DEVELOPMENT 15

In the chapter on "growth", you saw how the embryo found inside a seed slowly gets bigger and bigger. At the same time, it develops new parts and thus, a new plant is formed.

You have studied the life-cycles of a few animals. On that basis, answer the following questions:

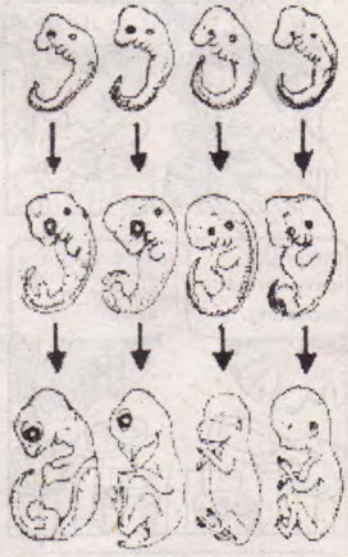
Do the larvae of housefly and mosquito grow only in size or do they undergo other changes as well? (1)

Write down the names of the organs found in tadpoles which are not found in adult frogs. (2)

Write down the names of two organs found in the adult frog which are not found in just hatched tadpoles. (3)

After hatching, do the offspring of grasshoppers, bedbugs, and red worms just grow in size or are any new parts also formed? (4)

During development in plants and animals, certain new parts are formed and certain old parts are destroyed.



Tortoise Chicken Rabbit Man

When you studied the development of sprouts, your attention was focused only on how the height of a plant increases. Let us now perform an experiment to see how plants develop as they grow in size.

Experiment-1

Fill up eight pots with garden soil. In four pots, plant five healthy bean seeds each. The seeds should be widely spaced from each other. In the same way, plant five corn seeds in each of the remaining pots. Water the soil lightly .

Place the pots at a place where they receive sunlight. See to it that the soil does not dry.

The day you plant the seeds shall be called day-0. Write the date of this day in your note book. The days that follow shall accordingly be called : day-1, day-2, day-3, and so on.

Now, for the next ten days carefully dig up one seed, sprout or plant every day from each species. While removing it, be careful not to damage the roots or any other part of the plant. Wash off the soil from it with water. First, look at the seed, its sprout or the plant through a magnifying glass.

Draw a picture of whatever you observe. (5)

Now, open up the seeds and look at their internal structure and the embryo. For this you may use techniques learned in the class six chapter "Seeds and their Germination".

Draw their pictures too. (6)

Draw a table like the one shown below in your note book. (7)

In this table, record whatever changes you see every day in the seed, the cotyledon, and the sprout. (8)

The Development from seed to plant

Table-1

day	changes	
	bean	corn
1.		
2.		
3.		
.		
.		
10.		

Date of planting the seed _____ (Day-0)

Answer the following questions on the basis of your observations. If you see any differences in the development of beans and corn seeds, mention it in your answer.

(a) From which part of the embryo does the root form the plumule or the radicle?

(b) From which part of the embryo do the overground parts of the plant develop?

(c) Which part of the plant develops first? The root, the stem or the leaves?

(d) In your experiment, which part of the plant emerged last?

(e) Make a list of those parts which did not even emerge during the experiment.

(f) Based on previous knowledge, indicate when these parts will develop.

(g) What changes occur in the cotyledons as a plant develops from a seed? In the end, what happens to them?

(h) Is the sequence and manner of development of various parts the same in bean and corn? (9)

You have seen above how a sprout develops from a seed and then a plant develops from the sprout.

For Practice

In the above experiment, you saw a bean seed develop into a plant. You have seen different stages (a-f) in the development of a bean seed as shown in Figure 1.

On the basis of your observations, tell which stage appears on which day. (10)

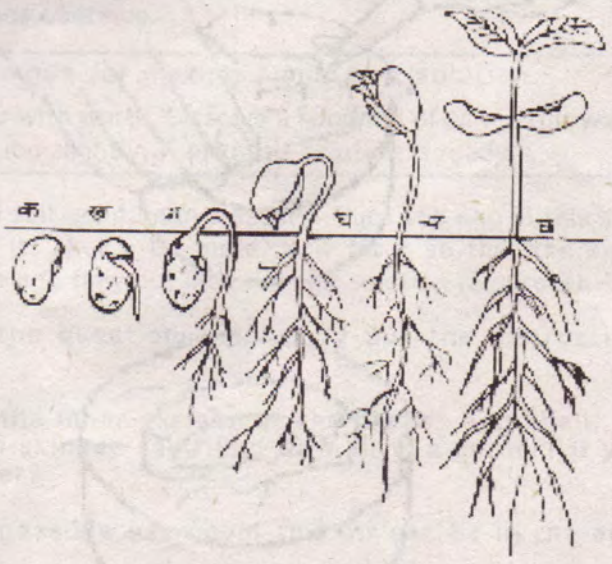


Figure-1

Another example of development in animals

In the chapter "The Life-cycle of Animals", you studied the developmental stages after hatching of eggs.

But does the development occur inside the egg too? To explore this question we shall need an egg which is large enough for us to open it and observe. For this, a chicken egg will do as it is big and easily available.

Figure-2(a)

Experiment-2

Inside the egg

Find a chicken egg which has been laid by a hen the same day. This egg will be called the "day-0 egg".

In case there are not enough eggs for each team, teams can get together to do the experiment.

Look at Figure-2. Make a cushion using hay or paper in a bowl so that the egg can be kept safely in it. Set the egg in such a manner that it does not roll away (Figure 2-a). Tap the shell of the egg lightly, with the rear end of a pair of tweezers, to make a small hole in the shell. Carefully remove the shell fragments which have broken off with the help of the tweezers as shown in Figure 2 b. Now enlarge the hole as big as the one shown in figure 2-c. While doing so, take care that the hole does not become too big, otherwise the fluids inside may spill out. If this happens, your experiment will be ruined.

Draw a picture of what you see inside the egg. (11)

The yellow substance floating in the middle is called the yolk. The transparent fluid surrounding the yolk is albumin (egg-white). The yolk is full of nutrients such as protein, fat, vitamins and salt. The albumin is itself a kind of protein. Show the yolk and albumin in your picture.

Before proceeding further, prepare a mild saline solution. By placing the contents of the egg in this solution the embryo remains alive and its processes continue.

Technique for making a mild salt solution.

Fill half a beaker with water. Dissolve a spoonful of salt in this water. Warm the solution slightly. A mild salt solution is ready.

Pour some mild salt solution in a saucer. Place the egg in this solution and break its shell a bit more. Now tilt it so that the entire contents of the egg flow out into the salt solution (Figure 3).

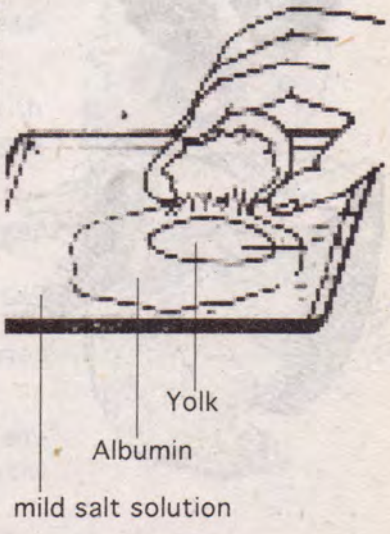


Figure-3

Now answer the questions and carry out the instructions given below -

(a) Observe the inner surface of the broken egg shell. Do you see a thin-skinned sac filled with air in a corner? If yes, in which corner?

(b) Of what possible use could this air sac be in the egg? Try a guess.

(c) Do you see two twisted, soft, white structures connected

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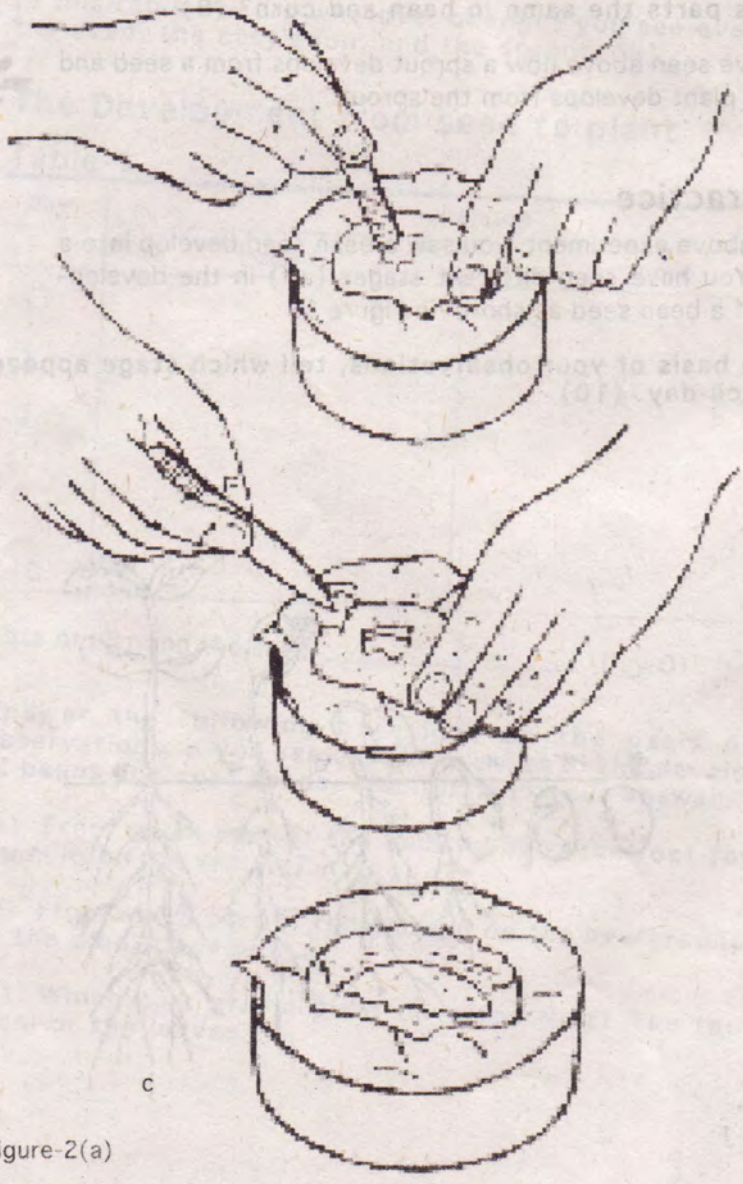

Figure-2(a)

to the yoke and floating in the albumin? Locate these with the help of your teacher. Shake the yolk and watch how they move. Make a picture of both these structures. (12)

These twisted, white structures help the yolk, floating in the albumin, to rest in a certain position.

Look for a small white spot on the surface of the yolk in the day-0 egg. This is the **foetus**. Look at the foetus and surface of the yolk through a magnifying glass and draw their picture.

For the next experiment, you will need eggs which are produced after the union of the male and female chickens. These eggs are called fertilised eggs. The eggs should have been incubated by the hens for different numbers of days. For this, you should consult people who raise *"desi"* chickens. If there is a poultry farm nearby (where chickens are raised in large numbers), then you can obtain fertilised eggs from there. Arrange to get fertilised eggs of different ages.

Our goal will be to have eggs of 3, 5, 7, and 10-days ready on the same day. The best way to do this will be for you to decide on the date of the experiment in advance. Ten days before this date, go to the chicken farmer and take an egg laid on that day. On it, write the date and place it under a clucking hen [the one not laying eggs] for incubation.

In the same way, seven days before the experiment, again go to the chicken farmer and take an egg laid that day, write the date on it with pencil and place it under the clucking hen for incubation. Do the same thing for 5 day and 3 day old eggs. On the day of the experiment, you can collect all four eggs of different agesfrom the chicken farmer.

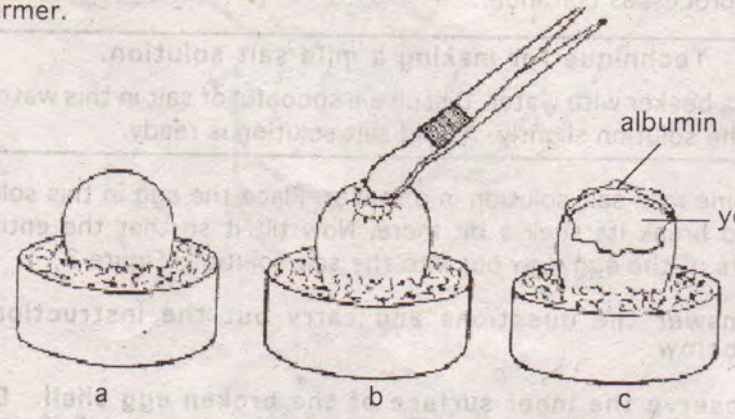

Figure-4

Experiment 3

Take the day-3 egg. Place it upright in a bowl with a cushion of straw or paper so that it stands with its broad end up (Figure 4a).

Carefully make a hole in the broad end, using a pair of tweezers (Figure 4b). Enlarge the hole by removing the broken shell fragments one-by-one with the tweezers, as shown in figure 4c. Remove the inner layer of thin skin under the shell.

Look at the inside of the egg through this hole, with a magnifying glass.

While making the hole, did you see air sac and two layers of thin skin?

Could you see the embryo?

Do you see red capillaries running in several directions, on the surface of the yolk ?

Can you see blood flowing through these capillaries? Observe with a magnifying glass and answer.

Do you see the embryo's heart beating?

Now take a saucer filled with some mild salt solution. Empty the contents of the egg in this solution as illustrated in Figure 3. With the help of a dropper, wash the embryo well with the salt solution.

Using a magnifying glass, observe the embryo and the network of blood capillaries spread on the surface of the yolk and draw their picture. (13)

Now find two 10-15 centimetres long stick-like objects, the tips of which should not be pointed. (For example: a broom straw, a leaf stalk, a cycle spoke, a thin glass rod.) Using them, try to separate the embryo by scraping away the yolk. Make sure no damage is caused to the embryo.

Keep the day-3 embryo carefully in salt solution.

Repeat the operation you did for the day-3 egg with the 5, 7, and 10-day eggs as well, one by one.

Now you have four different stages of a developing embryo. With the help of a magnifying glass, carefully observe these four stages and compare them with one another.

Is the embryo connected to the blood capillaries spread over the surface of the yolk ? (14)

What is the age of the egg in which this stage of the embryo is first seen ? (15)

Guess, what could be the purpose of these blood capillaries in the development of embryo? (16)

Look for the transparent thin membrane which surrounds the embryo. Under this membrane is a transparent fluid which protects the embryo from any external shocks.

Now look for a balloon-like bag made of thin membrane, emerging from the abdomen of the embryo, in the 3-day and 5-day eggs.

Now look for this bag in the 7 and 10-day old eggs as well.

Make a comparison of size and appearance of this bag in these four stages. (17)

The balloon-shaped bag serves two important functions in the development of embryo -

(a) Oxygen in the air is let in for embryo's breathing and carbon dioxide produced escapes through its surface.

(b) During the development of embryo, several substances are produced which, if allowed to accumulate, could be harmful to the embryo. It is necessary that these substances be removed. These substances are removed from the embryo and are collected in this bag. When the chick comes out of the egg, the bag remains stuck to the shell.

For each egg, draw a labelled diagram of the embryo, membranes, the blood vessels spread on the surface of yolk and any other structures you see in each stage. (18)

You will have to cut the surrounding membrane with a razor blade in order to separate the embryo. This technique is shown in Figure 5. While doing this, be sure not to harm the embryo. After cutting the membrane, wash the embryo a few times with salt solution so that no yolk or albumin remain attached to it.

Study the embryo of each stage carefully and draw their pictures. (19)

Find out the length of each embryo. In order to do this, let a friend straighten out the curved embryo using a stick-like object while you measure its length.

In your note book, draw Table 2 and write your observations in it. (20)

Growth and development of the chicken embryo

Table-2

Date when hen laid the egg	age of egg (in days)	length of embryo (c.m.)	Discription of embryo's stage
	0		
	3		
	5		
	7		

10

Answer the following questions—

(a) As the age of the egg increases, does the size of the embryo also increase?

(b) Looking at the 3-day embryo, show in your own picture where the following parts are located -

(1) heart (2) eye

(c) Write down the differences between a 5-day embryo and a completely developed chick in the form of a table.

(d) In comparison to the head, are the eyes of a 5-day or a 7-day embryo as big as those of a chick?

(e) At what age in an embryo, does development of the following parts begin?

(1) eye
(2) beak
(3) ear
(4) wing
(5) leg
(6) round, white structure on tip of beak. (21)

Between a 0-day and a 10-day embryo, is there growth in size alone or new parts are also formed? (22)

In Experiment 1, you saw that during formation of a plant from seed, both growth and development take place.

During the formation of a chick from an embryo, do various parts develop in a certain order? (23)

Can you tell what functions yolk and albumin have in an egg? (24)

You have studied the development inside a chicken egg.

In the chapter on reproduction, you have already seen that some animals lay eggs while some give birth to the their young directly. In the animals which lay eggs, some part of development occurs within the egg and the rest takes place after hatching.

Look at the uterus in the picture of the female rat 'B' in chapter 'Internal Organs of the Body and their Functions - 2'. In the animals which give birth to young directly, some part of development of embryo occurs within the uterus and the rest takes place after birth.

Some things to think over

What is the main difference between a pup and a calf immediately after birth? (25)

Write down the names of some animals whose young ones start to walk right after birth. (26)

Write down the names of animals whose offspring are unable to walk right after birth. (27)

Write down the names of animals whose offspring start to swim or move around and also start looking for their own food right after hatching. (28)

Write down the names of animals whose offspring are unable to move or fly right after birth and are dependent upon their parents for food. (29)

For practice

Some examples of development are given below:

(a) A few months after sowing, ears appear on wheat plants.

(b) When a female calf becomes a cow, it's udders develop and upon giving birth, it starts to give milk.

(c) In the beginning, children crawl on their knees while, at a later age, they walk upright.

(d) The frog in the tadpole stage eats scum but the adult frog eats only worms and insects.

Think of at least ten other such examples of development from your surroundings and write them down in your note book. (30)

NEW WORDS:

development	albumin	yolk
embryo	fluid	capillaries