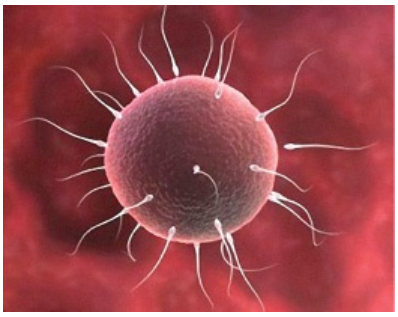
4. REPRODUCTION IN ANIMALS



In Ritwik's school one day, a small baby pigeon (squab) fell down from the ventilator. With the help of his friends, he carefully put it back in the ventilator. While keeping it back, he observed some eggs in its nest and two other baby birds that were trying to come out of the eggs. He waited to see if the eggs hatched ` and wondered

Fig-1 Nestling hatching out

Do all eggs hatch into nestlings?

- Can there be pigeons if there were no eggs?
- Can there be eggs if there were no pigeons?

Probably we cannot find an accurate answer to such questions. These questions are related to reproduction. You have already studied about ***"Reproduction in Plants"*** in class seventh. Now you will study about reproduction in animals in this chapter.

Fig2 A nestling

- Do all animals lay eggs?
- Are there any animals that give birth to young ones?
- How can we identify which animals lay eggs and which give birth to young ones?
- Are there any patterns in nature that give clues to modes of reproduction?

You might have seen a lot of small and big animals around us. Some of them have external ears (ears visible from outside) while some do not.

Names of some animals are listed below. Observe carefully and fill the table.

Deer, Leopard, Pig, Fish, Buffalo, Giraffe, Frog, Sparrow, Lizard, Crow, Snake, Elephant, Cat.

Sl. No.	**Animals that have external ears**	**Animals that do not have external ears**

You can also add some more names of animals you know, to this table.

⇝ Think how animals could hear without external ears?

Now let's think if there is any other pattern of recognizing these animals.

Read the names of animals given below and try to fill the table given below.

Cow, rat, crow, pig, fox, hen, camel, duck, frog, elephant, buffalo, pigeon, cat, peacock, lizard. You can also add a few more animals to this list.

Sl. No.	**Name of animals**	**Presence of external ears(Yes/No)**	**Presence of epidermal hairs on the skin / feathers on their wings**

⇝ Is epidermal hair seen in those animals whose ears are visible outside?

⇝ Do animals that have epidermal hair give birth to young ones or lay eggs?

Viviparous and Oviparous Animals :

From the above table you could observe that animals giving birth to young ones have epidermal hair on their skin and external ears. The animals that lay eggs do not have epidermal hair or external ears. The animals which lay eggs are called ***Oviparous*** while those which give birth to their offsprings are called ***Viviparous.***

In class 7 you learned how the seed of a plant germinates and grows into a plant. The process of living beings producing it's off springs is called reproduction. This is one of the basic life processes. This is essential for the continuation of the species.

Let us try to understand the modes of reproduction.

Modes of Reproduction in animals:

Animals reproduce both sexually and asexually.

We had already studied how potato, bryophyllum and chrysanthemum reproduce? It was asexual mode of reproduction in plants. Now we shall see how animals reproduce asexually.

Asexual reproduction

In some animals the formation of gametes does not take place. Still they produce offsprings like themselves. As the formation of gametes does not take place there is no question of fusion of gametes. Such process of reproduction is called Asexual Reproduction.

Do you know animals that reproduce asexually? Perhaps, you have not seen such animals, but they do exist. Some of these are amoeba, paramecium, hydra, etc.

Activity-1

Observation of Budding in Hydra

Get permanent slides of different stages of budding in *hydra.* Observe them under a microscope. Look out for any bulges from the parent body. Count the number of bulges and also observe the difference in their size from one slide to the next. Also, note the size of the bulges. Draw the diagram of hydra as you see it. Compare it with the figure given below.

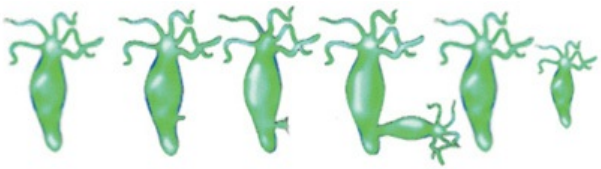


Fig. 3 Buddung of Hydra

Recall what you have observed in the first slide? Compare Slide 1 & 2 to observe which part of its body develops a swelling?

Observe all the remaining slides.

a) What did you observe in slide/picture 1, 2 and 3?

b) What is the main difference between slides 1 and 2 as well as 3 and 4?

c) What did the swelling (bulge) part develop in to?

Hydra, a microscopic organism reproduces ***asexually***. In each hydra, there may be one or more bulges, called ***buds***. In class 7, you learnt about budding in yeast. In Hydra also we see budding where new individuals develop from the buds. This type of asexual reproduction is called ***"Budding".***

Does ***zygote*** form in this type of reproduction, why?

Write the similarities and differences between budding in yeast and hydra according to your observations and diagrams given in the text. Now let us study this process in another organism. You may have seen the following diagram in your previous classes.

Fig. 4 Amoeba

This microorganism called amoeba lives in fresh water. Its body is made up of a single cell and hence called *unicellular organism.*

Observe the slide of an amoeba with the help of a microscope and also observe the diagram. Are you able to see a distinct round shaped organelle in its centre? Do you know what is it? Ask your teacher. What function does it perform?

Activity-2

Observation of Binary fission in Amoeba

Observe the given diagram carefully and fill the following table.

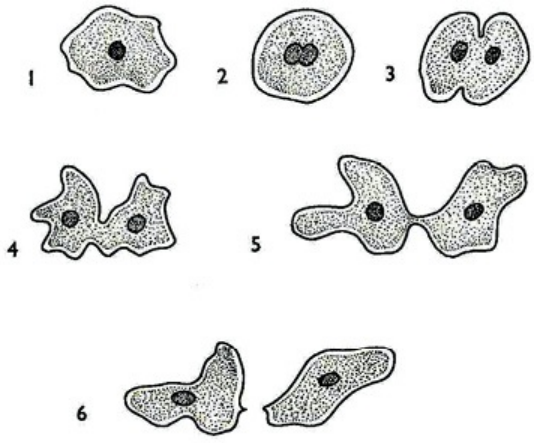


Fig. 5 Binary fission of Amoeba

Changes in the nucleus/body structure

1st diagram .....

2nd diagram .....

3rd diagram .....

4th diagram .....

5th diagram .....

6th diagram .....

How many amoebae are formed at the end?

After the *nucleus* gets matured, it starts dividing, (fig-5). After the complete division of the nucleus the body of amoeba divides into two. Thus a single parent forms *two daughter* amoebae. Thus the parent becomes nonexistent. This type of asexual reproduction in which an animal reproduces by dividing into two individuals is called Binary Fission.

Are budding and fission the only methods of asexual reproduction in animals?

Apart from budding and binary fission there are some other methods by which a single parent produces young ones. To know more about it you can ask your teacher or refer any related books in your library. You will also study about these in higher classes.

Sexual Reproduction

In the chapter on reproduction in plants, we have also studied about the process of sexual reproduction in plants. In this process, pollen grains produced in the pollensac reach the stigma of a flower, where they germinate. A long tube is formed from the pollengrains that reaches the ovary. The male reproductive cell of the pollen grain travels down this tube to the ovary where it fuses with the female reproductive cell. So, sexual reproduction is basically the ***fusion of the male reproductive cell with the female reproductive cell***.

In animals as well, sexual reproduction occurs by the fusion of female reproductive cell or ***ovum*** and the male reproductive cell or the ***sperm***. The body formed thereafter is called ***zygote***

You have studied in class 7th that formation of zygote is very important to give rise to offspring. Do you know from where the male gametes and female gametes are produced in animals?

You have already learnt where they are produced? collect any male and female flower from your surroundings.

Fig. 6(a) Male flower

It's Parts

1. _____
2. _____
3. _____
4._____

Fig. 6(b) Female flower

It's Parts

1. _____
2. _____
3. _____
4._____

Like plants, animals also have specialized organs for reproduction.

Let us try to understand the reproductive sysytem of human beings.

Now write a note on where male and female gametes are produced in plants. Illustrate with a diagram.

Male reproductive system

You might have seen a cow giving birth to a calf. A she goat gives birth to a lamb and a woman gives birth to a baby. Have you ever thought about the role of a man (male) in giving birth to a baby?

Let’s recall how a seed is formed from a flower? Is it formed only from ovary? Do pollen grains play any role in formation of seeds? Likewise a male produces sperms which is quite essential for reproduction.

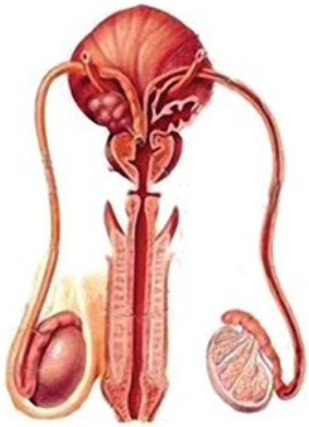


Fig. 7 Male reproductive system

Fig. 8 Human sperm

The male reproductive organs are situated just below the abdomen. It includes a pair of ***Testis (testes** in plural**).*** Two sperm ducts (also called ***Seminal ducts***) and a Penis. The ***testes*** are egg shaped and produce the male gametes or sperms. It is connected with a pair of seminal ducts through which sperms travel and ejaculate out with the help of penis.

Millions of sperms are produced by the testes (fig-7). These are microscopic and single celled. Each sperm has a head, a middle piece and a tail. The head bears a nucleus. It gets energy from Mitochondria present in the middle piece.

Can you imagine the purpose of the tail of a sperm serves?

Female reproductive system

The female reproductive organs are situated inside the abdomen just below the navel of women. It contains a pair of ***ovaries, oviducts*** (also called ***fallopian tubes***) and ***Uterus*** (see the figure - 9). The Ovaries lie inside the abdomen, in the hip region of the body, one on each side of the Uterus. Each Ovary is placed just below the funnel shaped opening of the fallopian tubes.

The Ovary produces female gametes called ***ova*** (ovum in singular) or eggs. In human beings, a single matured egg is released into the oviduct by one of the ovaries every month. Uterus is the part where development of the baby takes place. Like the sperm, an OVUM is also a single cell. The ovum is surrounded by an outer covering and a nucleus floating in cytoplasm is found in the centre of it.

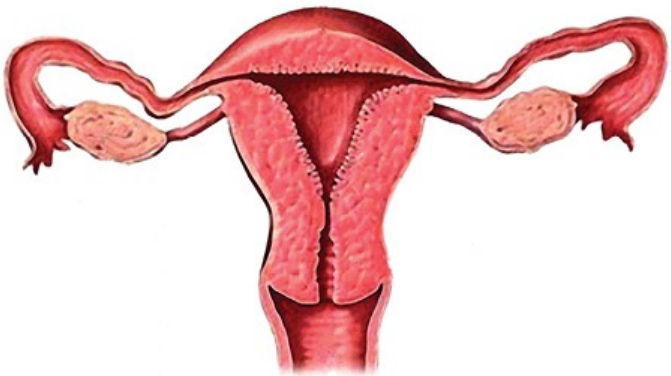


Fig. 9 Female reproductive system

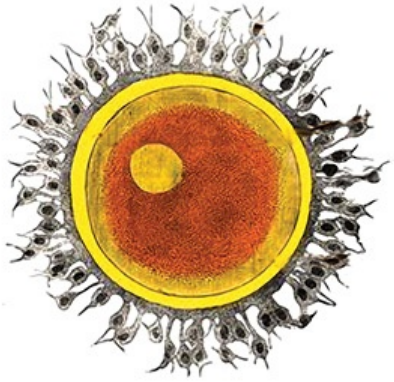


Fig. 10 Human Ovum/ egg

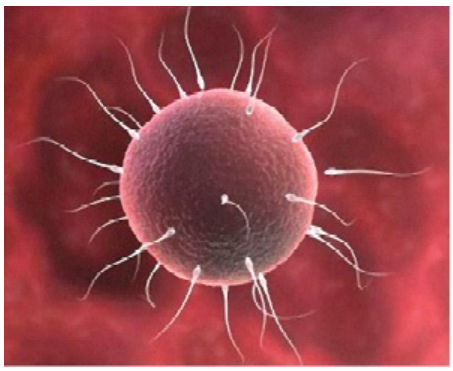


Fig. 11 Fusion of ovum and sperm(fertilization)

MALE	FEMALE
TESTIS	OVARY
SPERM	OVUM

ZYGOTE

In the first step of reproduction fusion of sperm and ovum takes place, which, you already know, is called "Fertilization". During fertilization the nuclei of the sperm and the ovum fuse to form a single nucleus. This results in the formation of a fertilized egg or zygote.

Sperm + ovum zygote

Internal fertilization

For internal fertilization it is necessary for the sperm to reach inside the body of the female. Animals in which fertilization is internal have some arrangements for ensuring that the sperm enters the body of the female. This type of fertilization occurs in different organisms like insects, snakes, lizards, birds and mammals etc.

Observe the diagram of the female reproductive system and say where an ovum and sperm have a chance of fusion?

Development of the embryo

Fertilization results in the formation of a zygote. This zygote divides repeatedly to give rise to a ball of cells. (Fig-12).

The cells then begin to form groups that develop into different tissues and organs in the body. This developing structure is termed as an ***Embryo***. The embryo gets embedded in the wall of the uterus for further development.

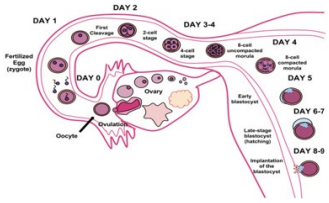


Fig. 12 Zygote formation and development of an Embryo

The embryo continues to develop in the uterus. It gradually develops body parts such as hands, legs, head, eyes, ears etc. When the embryo develops fully and all other parts are distinct, it is called a ***foetus.*** The period from zygote to fully developed foetus is called ***"Pregnancy" period.*** Usually, after completion of this period (about270-280days) a baby is born. This is called gestation period.

Now, you can try to fill the incomplete boxes in the previous page.

- What would happen if fusion of sperm and ova doesn't takes place?
- Why do animals give birth to their babies?
- What would happen if each couple gave birth to more than two babies. Is it necessary to control population?

Think what would happen if all the animals stopped giving birth to their babies.

Fertilization takes place by fusion of gametes from mother and father. Does it affect the resemblance of the offsprings with their parents?

Activity-3

Observation of resemblance in parents & children

Divide your class into 4 or 5 groups. See that all groups have at least 5-6 members. Collect photos of parents of all the members. Now compare the faces of your friends with their parents. See what parts of your friend's face resemble his/her mother or father. Table given below will help you to note the similar and dissimilar characters.

Fill the table:

S. No	Name of your friend	Name of the organ	Character Resembles mother	Character Resembles Father	Other characters
1.		**A** .nose **B**. eye **C**. eye brow **D.** **E.**			
2.					

Now discuss with your teacher why some characters of your friends resemble that of their mother or father. Similarly, look at your brother or sister. See if you can recognize some characters in them similar to those of your mother or your father. You can ask your teacher and know why sometimes no characters match with your father or mother.

You can make your own table for this.

Do you know?

Test tube babies:

You might have heard that in some women oviducts are blocked. These women are unable to bear babies because sperms cannot reach the eggs for fertilization. In such cases, doctors collect freshly released egg and sperms and keep them together for few hours for ***IVF or in vitro fertilization*** (fertilization outside the body). In case fertilization occurs, the zygote is allowed to develop for about a week and then it is placed in the mother's uterus. Complete development takes place in the uterus and the baby is born like any other baby. Babies born through this technique are called test tube babies. This term is actually misleading because babies cannot grow in test tubes

Fertilization - outside the body

You know that it is necessary for the sperm and ovum to come together for fertilization. In some animals fertilization takes place inside the body of the female.

while in others it takes place outside her body. The process of fertilization that occurs outside an organism's body is called ***external fertilization***.

We shall study about this by taking the example of frog. Frogs reproduce externally. Observe the pictures how they go about it.

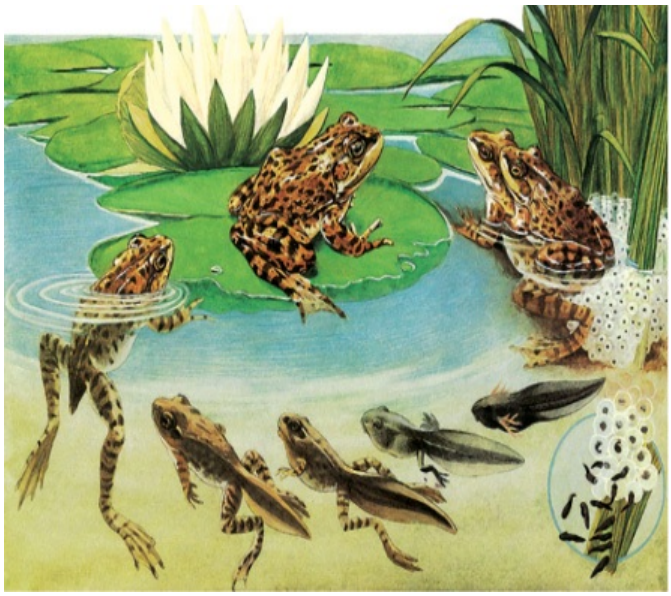


Fig. 13 Life Cycle of Frog

Life cycle of frog

Do all young ones (off springs) resemble their parents?

In class seventh you have learnt about the life history of silk moth. Does the larva of a silk moth resembles its adult? The young ones of some animals resemble their parents and some do not, when they emerge from eggs.

Such animals undergo a process called, metamorphosis (*META-beyond, MORPHE - form),* thus transformation of shape of the body occurs during development over a period of time and only then they begin to resemble their parents.

Have you ever seen some fish like forms swimming in a pond? Refer to the diagram to identify them. These fish like forms are called ***tadpoles***

Fig. 14 Tadpole

Where do you observe them? In nearby pond / ditch / slow flowing streams etc?

Think why frogs croak in a rainy season?

Fig. 15 Copulation

Fig. 16 Release of eggs and sperms

Step: 1

Go to a nearby pond or a slow flowing stream where usually sewage stagnates during rainy season. Collect few eggs of a frog with the help of wide mouthed bottle as shown in the Figure-17. While collecting eggs, take care that the clusters of eggs are not disturbed and isolated.

Fig. 17 Eggs in a pond Fig-18 Collection of Eggs

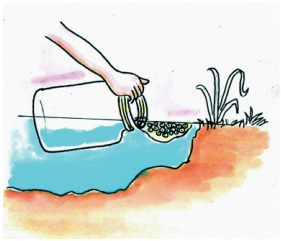


Fig. 18 Release of eggs and sperms

Step: 2

After collecting eggs, take a tub of 15 cm depth and a radius of 8-10 cms. Transfer the eggs along with the weeds and algae that you have collected from the pond into the tub. Carefully observe the eggs. You will find a blackish part in the middle of the eggs. That is the embryo of the frog.

Step: 3

Observe the tub daily and note down the changes in your observation book. Draw diagrams after observing for atleast once in three days.

Project work :

NOTE: this project work needs patience and carefulness. Teachers should be cautious while doing this project. Care should be taken at the time of collection of eggs of frogs from a nearby pond or slow flowing streams. If eggs are not available, you need not worry. You can start your project after collecting Tadpoles.

To conduct this project you require:

- Wide mouthed transparent bottle/ tub.
- Transparent glass.
- Dropper
- Petridish
- Some pebbles
- Magnifying lens

1-3 days observations diagram	4-6 days observations diagram	7-9 days observations diagram	10-12 days observations diagram
13-15 days observations diagram	16-18days observations diagram	19-21days observations diagram	22-24 days observations diagram
25-27 day observations diagram	28-30days observations diagram	31-33 days observations diagram	34-36 days observations diagram
37-39 days observations diagram	40-42 days observations diagram	42-44days observations diagram	45-46 days observations diagram

Step: 4

To observe the tadpole take a transparent glass and fill it with some water taken from the previous tub where tadpoles are preserved for observation. Take a plastic dropper and fill in some water along with a tadpole. (See the

figure -11)

Fig-19 Observation through a dropper

It is not easy to watch the tadpole in the dropper when it grows older. For this, you need to take help of a watch glass or any other glass bowl.

Step: 5

- Try to answer these questions after your observation:
- How many days did it take for the eggs to hatch?
- How does the tadpole look like?
- When did you find gill slits in a tadpole?
- On which dates did you observe:

Heart : …….....……

Intestine : .....

Bones : …….....….....……

Rectum : …….....…….....

Hind limbs …….....……

Fore limbs : …….....……

Step: 6

Having observed hind limbs, keep pebbles in the tub as shown in the figure-20. It is for accommodating tadpoles to settle out side for some time. It is essential in this stage as respiration through lungs starts.

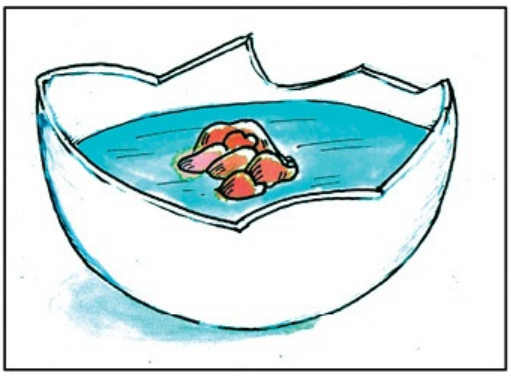


Fig-20 Setup for late tadpole

Now try to answer the following questions:

- When did gill slits disappear?
- When did the tail completely disappear?
- How many days did it take for a tadpole to transform into an adult frog?

Do you know?

Some animals like earthworms are neither male nor female. They carry both male and female reproductive organs. Such animals are called ***"bisexual animals"*** (also called ***hermaphrodite***).

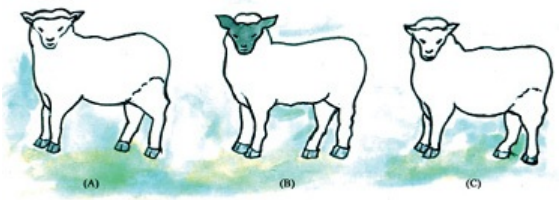
Write a note on what you have learnt about external fertilization. We see that external fertilization in frog takes place in water.

Give some examples of other animals in which external fertilization takes place in water.

Though you have studied different modes and processes of reproduction, these are not the only way how the animals reproduce. Besides these, there are also some other modes of reproduction. You will learn about these in your higher classes

Story of Dolly, the clone

Cloning is the production of an exact copy of a cell, any other living part, or a complete organism. Cloning of an animal was successfully performed for the first time by Ian Wilmut and his colleagues at the Roslin Institute in Edinburgh, Scotland. They successfully cloned a sheep named Dolly (see figure-c below) Dolly was born on 5th July 1996 and was the first mammal to be cloned.



A) Finn Dorset sheep B) Scottish black face ewe C) Dolly

Fig-21

During the process of cloning Dolly, a cell was collected from the mammary gland of a female Finn Dorset sheep. Simultaneously, an egg was obtained from Scottish blackface ewe. The nucleus was removed from the egg. Then, the nucleus of the mammary gland cell from the Finn Dorset sheep was inserted into the egg of the Scottish black face ewe whose nucleus had been removed. The egg thus produced was implanted into the Scottish black face ewe. Development of this egg followed normally and finally Dolly was born. Though Dolly was given birth by the Scottish black face ewe, it was found to be absolutely identical to the Finn Dorset sheep from which the nucleus was taken. Since the nucleus from the egg of the Scottish black face ewe was removed, Dolly did not show any character of the Scottish black face ewe. Dolly was a healthy clone of the Finn Dorset sheep and produced several offsprings of her own through normal sexual means.

Unfortunately, Dolly died on 14th February, 2003 due to certain lung disease.

After claims of Dolly, several attempts were made to produce cloned mammals. However, many died before the birth or die soon after the birth. The cloned animals are many-a-time found to be born with several abnormalities.

Key words

Reproduction, Budding, Uterus, External fertilization, Pregnancy, Zygote, Off springs, Binary fission, Ovary, Internal fertilization, Embryo, Testes, Epidermal hairs, Foetus, Oviparous, Sperms, Fertilization, "Bisexual animals, Viviparous, Ova, Asexual reproduction, Sexual reproduction, Metamorphosis.

What we have learnt

- Animals such as human beings, cows and dogs which give birth to young ones are called viviparous animals.
- Animals such as hen, frog, lizard and butterfly which lay eggs are called oviparous animals.
- Viviparous animals have external ears and epidermal hairs on their skin.
- There are two modes by which animals reproduce. These are: (i) Sexual reproduction and (ii) asexual reproduction.
- The type of reproduction where fusion of gametes does not take place is called asexual reproduction.
- Asexual reproduction is common in micro-organisms.
- Budding, fission etc are some common methods of asexual reproduction. Budding is observed in Hydra and binary fission is observed in Amoeba.
- Reproduction resulting from the fusion of male and female gametes is called sexual reproduction.
- The reproductive organs of a male consists of testes, sperm ducts and penis.
- The reproductive organs of a female consists of ovaries, oviducts and uterus.
- The ovary produces female reproductive cells called ova and the testes produces the male reproductive cells called sperms.
- The fusion of ovum and sperm is called fertilization. The fertilized egg is called a zygote.
- Fertilization that takes place outside the female body is called external fertilization and that which takes place inside the female body is called internal fertilization.
- Internal fertilization is observed in human beings and other animals such as hens, cows, dogs etc.
- External fertilization is very common in aquatic animals such as fish, starfish etc. it is also seen in frogs.
- Due to fertilization offsprings get some characters from their parents.
- The zygote divides repeatedly to develop into an embryo.
- The embryo gets embedded in the wall of the uterus for further development.
- The stage of the embryo in which all the body parts are identifiable is called foetus.
- The transformation of the larva into adult through drastic changes is called metamorphosis.
- Apart from natural reproduction system, nowadays, most sophisticated techniques of artificial reproduction are also available.

Improve your learning

1. Differentiate between: (AS1)

a) Sexual reproduction and asexual reproduction

b) Gametes and zygote

c) External fertilization and internal fertilization

d) Viviparous and oviparous animals

2. Compare the reproduction in Hydra and Amoeba. Note down the differences in your notebook. (AS1)
3. Why do fish and frog lay more number of eggs where as cow and human beings usually give birth to only one at a time? (AS1)
4. Can animals produce offsprings even without formation of zygotes, how? Explain with suitable example. (AS1)
5. How can you identify the animal is viviparous or oviparous. (AS1)
6. Who am I? (AS1)

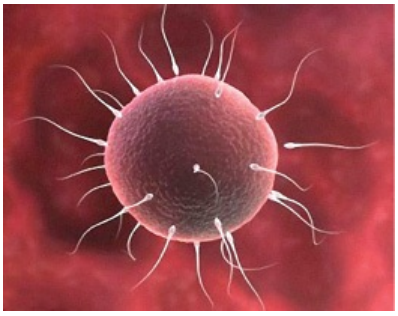
a) I am formed by the fusion of male and female gametes...

b) I am a gamete that has a tail and travel to fuse with female gamete...

c) I am a fully developed embryo inside a mother's body...

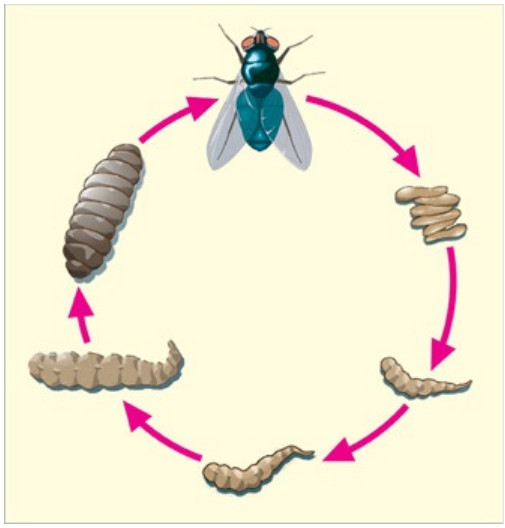
7. State the reason why most of the terrestrial animals' fertilsation takes place internally. (AS1)
8. Observe the following figures and write the functions of them. (AS1)



9. a. By taking help of the given words label the following life cycle? (AS1)

(eggs, adult, pupa, larva)



b. Explain the process of metamorphosis in housefly by taking help from in the given diagram.

10.Match the following (AS-1)

A) Oviparous ( ) 1. Tadpole to adult

B) Metamorphosis ( ) 2. Birds

C) Embryo ( ) 3. Fertilisation outside the body

D) External fertilization ( ) 4. Developed Zygote.

11. What would happen if all the organisms stop the process of reproduction? (AS 2)
12. Kavitha found a tadpole in a pond. She collected it carefully and put it in an aquarium supposing it as a fish. After some days what did she find and why? (AS 3)
13. Collect information from your library or from other sources like internet and discuss the life cycle of Honeybees in the symposium at your school. (AS 4)

14. Sketch the diagrams of male and female reproductory systems? (AS5)
15. Draw labelled diagram of life history of frog and identify forms are herbivores (AS 5)
16. How would you appreciate Ritwik's work when he kept back the pigeon squab in the ventilator? If you were in Ritwik's place what would you do? (AS 7)