1. Reproduction:

Reproduction is the process by which living organisms produce more living organisms of their own kind.

1.1 Mode of Reproduction:

There are two main types of reproduction in living organisms.

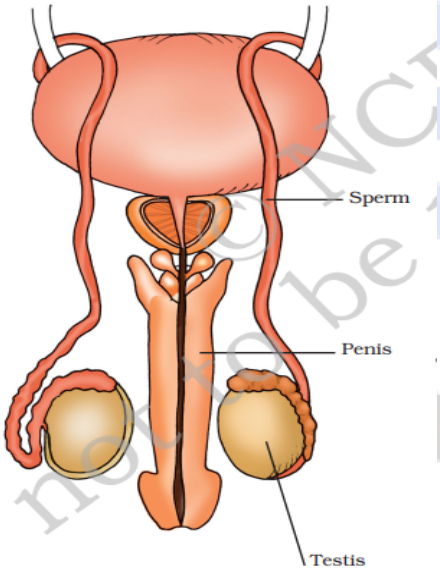
(i) Asexual Reproduction: The process of reproduction in which new individuals are produced from a single parent. E.g. microorganisms. Asexual reproduction is found in the single-celled organism such as the archabacteria, eubacteria etc. Many plants and fungi reproduce asexually as well.

(ii) Sexual Reproduction: The process of reproduction in which two individuals are involved to produce a new individual. E.g. Human beings, Tiger.

2. Sexual Reproduction in Human Beings:

In animals, males and females have different reproductive parts or organs. The reproductive parts in animals produce gametes that fuse to form a zygote. It is the zygote which develops into a new individual. This type of reproduction that involves fusion of male and female gametes is called sexual reproduction. It is biparental.

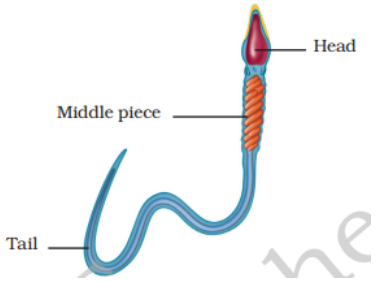
2.1 Reproductive Organs in Humans:



Male reproductive System

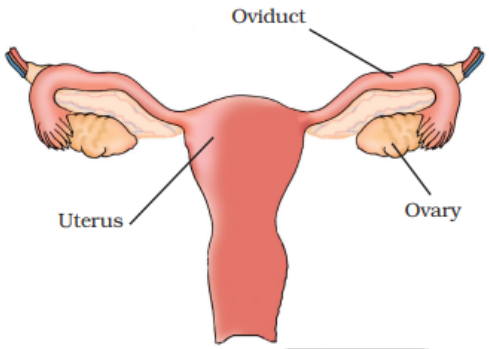
2.1.1 Male Reproductive System: A pair of testes (singular, testis), two sperm ducts and a penis, these are the male reproductive organs.

The testes produce the male gametes called sperms. Millions of male gametes (sperms) are produced by the testes. Each sperm has a head, a middle piece and a tail. Sperm is a single cell with all the usual cell components.



Sperm

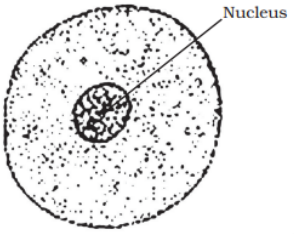
2.1.2 Female Reproductive System:



Female Reproductive System

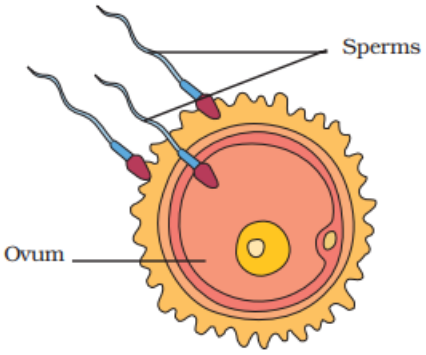
A pair of ovaries, oviducts (Fallopian tubes) and the uterus constitute the female reproductive organs. Ovary produces female gametes called ova (eggs). In human beings, a single matured egg (ovum) is released by one of the ovaries, into the oviduct every month. Uterus is the part where embryo gets implanted during pregnancy.

Ovum is the female gamete that undergoes fertilization.

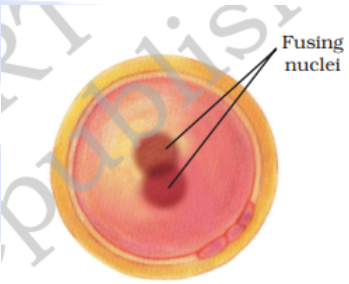


Ovum

2.2 Fertilization: The process of fertilization is fusion of a male gamete (Sperm) with a female gamete (Ovum) to produce a single cell called the zygote. Zygote has two sets of chromosomes.



Fertilisation



Zygote

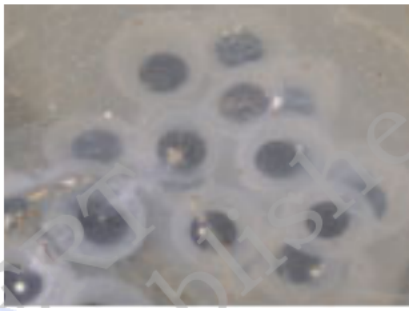
2.2.1 Types of Fertilization:

There are two types of fertilization in animals, external fertilization and internal fertilization.

(i) Internal Fertilization: When fertilization takes place inside the animal's body, it is called internal fertilization. Internal fertilization occurs in many animals including humans, cows, dogs and hens. Fewer gametes are produced as there is more surity of fertilisation.

(ii) External Fertilization: In this type of fertilization, the fusion of a male and a female gamete takes place outside the body of the animal's body. It is very common in aquatic animals such as fish, starfish, etc. Thousands of sperm and eggs are produced as some gametes may be eaten up by predators or may be swept away by water.

During spring or rainy season, frogs and toads move to ponds and river. When the male and female come together in water, the female lays the eggs in water. The eggs are covered by a gelatinous substance for protection. The male deposits sperms over them. Each sperm swims randomly in water with the help of its tail.



Eggs of frog

The sperms then come in contact with the eggs.
Fertilisation takes place to form a Zygote, a single cell with which a new individual is formed.

2.3 Development of Human Embryo:

Development of embryo takes place in the female reproductive system through following steps:

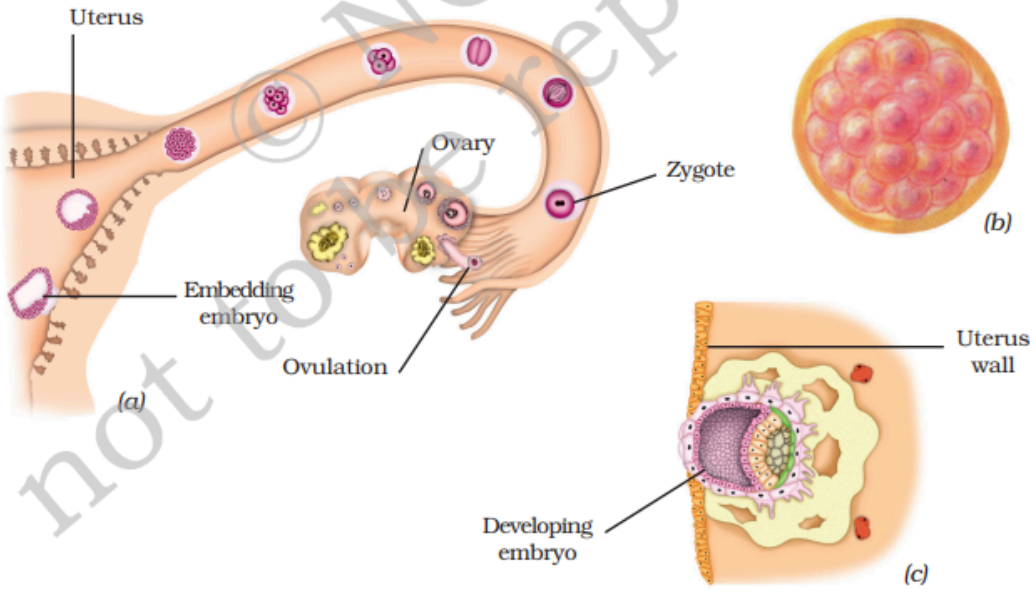


Fig : (a) Zygote formation and development of an embryo from the zygote; (b) Ball of cells (enlarged); (c) Embedding of the embryo in the uterus (enlarged)

(i) Every month, a single egg comes out of the ovary and reaches the fallopian tube of female reproductive system.

(ii) During copulation, the penis of the male deposits the sperm in the Fallopian tube where a sperm fertilizes the egg. This results in formation of zygote.
(iii) The zygote divides repeatedly to give rise to a ball of cells. This is the embryo. The cells then begin to form groups that develop into different tissues and organs of the body. This developing structure is termed an embryo.
(iv) The embryo gets implanted in the wall of the uterus for further gradually developed the body parts such as hands, legs, head, eyes, ears, etc.
(v) The stage of the embryo in which all the body parts can be identified is called a foetus. When the development of the foetus is complete, the mother gives birth to the baby.

3. Formation of Egg Shell in Hens:
Internal fertilization takes place in hens. After fertilization, the zygote divides continuously and moves to the oviduct. As it travels down, many protective layers are formed around it. The hard shell in a hen's egg is one such protective layer. After the hard shell is formed, the hen finally lays the egg. The embryo takes about 3 weeks to develop into a chick. The hen sits on the eggs to provide sufficient warmth (incubation). After the chick is completely developed it bursts open the egg shell.

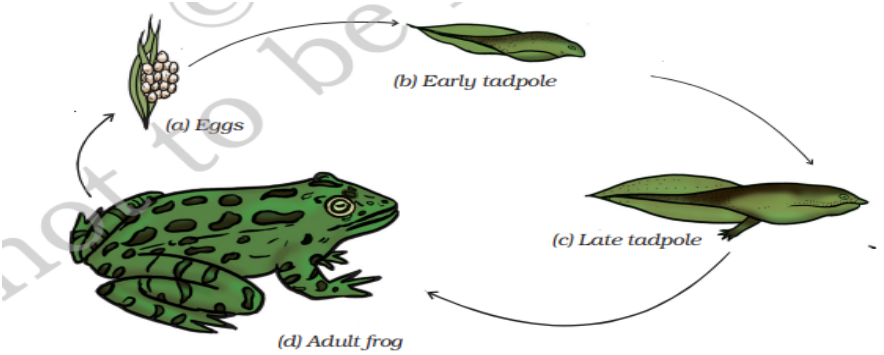
4. Viviparous Animals: The animals which give birth to young ones are called viviparous animals. ExamplesHuman being, dog, cows.
Oviparous Animals: Those animals which lay eggs are called oviparous animals. Examples – hen, frog etc.

5. IVF (In Vitro Fertilisation):

I. Fertilization carried out in laboratory is called in-vitro fertilization. Some women are unable to bear babies because their oviducts are blocked or for some reason the sperm cannot reach the egg for fertilization.
II. Doctors collect freshly released egg and sperms and keep them together for a few hours for IVF or in vitro fertilization (fertilization outside the body).
III. If fertilization occurs, the zygote is allowed to develop for about a week and then it is transferred in the mother's uterus.
IV. Whole development takes place in the uterus and the baby is born like any other baby.
V. Babies born through this technique are called test-tube babies.

6. Young Ones to Adults: Development
Direct Development: When the young ones of an animal resemble the adult, then direct development takes place, e.g. hen, man, monkey, etc.
Indirect Development: When the young ones of an animal do not resemble the adult, then indirect development takes place, e.g. frog, butterfly, silk moth, etc.

Metamorphosis: In case of indirect development, transformation of young ones into adult through drastic changes is called metamorphosis. Larva of butterfly undergoes metamorphosis to become a butterfly. A tadpole undergoes metamorphosis to become a frog.

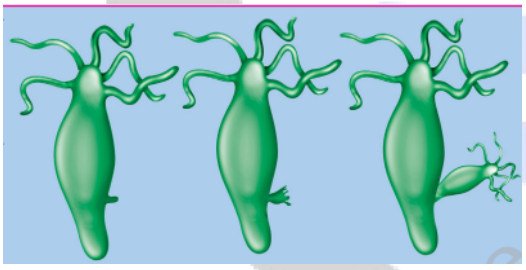


Life Cycle of Frog

7. Asexual Reproduction

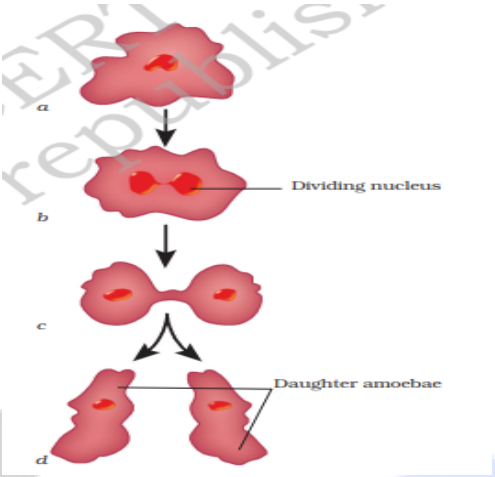
Uniparental reproduction, The process of reproduction in which new individuals are produced from single parent.

7.1 Budding: This reproduction method is seen in those multi cellular animals which are highly simple in structure. A small bud or bulge develops on the body. After developing the bud, it gets detached from the parent's body to begin life as a new individual. Since new individuals develop from the buds, this type of asexual reproduction is called budding Examples: Hydra and sponges. Yeast, a unicellular organism also reproduces by budding.



Stages of budding in Hydra

7.2. Binary Fission: This method of reproduction is seen in unicellular animals like amoeba. In this method, an organism divides and forms two daughter cells. First the nucleus divides and forms two daughter nuclei. Then the cytoplasm in the mother cell divides into two daughter cells. This leads to the formation of the two daughter cells each having a nucleus and its own cell organelles which then develop into a fully formed adult. Other examples include Paramaecium and Leishmania.



Binary Fission in Amoeba

7.3 Cloning: Cloning is the process of producing an exact copy of a cell, any other living part, or a complete organism. Cloning process of an animal was successfully performed for the first time by Ian Wilmut and his colleagues at the Roslin Institute in Edinburgh, Scotland. They cloned successfully a sheep named Dolly.

A cell was collected from the mammary gland of a female Finn Dorsett sheep. Simultaneously, an egg was collected from a Scottish blackface ewe.

The nucleus was removed from the egg. After that, the nucleus of the mammary gland cell from the Finn Dorsett sheep was inserted into the egg of the Scottish blackface ewe whose nucleus had been removed.

Then this egg was implanted in the uterus of the Scottish blackface ewe.

The sheep that was born was found to be absolutely identical to the Finn Dorsett sheep from which the nucleus was taken.