Chapter 20

REPRODUCTION IN LIVING ORGANISMS

20.1

You must have seen farmers and gardeners sowing seeds, and new plants coming up from these seeds. You know that a chickpea seed gives rise to a chickpea plant, bean seeds sprout into a beanstalk and a mango seed gives rise to a mango tree. Similarly, a cow gives birth to a calf, a goat gives birth to a kid (baby goat) and chicks hatch from the hen's eggs. All living beings give rise to offspring of the same kind, and this process is called reproduction.

20.2 Reproduction in Plants

You have already read that fruits develop from flowers, and seeds are formed in the fruits. We also know that seeds germinate to give rise to new plants. Let us now find the association between flowers, fruits and seeds.

Activity - 1

Materials required :- Two flowers and fruits each of lady finger, brinjal, gulmohar, pea etc., razor blade.

Choose flowers with big and prominent ovaries. The fruits should also be available at the same time as the flowers.

Observe the flowers carefully and draw their diagrams in your notebook (fig.20.1).

Identify the different parts of the flower and dissect out the calyx, corolla, androecium very carefully, taking care not to damage the gynoecium. Now only the gynoecium will be left in the flower. It is made up of ovary, style and stigma. Draw the gynoecium and the fruit in your notebook (fig.20.2).

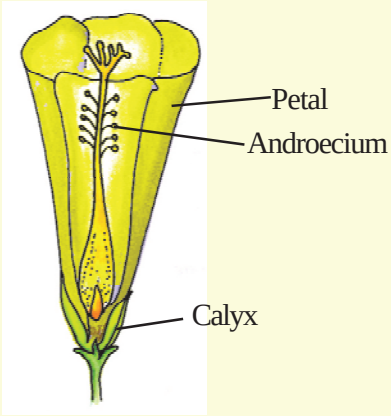
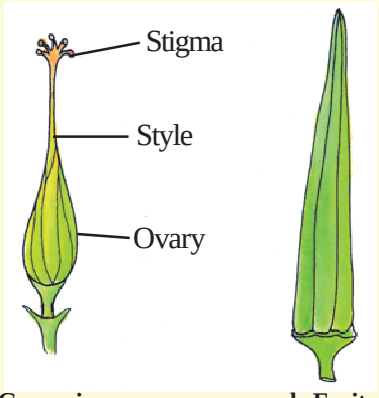


Fig. 20.1 Flower of Ladyfinger



a. Gynoecium b. Fruit

Fig. 20.2

Observe the ovary of the flower and the fruit very carefully and enter their characteristics in table 20.1.

Table - 20.1

Characteristics	Ovary	Fruit
Size	Small/Big	Small/Big
Shape	Long/Round	Long/Round
Surface	Smooth/Hairy Flat/Ribbed	Smooth/Hairy Flat/Ribbed

To observe the internal structure of the ovary and the fruit, cut them transversely and longitudinally. Draw the diagrams of the sections in your notebook.

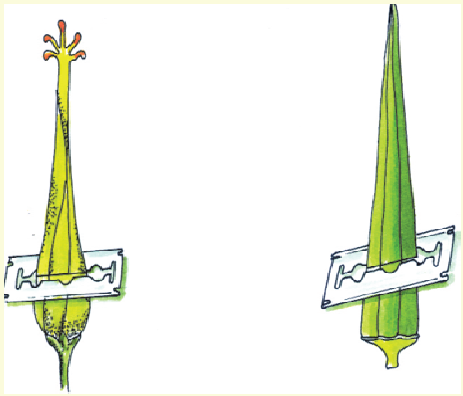


Fig. 20.3 a. Cutting the gynoecium and fruit transversely

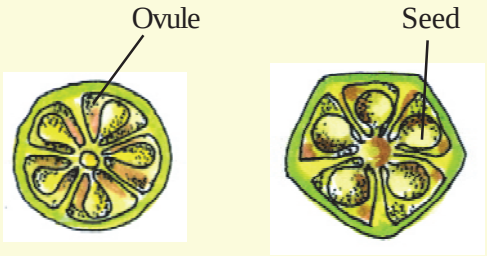


Fig. 20.3 b. Transverse sections of ovary and fruit

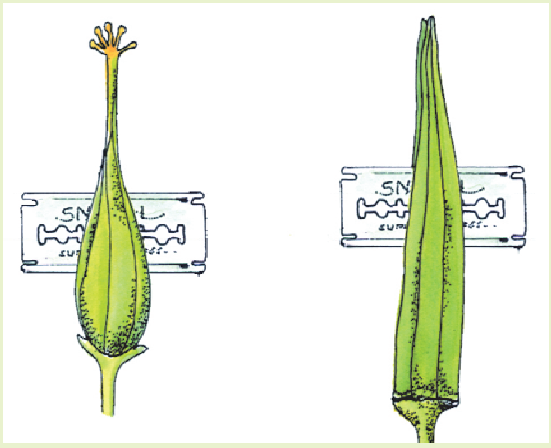


Fig. 20.4.a. Cutting the gynoecium and fruit longitudinally

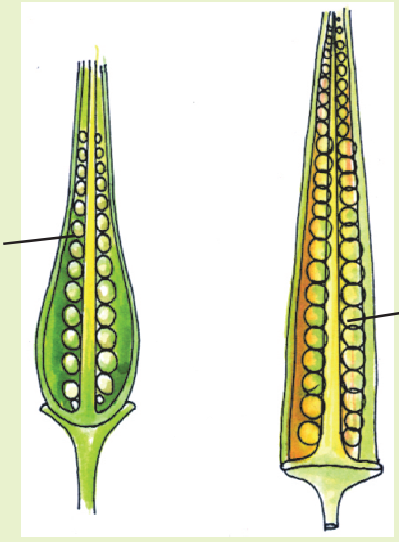


Fig. 20.4 b. Longitudinal sections of ovary and fruit

Answer the following questions on the basis of these sections and diagrams:

What are the similarities between the transverse section of an ovary and a fruit?

What is the shape?	Elongated/ circular/ angled
What is the type of wall?	Thick/ Thin
What is the surface like?	Smooth/Rough
How many chambers are in the ovary?	_____
Which part of ovary are the ovules attached to?	Wall/centre
Which part of fruit are the seeds attached to?	Wall/ centre

We can conclude on the basis of these similarities that fruits are formed from the ovary and seeds are formed from the ovules.

Now, do you think a plant can bear fruits if it does not have flowers?

Activity - 2

Materials required :- China rose, papaya, maize, bottle gourd flowers.

Identify the position of androecium and gynoecium in these flowers and complete the table 20.2. Also, observe the other flowers found in your neighbourhood and enter your observations too in the table.

Table - 20.2

S. No.	Name of Flower	Position of Androecium and gynoecium in flowers growing on the same plant		Androecium and gynoecium in different flowers on different plants
		In the same flower	In different flowers	
1	China rose			
2	Papaya			
3	Maize			
4				
5				

See Fig. 20.4(c).The majority of plants have both androecium and gynoecium in the same flower. Such flowers are called bisexual flowers. On the other hand, some flowers have only androecium or only gynoecium. These are the unisexual flowers. Unisexual flowers can grow on different parts of the same plant or on different plants. Unisexual flowers having only androecium are called male flowers and those bearing only gynoecium are called female flowers.

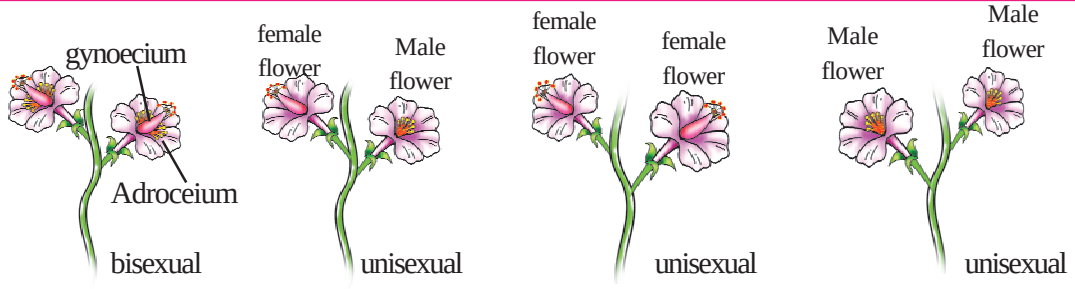


Fig. 20.4 (c) : Symbolic pictures of the situation of androecium & gynoecium

Activity - 3

Materials required :- Flowers of Besharam or *Datura*, razor blade, magnifying lens

Identify the androecium in these flowers and draw its diagram in your notebook. Label the anther, filament and the connective. Feel the anther with your finger. What happened? Did a powdery substance stick to your finger. Observe it under a magnifying lens. What did you observe? Anther contains a large number of small rounded structures called the pollen grains. Cut the anther transversely (Fig. 20.5 a,b). Pollen grains are the male gametes of the plant.

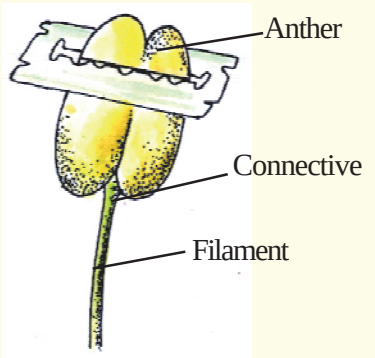


Fig. 20.5(a) Cutting the anther lobe transversely

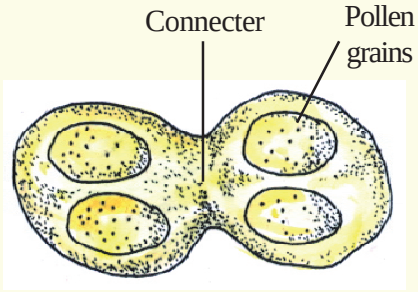


Fig. 20.5 (b) Transverse Section of anther

Cut the longitudinal section of the gynoecium and observe it under a magnifying lens. Gynoecium has a long, hollow tube connecting the stigma and the ovary. This is the style. Ovary contains the ovule and ovule is the female gametes of the plant.

Fusion of the male and female gametes of the plant is necessary for the formation of seeds. This takes place when the pollen grains reach the stigma from the anther. The transfer of pollen grains to the stigma is called pollination. Various agencies like wind, insects, birds, bats, ants etc carry out pollinations in different plants. What happens after pollination? Let us try to understand this through an exercise.

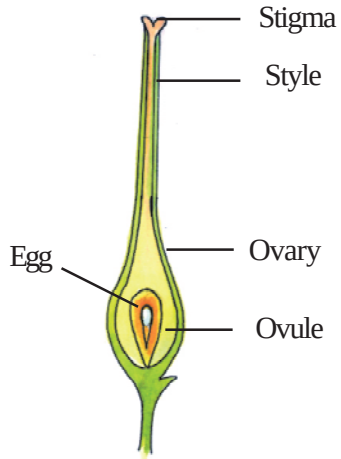


Fig. 20.6
Vertical Section of gynoecium

Activity - 4

Materials required :- Flowers of *Datura*, Lady's finger, slides, water, sugar and microscope

Put a drop of water on the slide and tap the anther of the flower over this slide. Observe this under the microscope. You will see a large number of rounded pollen grains. Add a few grains of sugar to the water put on the slide. Observe the slide after an hour or so under the microscope. (Make sure that the water on the slide does not dry up.)

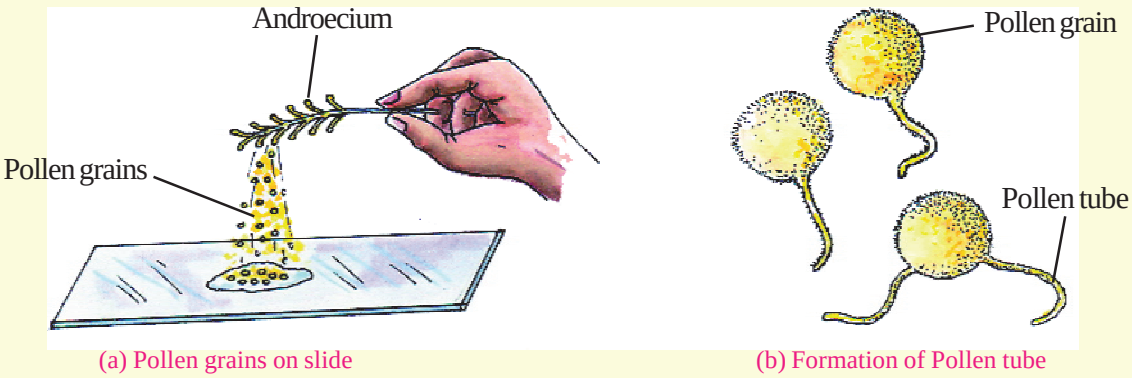


Fig. 20.7

Long, thin tubes emerging from the pollen grains are the pollen tubes. Pollen tube formation takes place after the pollen grains reach the stigma. Presence of a sugar-like substance on the stigma and in the style guides the pollen tube into the ovary. You can now figure out why we put sugar on the slide.

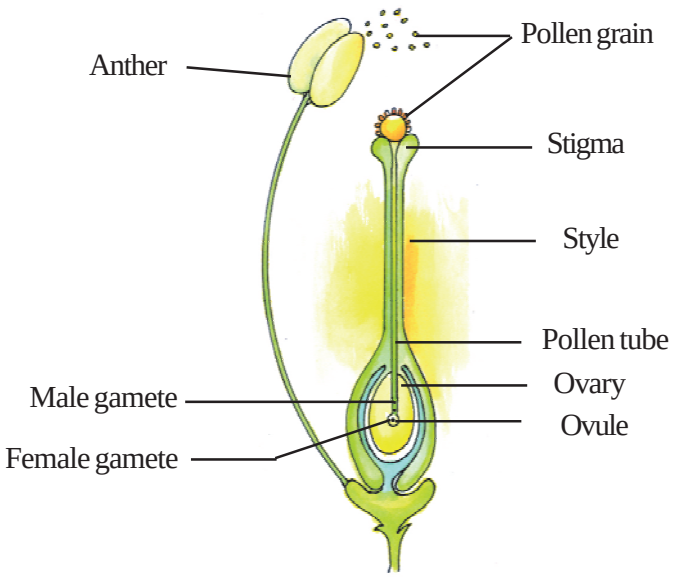


Fig. 20.8 : Fertilization in Plants

After reaching the ovary, the pollen tube enters the ovule. This is where the fusion of the male and the female gametes takes place. This process is called fertilization. The fertilized ovule develops into an embryo. The ovules are converted into seeds and ovary into fruit. Seeds give rise to new plants. This process of formation of new plants is called sexual reproduction.

Do all plants arise from seeds? Have you ever seen new plants arising from parts of plants other than the seeds?

Discuss this in your class and fill in table 20.3 indicating which part of plant gives rise to a new plant.

Table - 20.3

S.No.	Example	Part of plant from which arising
1.	Garlic	.....
2.	Yam	.....
3.	Bryophyllum	.....
4.	Sweet potato	.....
5.	Rose	.....
6.	.....	.....

Activity - 5

Materials required :- Potato, razor blade, two plastic bags, soil, water

Cut the potato into small pieces. Take two of these pieces, one with its eye intact and other without an eye. Fill the two plastic bags with soil and put one piece of potato in each of these bags. Cover the potato pieces with soil and ensure that the soil remains wet. Observe this set-up everyday.

What do you observe after 4-5 days? Which piece of potato gives rise to a new plant? The one with the eye or the one without it?

Actually, potato is an underground stem and the eyes are the nodes. Since it is an underground stem, there are no leaves on the surface but there are buds present in these eyes which, on getting favourable temperature, moisture and air give, rise to new plants (Fig 20.9).

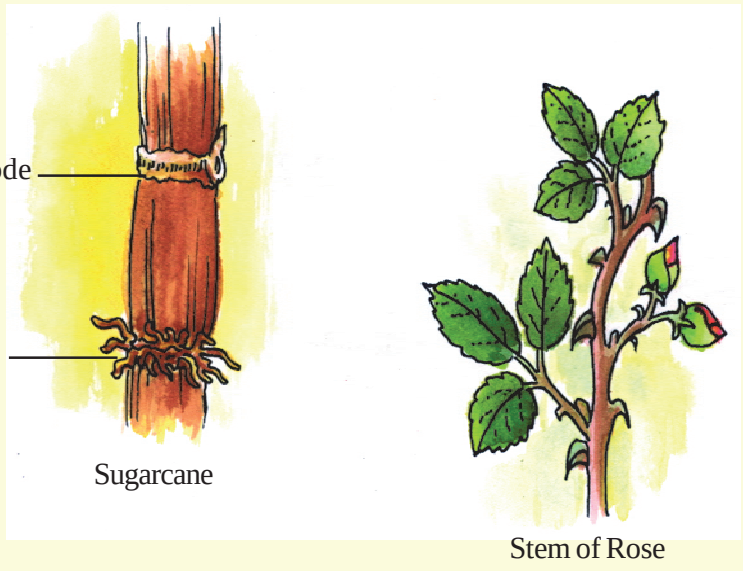
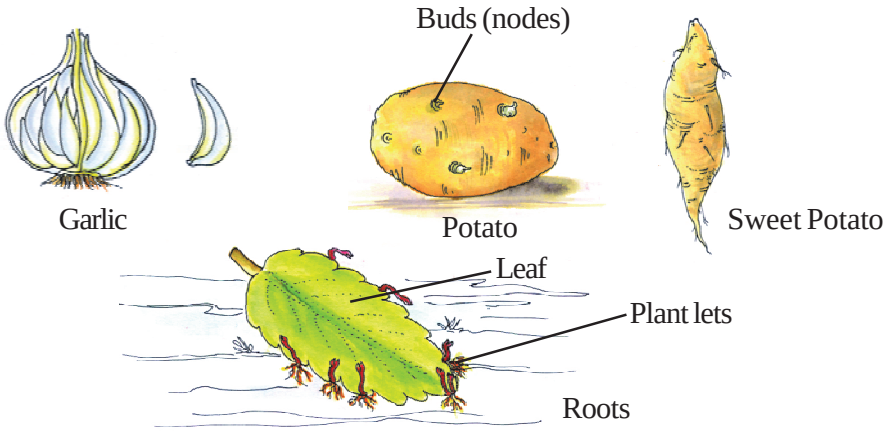


Fig. 20.9 (a) : Asexual reproduction in plants



Bryophllum leaf

Fig. 20.9 (b) : Asexual reproduction in Plants

Now we have learnt that new plants can arise even without the fusion of male and female gametes,. This is called asexual reproduction. By this method we can grow more plants in a short duration. This is the main type of reproduction in those plants where seeds are either not formed at all or take a long time to form.

20.3 Reproduction in Animals

You must have seen earthworms coming out of wet soil after rains. Similarly, when water accumulates in puddles and ponds, you suddenly see many frogs, insects, fish and many types of plants in them. Where do these organisms come from? Let us try to understand this by means of an activity.

Activity - 6

Materials required :- Two transparent plastic boxes A and B, fresh cow dung, paper to cover the boxes, rubber bands, and magnifying lens.

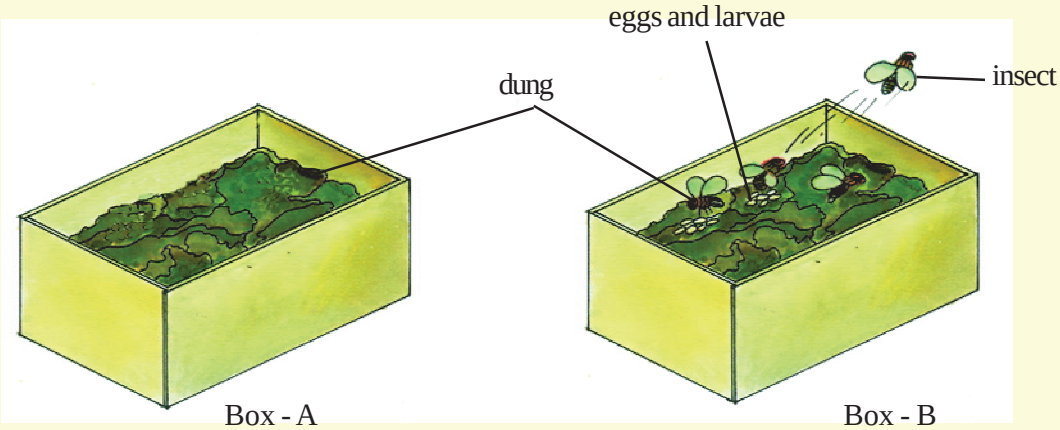


Fig. 20.10

Put fresh cow dung in boxes A and B. Cover the box A in such a manner that no insect can sit on the cow dung in it. Leave the cow dung in the box B open. You will find insects sitting on it. Observe both these boxes carefully for two or three days. You would see that after a few days there are depressions in the cow dung kept in box B. If you scratch the depressions a little, you will see larvae in them. Where did these larvae come from? They have come from the eggs of the insects which sat on the cow dung. These larvae develop into insects. On the other hand, no larvae are seen on the cow dung kept in box A. You would have now understood that no organism arises on its own. For a new individual to arise, it is necessary that individuals of its own kind already exist.

You have read about sexual reproduction in plants. Like plants, animals too have male and female sex organs. When these are found in separate individuals, the animal is called unisexual, for example, man, cow, cat etc. If both types of sex organs are found in the same individual, then the animal is called bisexual. Earthworm and leech are examples of bisexual animals.

Apart from the sex organs, do you think there are any other features on the basis of which you can distinguish between male and female animals?

On the basis of external characteristics, try to differentiate between a cow and a bull, a he-goat and a she-goat, a hen and a cock. In many organisms like lizards, insects etc., one cannot distinguish between male and female on the basis of external characters.

You would observe that external sexual characteristics are more prominent in those animals that give birth to young ones. There are well-defined sex organs in higher organisms like humans, cow etc. The main reproductive organ in males is the testis. Sperms are produced in the testis. These are the male gametes.

Fig. 20.11
Structure of a Sperm

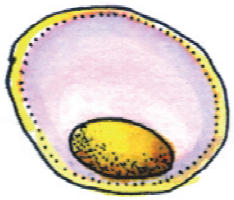


Fig. 20.12

Structure of an Egg

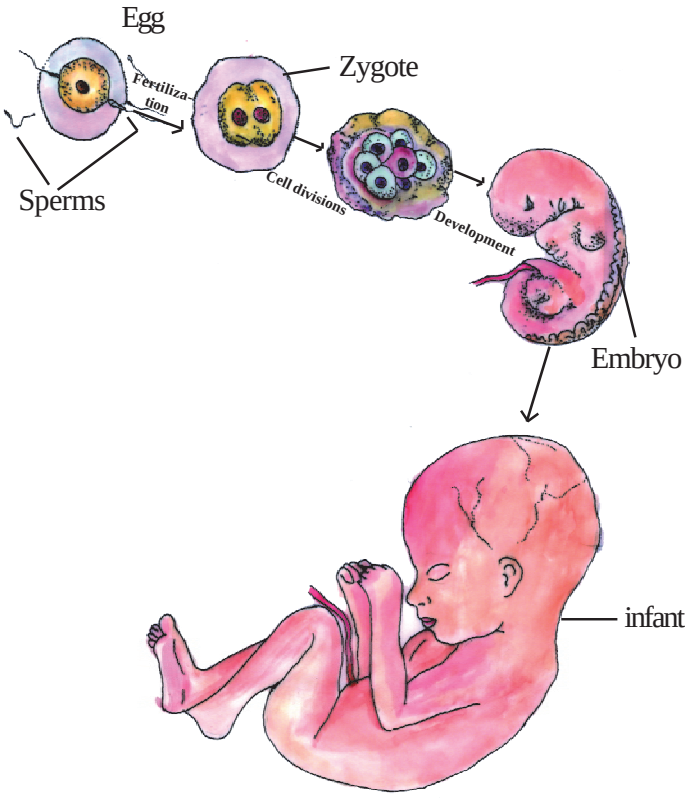


Fig. 20.13

Fertilization and development in Human

The main female reproductive organ is the ovary, where the eggs or female gemetes are produced. Compared to sperms, the eggs are much bigger, immobile and rounded in shape. After coming out of the ovary, the eggs enter the fallopian tubes, which are parts of the oviduct. This is where the sperm and the egg fuse. This process is called fertilization. In majority of organisms, fertilization takes place inside the female body and is called internal fertilization, for example in man. You would have seen the eggs of lizards and birds. These are the fertilized eggs.

Fertilization in aquatic and amphibious animals like fish and frogs takes place in water. The female frog drops its eggs in the water and the male drops its sperms over the eggs. These keep floating in water for a while and then get fused. This type of fertilization is called external fertilization.

After fertilization the egg is called the zygote. After several divisions, the zygote is transformed into an embryo. Differentiation and development take place slowly in the embryo, and it then gets converted into the young organism. This process is called development.

In mammals the development of the young takes place in the uterus and they give birth to a fully developed offspring. Such animals are called viviparous. Fish, frog, snakes, birds etc lay eggs and are called oviparous.

In many oviparous animals the offspring do not resemble the parents. The young animal which comes out of the egg is called a larva. The larva develops into a pupa and the pupa develops into an adult. This process is called metamorphosis and occurs in mosquitoes, flies etc.

Answer these

1. Make a list of five oviparous and five viviparous animals and answer the following;

Oviparous animals	**Viviparous animals**
1. ----------	1. ----------
2. ----------	2. ----------
3. ----------	3. ----------
4. ----------	4. ----------
5. ----------	5. ----------

2. Name two oviparous animals where the young ones resemble their parents.
3. Name two oviparous animals where the young ones do not resemble their parents.
4. Name two animals whose offspring can start moving immediately after birth.
5. Name two animals whose offspring can start moving or swimming immediately after coming out of the eggs.

You have read about asexual reproduction in plants where new organisms arise from some part of the organism. In some micro-organisms like Amoeba, the animal divide into two parts and each part becomes a separate individual (Fig 20.14). This is called division (binary fission). But if an organism gets

divided into many parts as a result of an accident, and each part becomes a new individual, the process is called regeneration (fig 20.15).

In animals like *Hydra*, under favourable conditions, a small protuberance called a bud appears on the surface of the body (fig 20.16). On further growth and development, this bud separates from the parent and becomes a new individual. This process is called budding.

You must have seen the tail of a lizard separating from the body. Do you think that a full-fledged lizard arises from the tail or does the lizard grow a new tail? When broken parts or organs develop again, it is called repair.

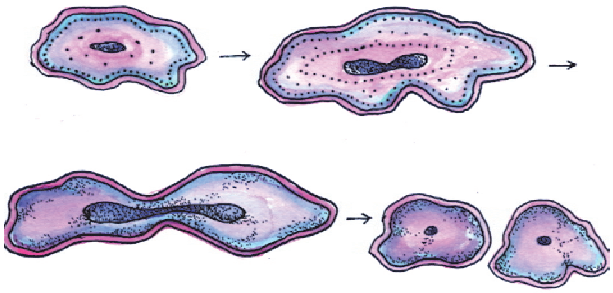


Fig. 20.14 : Binary Fission (Division) in amoeba.

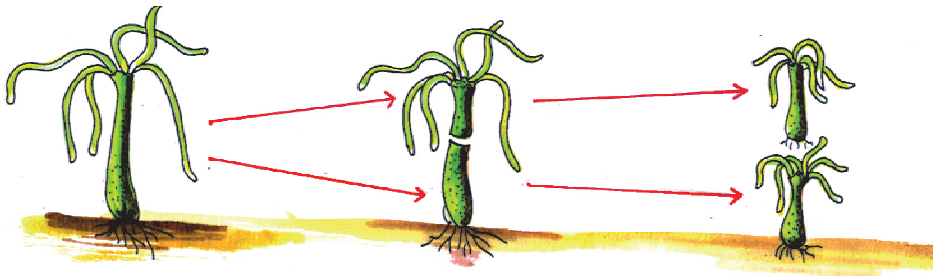


Fig. 20.15 : Regeneration in Hydra

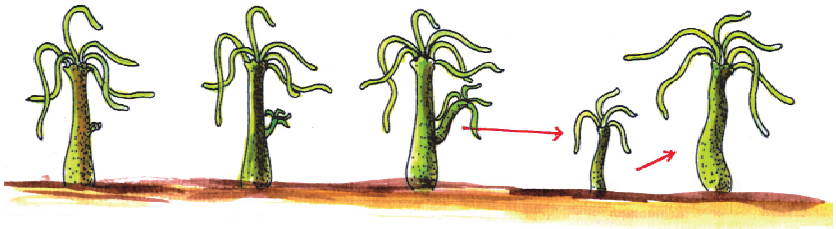


Fig. 20.16 : Budding in Hydra

We have learnt

- Reproduction is the process by which organisms produce individuals of their own kind.
- Reproduction is of two types - sexual and asexual.
- Male and female gametes are required to carry out sexual reproduction.
- In plants, androecium is the male reproductive organ and gynoecium is the female reproductive organ.

- Androecium contains pollen grains and gynoecium contains ovules.
- Transfer of pollen from anther to stigma is called pollination.
- In asexual reproduction, new plants arise from any part of the parent plant other than the seed.
- Most animals exhibit sexual reproduction but some microorganisms and lower animals exhibit asexual reproduction.
- In higher organisms, the main reproductive organ in males is testis and in females the ovary.
- Sperms are produced in the testes and eggs are produced in the ovary.
- External fertilization occurs in some animals and internal fertilization occurs in others.
- Animals which give birth to young ones are called viviparous and those which lay eggs are called oviparous.
- Transformation of zygote into embryo and embryo into young animal is called development.
- Development of new individuals through fragmentation is called regeneration.

Questions for practice

1. Choose the correct answer :

I These are the reproductive organs in a flower:

(a) Calyx and corolla (b) Calyx and androecium

(c) Gynoecium and androecium (d) Corolla and gynoecium

II A seed is formed from:

(a) Egg (b) Ovary

(c) Anther (d) Ovule

III Sperms are produced in :

(a) Ovary (b) Testes

(c) Uterus (d) Seminal vesicle

IV In human beings, the eggs are fertilized in :

(a) ovary (b) uterus

(c) fallopian tubes (d) out side the body

2. Fill in the blanks :-

1) The fusion of male and female gametes is called ……..

2) After fertilization of flowers the ovary gets converted into…….

3) The reproduction in sugarcane is usually through ……..

4) *Amoeba* reproduce asexually through ……

5) The structure formed during asexual reproduction in *Hydra* is called ……

3. Identify whether these statements are correct or incorrect. Correct the statements that are incorrect.

1) The flowers of pumpkin are unisexual.

2) Embryos and seeds are produced during asexual reproduction.

3) Rose plants are usually grown from seeds.

4) Sexual reproduction requires the fusion of the sperm with the egg.

5) *Amoeba* usually reproduce sexually.

6) There is internal fertilization in fishes.

4. Explain the following:

1) Oviparous 2) Viviparous 3) Fertilisation

5. Write short answers to the following questions.

1) What is reproduction?

2) Explain briefly:

a. Sexual reproduction

b. Asexual reproduction

c. Pollination

3) Draw a diagram of a bisexual flower and label the various parts of androecium and gynoecium.

4) Write the main differences between sexual and asexual reproduction.

5) Explain asexual reproduction in *Amoeba* through illustrations.

6) Explain what is regenerative reproduction using an example.

Do these also

1. Find out whether these plants have flowers or not – grass, maize(corn), chillies, Tulsi, Shisham, Peepal, Banyan (Bargad), Mango, Jamun, Guava, Pomegranate, Papaya, Banana, Lemon, Sugar cane, Potato, Peanuts and other plants around you. In the list of plants given above were there any in which you could not see the flowers but could see the fruits? Make a list of such plants and discuss them with the help of your teachers and guardians.

2. Collect five unisexual flowers and five bisexual flowers and place them between the sheets of an old thick book and dry them. Stick them on your collection file and label the various parts of the flowers. Display your collection files on special occasion in your school.