

# Revision Notes on Reproduction in Animals

- Several processes such as circulation of blood, digestion and respiration are essential for the survival of human beings and other animals.
- Similarly, reproduction is essential to maintain the continuity in the species.
- If reproduction in animals does not take place, no similar kind of organisms will be present on the earth generation after generation.

## Modes of Reproduction in Animals

There are two modes of reproduction in animals:

- Sexual Reproduction
- Asexual Reproduction

### Similarities between Reproduction in Plants and Animals

- Plants and animals can both undergo the sexual and asexual process of reproduction.
- Just like plants, in animals, the males and females have different reproductive organs.
- In both the plants and animals, the zygote is formed when the male and female gametes fuse together and hence the zygote develops into a new individual.

## Sexual Reproduction

The type of reproduction that begins with the fusion of male and female gametes is called Sexual Reproduction.

## Reproductive Parts in Humans

### Male Reproductive Organs

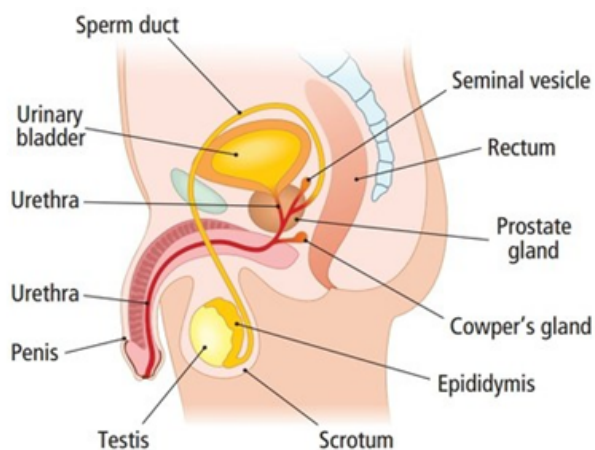


Figure 1: Male reproductive organs

The male reproductive system provides the sperm (male gametes) for fertilization. The male reproductive organs include the following:

#### Penis

It is a cylinder-shaped organ containing a small opening at its top. It secretes semen which contains the male gametes or sperms.

## Scrotum

It is a sac-like structure present behind the penis. The testicles or testes are present in this organ. It provides them the right temperature so that they can produce sperms.

## Testes

Most males have a pair of testis (testes) or testicles. The testes consist of coiled tube-like structures that produce sperms. The testes also generate the male sex hormone or the testosterone that causes puberty in males.

## Urethra

It is a tube-like structure that allows the flow of semen that contains sperms outside the body. The urethra and penis both are also a part of the male urinary system.

## Vas Deferens

It is a tube that carries the sperms from the testicles to the urethra.

## Prostate Gland

It is a gland located under the urinary bladder. It secretes prostate fluid which makes the one third content of semen. This fluid contains some enzymes, zinc and citric acid.

## Seminal Vesicles

They have a pouch-like structure. They are located above the prostate gland and connect with the vas deferens. They also secrete a fluid that provides nourishment to the sperms.

## Male Sex Hormone or Testosterone

The testes produce testosterone and the pituitary gland controls how much testosterone will be produced. This hormone is responsible for the development of male sex organs and development of secondary sexual characters in males during puberty such as deepening of voice and growth of facial and body hair.

## The Sperm Cell

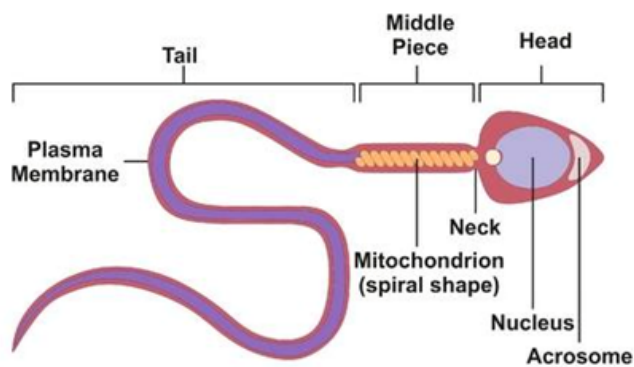


Figure 2: Sperm Cell

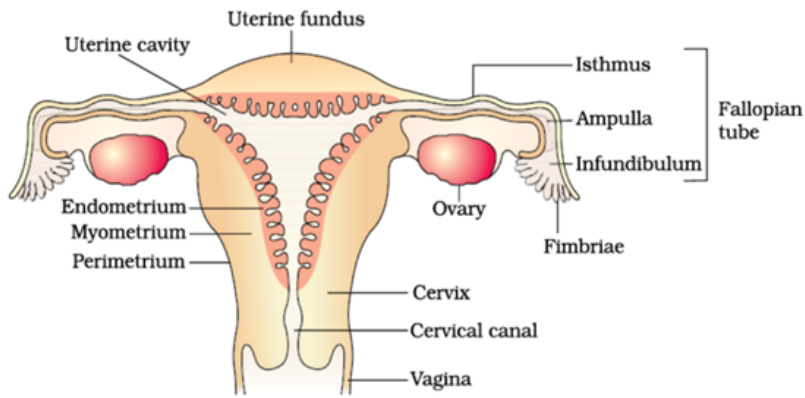
The testes secrete millions of sperm cells together. A sperm comprises of a single cell and has a specific structure with three main parts as given below:

**Head:** It consists of the nucleus which contains the DNA information of the cell.

**Middle Part:** It is packed with cell organelles called **Mitochondria**. The mitochondria are responsible for producing energy in the cell. Hence, sperm uses this energy to move.

**Tail:** It allows the sperm cell to travel at a fast pace.

## Female Reproductive Organs



**Figure 3: Female Reproductive Organs**

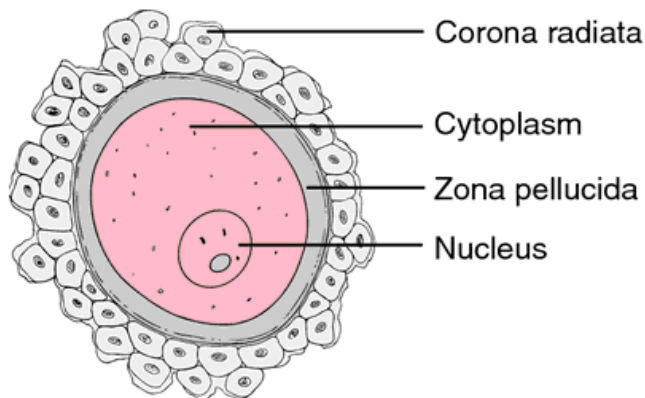
The female reproductive system provides the eggs (female gametes) for fertilization. The female reproductive organs are:

### 1. Ovaries

The female reproductive system comprises of a pair of ovaries. These are the main female sex organs and are responsible for the production of female gametes called **Eggs or Ova** (ovum – singular) and female hormones. The ova or female eggs also consist of a single cell.

#### Estrogen and Progesterone

These are hormones or chemical substances produced by the ovaries. These hormones are responsible for the development of the female reproductive organs and the secondary sexual characteristics in women such as development of breasts and body hair.



**Figure 4: Ovum or Female Egg**

### 2. Oviduct or Fallopian Tubes

These are two funnel-shaped structures that extend from the superior right and left corners of the uterus to the edge of the ovaries. The ovaries release one egg every month into the oviducts. The oviducts consist of cilia that carry the ovum from the oviduct to uterus.

### 3. Uterus

It is an inverted pear-shaped organ that allows the development of the fertilized egg into a human baby. The uterus connects with an opening called **Cervix** that connects it to the vagina.

### 4. Vagina

It is a muscular tube-like structure that connects with the cervix. It acts as the receptor of the penis and allows the movement of sperms to the fallopian tubes and uterus. It also allows delivery of the foetus during the birth of the child.

## Menstrual Cycle

When females hit puberty, they start producing mature eggs every month indicating the ability to reproduce. This process is called menstrual cycle. In this cycle, the ovaries produce an egg every month that travels to the uterus and attaches to its lining. If the egg is not fertilized, the uterus sheds its lining and the egg which result in bleeding in the females. On an average the duration of the menstrual cycle is 28 days. The cycle starts at puberty, around the age of 10 or 11 years and lasts until the age of 45 to 55 years.

## Gametogenesis

It is the process of production of gametes by the male and female primary reproductive organs. It occurs in three phase in both males and females:

- Multiplication Phase
- Growth or maturation phase
- Meiotic Phase

Gametogenesis in males is called **Spermatogenesis**. It occurs in the testes and results in formation of sperm cells.

Gametogenesis in females is called **Oogenesis**. It occurs in the ovaries and results in production of female eggs or ova.

## Fertilization

- Firstly, reproduction in animals begins when the sperm fuses with an ovum. This process is called **Fertilization**.
- The nuclei of the sperm and egg combine together and form a single nucleus.
- As a result, the **zygote** is formed.
- Since the zygote is formed with the fusion of male and female gametes the new individual possesses the characteristics of both the parents.

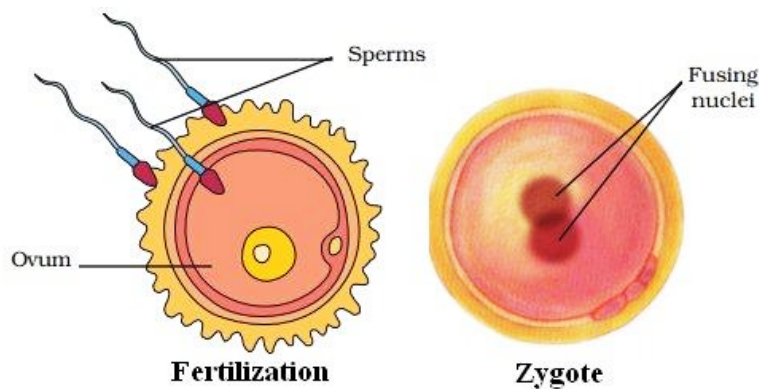


Figure 4: Fertilization and Zygote

Fertilization can be of two types:

Internal fertilization	External fertilization
The fertilization process takes place inside the female body	The fertilization process takes place outside the body of the females.
Less number of eggs are produced by such females as there are high chances of the survival of the offspring.	A large number of eggs are produced by such females as the chances of survival of the offspring are very low.
For Example, Cows, Human beings and hens undergo internal fertilization.	For Example, Aquatic animals like fishes and amphibians like frogs undergo external fertilization.

## External Fertilization in Frogs and Toads

- The frogs and toads reproduce by laying eggs in a slow stream or ponds.
- The female frogs first lay hundreds of eggs together in the water.
- These eggs are not covered with any hard shell instead there is a jelly-like substance that guards them all and holds them together.
- As the female frogs lay their eggs, the male frogs deposit the sperms over them.
- This results in external fertilization when the sperms come in contact with the eggs in the water.
- Though the eggs are large in numbers only a few of them manage to survive.
- There are several factors which may hinder the fertilization process such as exposing to water movement, rainfall, winds and other animals.

## Internal Fertilization in Hens

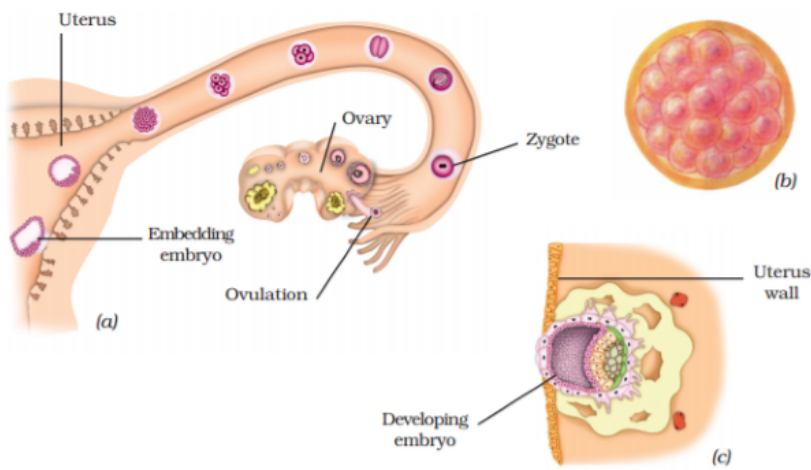
- Hens reproduce by laying eggs.
- After the formation of the zygote, it keeps on dividing itself and then travels through the oviduct.
- In this process, different layers are formed over the egg that then turns into a hard shell or covering of the egg.
- When this hard shell is formed the hen lays the egg.
- Then it takes almost 3 weeks for the embryo to develop into a chick.
- In this time period, the hen often sits over the egg to provide it with warmth.

## What are test tube babies?

- In some women, the oviducts are blocked and hence they are unable to hold the eggs. This means that these women are not able to bear babies because of blocked oviducts. However, due to the process of **Vitro Fertilization or IVF**, the freshly released eggs of females and the male sperms can be fertilized externally.
- The zygote thus formed is allowed to develop for a week outside the female body in safe conditions and is then placed in the woman's uterus.
- In this way, these women can bear babies.
- The babies that are born with the IVF process are called **Test Tube Babies**.

## Development of the Embryo

- The **zygote** formed after the fertilization process divides itself in a repeated manner and forms a ball of cells.
- These cells then form different groups and each group then starts developing into different tissues and organs. This structure is called an **Embryo**.
- The embryo embeds itself into the uterus wall and continues to develop and grow.
- Soon the body parts such as hands, legs, feet, eyes and ears start developing.
- The embryo whose parts can be identified individually is called a **Foetus**.
- The foetus then completely develops and takes birth as a baby.



(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)

### How is an embryo different from a zygote?

Zygote	Embryo
A zygote consists of a single cell.	An embryo consists of more than one cell.
It is formed as the fertilization process occurs.	It is formed after the fertilization process.
It has no well-defined organs or tissues.	The body parts and tissues are well defined in an embryo.

Based on the way how the organisms give birth to their offspring, they are classified into two categories:

Viviparous	Oviparous
These are the organisms that give birth to their young ones directly.	These are the organisms that reproduce by laying eggs.
For Example, Human beings, Dogs, Cattle, Cats	For Example, Fishes, Reptiles Amphibians

### Turning into adults from young ones

- As individuals are born they continue to grow until they turn into adults.
- The young ones may or may not look like the same when they become adults. For instance, in the case of frogs and silkworms, the adults and young ones are completely different.

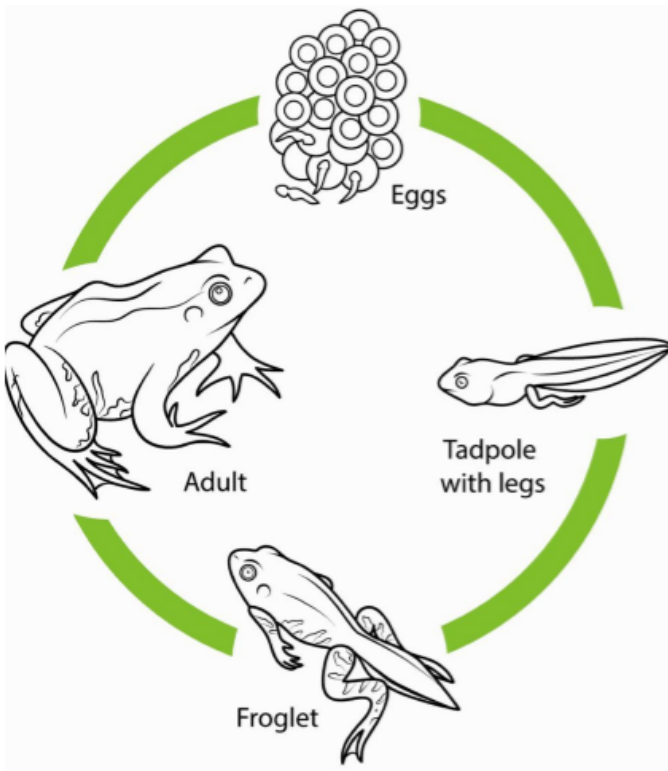


Figure 6: Life cycle of a frog

### What is metamorphosis?

- The process in which the young ones undergo drastic changes as they develop into an adult is called **Metamorphosis**.
- Human beings do not undergo metamorphosis. This is because their body parts remain the same from the childhood to adulthood.

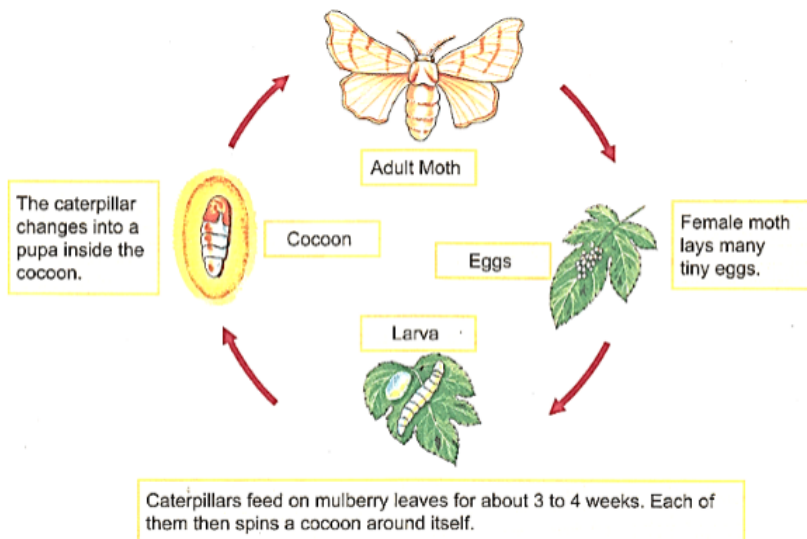


Figure 7: Metamorphosis in Silk moth

### Asexual Reproduction in Animals

This type of reproduction involves only one parent. It takes place in microscopic animals like Amoeba and small animals like the hydra.

#### Budding in Hydra

- Just like yeast, reproduction in hydra takes place through the process called **Budding**.
- The Hydra possesses different bulges on itself called **Buds**.
- These buds develop into individual Hydra. Each Hydra can possess a different number of buds.

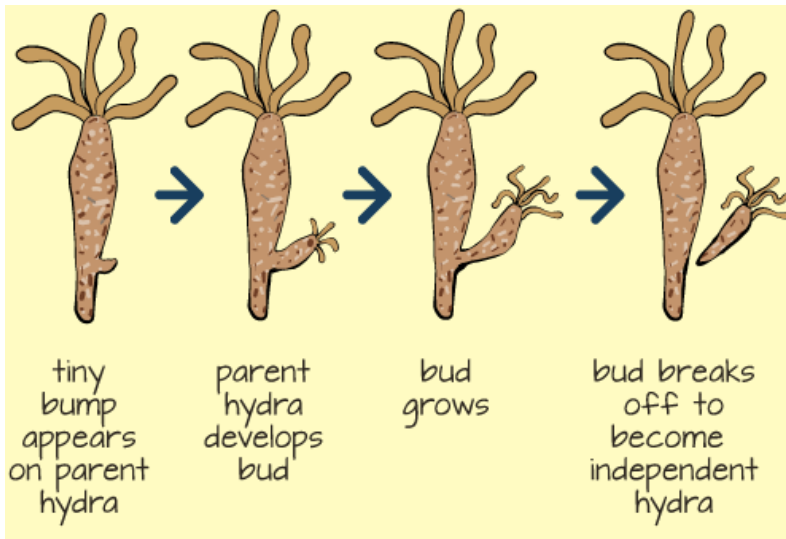


Figure 8: Budding in Hydra

### Binary Fission in Amoeba

- The Amoeba divides itself into two individuals and the reproduction takes place in this way. It is called **Binary Fission**.
- Amoeba consists of only one cell.
- As it reproduces the nucleus of the Amoeba divides itself and forms two different nuclei.
- Then the division of the body of the Amoeba takes place and each part receives one nucleus.
- In this way, two Amoebas are produced from a single parent.

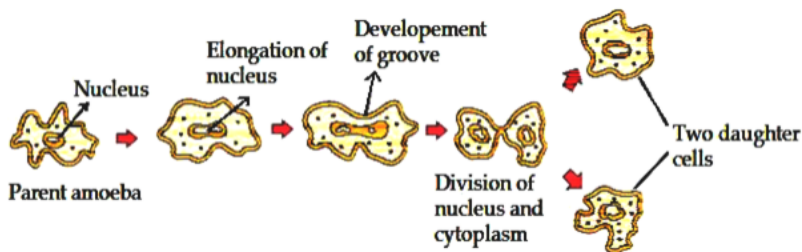


Figure 9: Binary fission in Amoeba

### Fragmentation and Regeneration

In some organisms, the parent organism divides itself into different fragments where each fragment then regenerates and develops into a new organism. This type of asexual reproduction takes place in Planaria and Starfish. Although, starfishes are capable of sexual reproduction as well but many times they also reproduce asexually with the process of fragmentation.

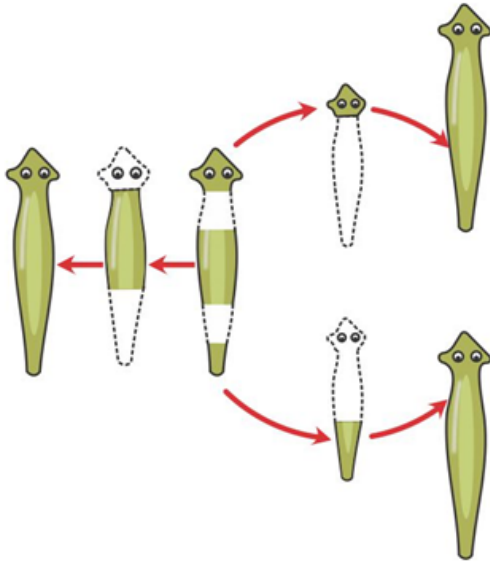


Figure 11: Fragmentation and Regeneration in Planaria

### Parthenogenesis

In this type of asexual reproduction, the female organisms are capable of producing eggs without fertilization. These eggs develop into a new organism. This type of reproduction can be seen in some fishes like sharks, some birds, reptiles like lizards and a few insects. However it cannot be seen in mammals.