduction requires the involvement of _____ parents.
3. The offspring produced by asexual reproduction are genetically _____ to the parent.
4. In humans, fertilization takes place in the _____.
5. The zygote develops into an _____ and eventually a fully formed organism.

C. Write True or False.

1. Asexual reproduction produces offspring with genetic diversity. _____
2. Budding is a type of sexual reproduction. _____
3. Fertilization in humans occurs outside the female body. _____
4. A zygote is formed after the fusion of male and female gametes. _____

D. Define the following terms.

1. Reproduction
2. Asexual Reproduction
3. Sexual Reproduction
4. Fertilization
5. Zygote

E. Match the columns.

Column A	Column B
1. Hydra	(a) Internal fertilization
2. Amoeba	(b) Zygote formation
3. Humans	(c) Binary fission
4. Sperm and Egg	(d) Budding
5. External Fertilization	(e) Frogs

F. Give reasons for the following statements.

1. Asexual reproduction is faster than sexual reproduction.
2. Sexual reproduction leads to genetic variation in offspring.
3. Fertilization is necessary for the formation of a zygote.
4. External fertilization occurs mostly in aquatic animals.
5. Budding in Hydra results in an identical offspring.

G. Answer in brief.

1. What is the difference between sexual and asexual reproduction?
2. How does fertilization lead to the formation of a zygote?
3. What is binary fission, and which organisms use this method of reproduction?
4. Why is genetic variation important in sexually reproducing organisms?
5. Explain the process of budding with an example.

H. Answer in detail.

1. Describe the different types of asexual reproduction with examples.
2. Explain the process of sexual reproduction in humans, from gamete formation to zygote development.
3. Compare internal and external fertilization, giving examples of organisms that use each method.
4. Discuss how asexual reproduction benefits certain organisms in stable environments.
5. Explain the importance of reproduction in the survival and continuation of species.

NEP Corner

Know about NEP 2020

Choose Your Own Path!

No need to worry about being "stuck" in one career. NEP lets you explore multiple entry and exit points in higher education.

Skill-based Activity

Biological Exploration

STEM

Reproduction is the biological process by which new individual organisms are produced. It can occur in two main forms: sexual and asexual reproduction, each with unique characteristics and mechanisms. Sexual reproduction involves the fusion of male and female gametes, resulting in genetic diversity, while asexual reproduction produces genetically identical offspring.

1. What are the primary differences between sexual and asexual reproduction, and how do these differences impact genetic diversity?
2. What are some examples of organisms that use both sexual and asexual reproduction, and under what circumstances do they switch between these modes?
3. How does the environment influence whether an organism reproduces sexually or asexually?
4. Compare the energy requirements and survival advantages of sexual vs. asexual reproduction. Represent the comparison in a table format.

Skills Covered: Research, critical and logical thinking, brainstorming, comparative analysis

Visual Exploration of Reproductive Systems

Art

Create a detailed chart comparing the male and female reproductive systems in humans. Label the main organs involved and describe their functions in relation to the process of reproduction.

Skills Covered: Creativity, critical thinking, comparative analysis, anatomical understanding

Debate on Genetic Modification vs. Natural Reproduction

Group Activity

Research the topic "Genetic Modification vs. Natural Reproduction: Progress or Risk?" Divide the class into two groups, with one group advocating for genetic modification as a way to enhance reproductive processes and the other opposing it, emphasizing the importance of natural reproduction. Each group will prepare a presentation and participate in a debate to support their perspective.

Skills Covered: Teamwork, communication, critical thinking, brainstorming, ethical reasoning, persuasive skills

From Cells to New Life

Case to Investigate

The process of reproduction, whether sexual or asexual, results in the creation of new life. Different organisms use different types of reproduction, each with unique processes and characteristics. Sexual reproduction involves the fusion of gametes, while asexual reproduction does not require gamete fusion and leads to genetically identical offspring.

Conduct a survey and list ten different organisms that reproduce asexually and ten that reproduce sexually. Describe the method of reproduction for each organism and note any advantages or disadvantages. Present the information in a table format.

Skills Covered: Observation, Critical thinking, Research, Analytical skills, Communication

Ethical Considerations of Cloning in Reproduction

Artificial Intelligence

Cloning is a form of asexual reproduction where an organism is replicated to produce a genetically identical copy. While cloning has various applications in science and medicine, it also raises ethical questions, especially regarding its use in humans and animals.

1. What are some ethical concerns associated with cloning in animals and humans?
2. How has cloning been used in agriculture, and what are the potential benefits and risks to biodiversity?
3. What role does AI play in cloning research, and how does it contribute to the accuracy and efficiency of cloning processes?
4. Are there international laws or ethical guidelines governing cloning practices? Summarize key points in a table.

Skills Covered: Critical and logical thinking, brainstorming, ethical analysis, research