

REPRODUCTION IN ANIMALS

5



SYLLABUS

1. Asexual and sexual reproduction in animals.
 - * Life cycle of a butterfly – may be observed directly if possible (D).
2. Reproduction in human beings.
3. Physical changes in human beings as a result of growth.
4. Adolescence and adulthood – problems related with adolescence.
 - * Measuring height and weight of children in different classes – finding averages – tabulating results and arriving at conclusions (group work) (E).
 - * Observing changes in self – through comparing photographs taken at different ages (E).
 - * Films on human development, puberty (D).

Reproduction is the process of producing new individuals of the same kind. Reproduction also helps in the continuance of the species. Different organisms reproduce in different ways.

You have already studied that some single-celled organisms, like amoeba, reproduce by simply dividing into two. Some multicellular animals like hydra, produce small buds which grow in size and get separated. These are the asexual methods of reproduction (not involving eggs or sperms).

However, most animals reproduce **sexually**. In this process of reproduction, two sexes produce special types of reproductive cells *i.e.* males – the **sperms** and females – the **eggs**. The sperms and the eggs fuse to form a zygote, which ultimately gives rise to an adult organism.

ASEXUAL REPRODUCTION IN ANIMALS

1. Fission (Binary fission or multiple fission) – This is the most common method

of reproduction in single-celled organism, *e.g.*, amoeba, *etc.* It results in the division of the parent amoeba into two daughter amoebae (Fig. 5.1). First, the nucleus divides into two, followed by the division of the cytoplasm and then, the two separate and live as new individuals.

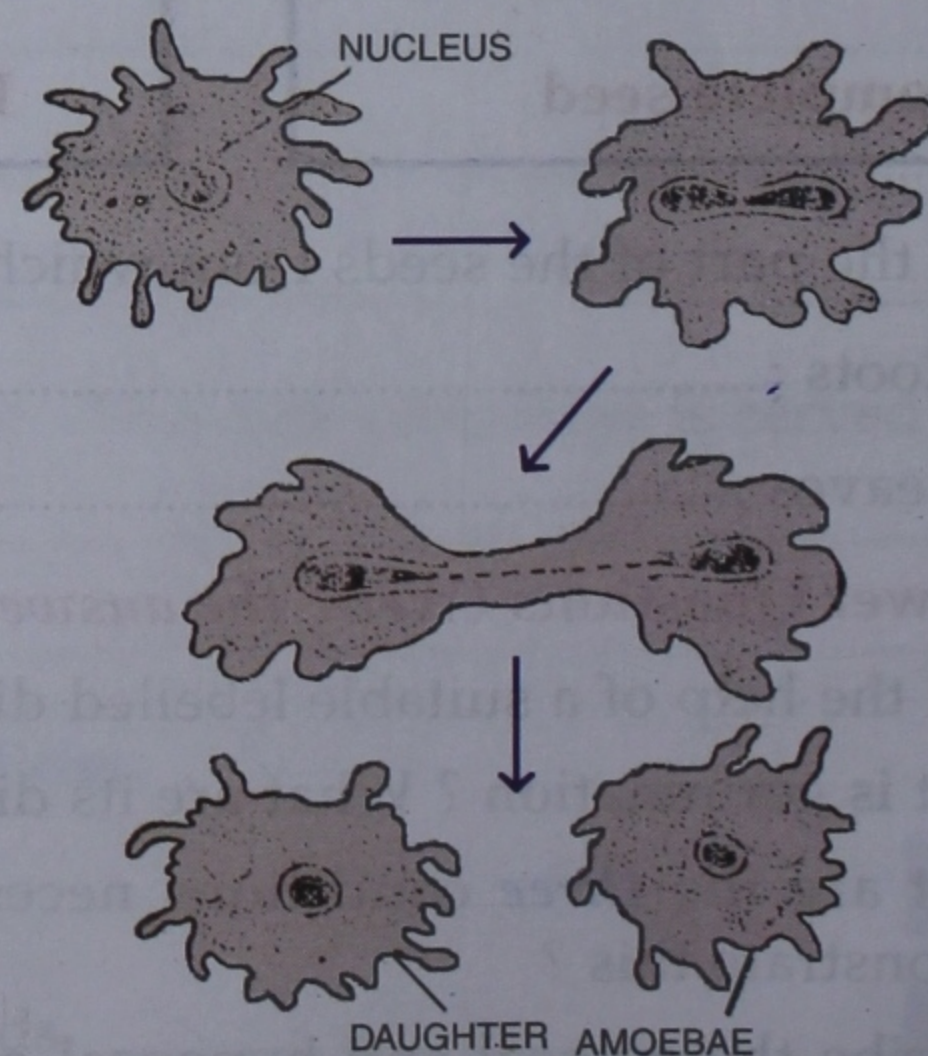


Fig. 5.1 Binary fission in Amoeba

2. Budding – Budding is a process in which buds grow on the outside of the parent

body (Fig. 5.2). These buds detach themselves when they are big enough, for independent existence.

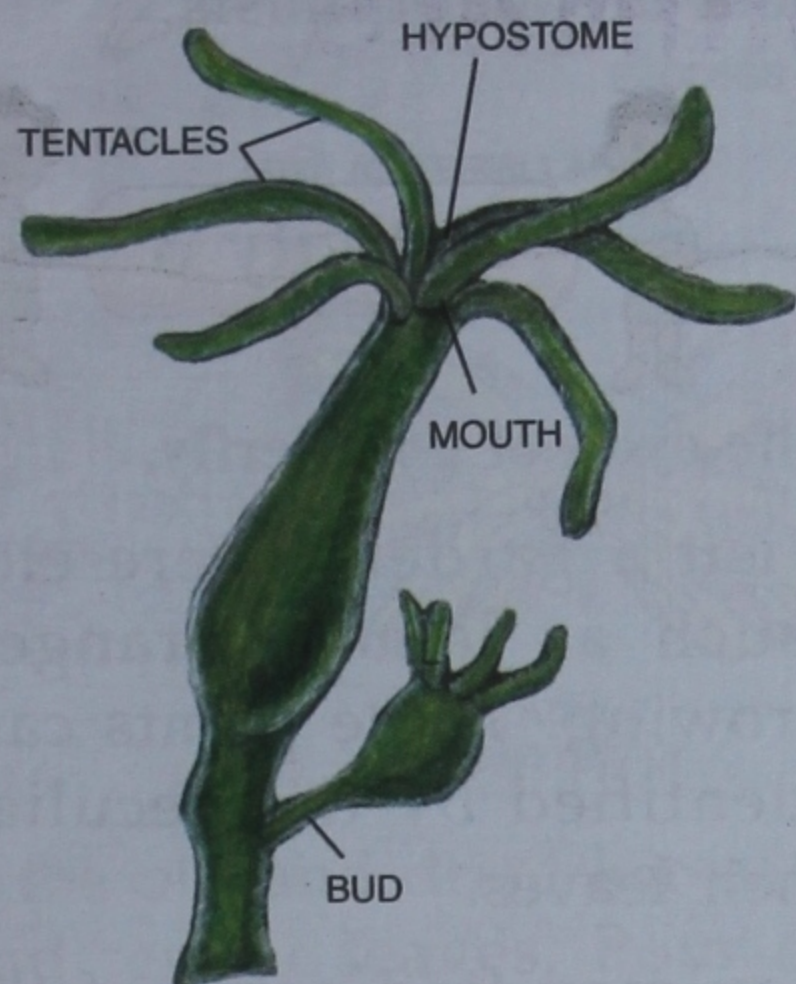


Fig. 5.2 Hydra

3. Regeneration – Animals like hydra and starfish have a great power to regrow the missing or lost parts of their body. This process of generating lost parts is called regeneration. Regeneration can also take place for reproductive purposes. For example, in hydra, if we cut it transversely into 2-3 pieces, each piece will regenerate and give rise to a new individual.

SEXUAL REPRODUCTION IN ANIMALS

Most animals reproduce **sexually**. In sexual reproduction, the two sexes *i.e.*, male and female produce special types of reproductive cells — **sperms** in the male and **eggs** in the female.

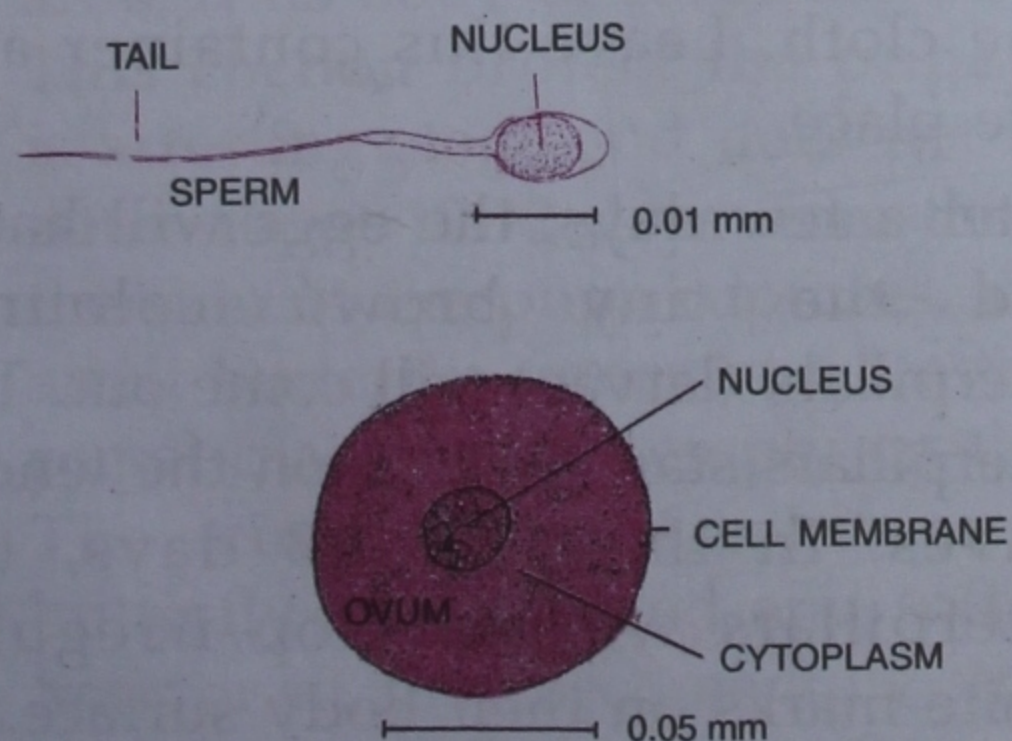


Fig. 5.3 Human sperm and egg

To produce a new individual, the sperm has to reach the ovum of the opposite sex and fuse with it. This process is called **fertilisation**.

After the fertilisation of an ovum by a sperm, a cell called the **zygote** is formed. The zygote grows by cell division and produces an **embryo**. The embryo finally grows to become a new individual.

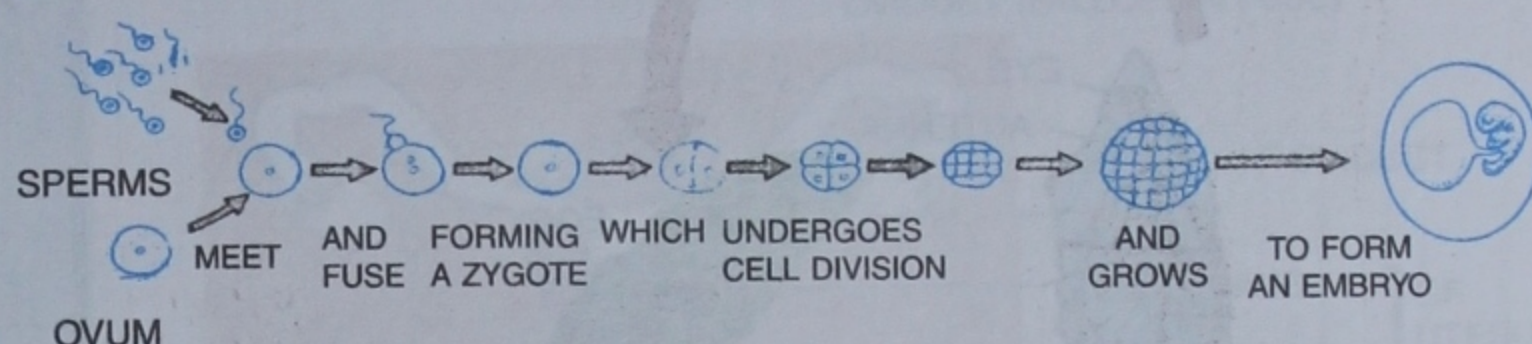


Fig. 5.4 Fertilisation and development

LIFE CYCLE OF AN INSECT

Different insects have different methods to grow from its egg stage to an adult stage. For example, the egg of a grasshopper hatch out in a tiny hopper called **nymph**, which feeds and grows into an adult.

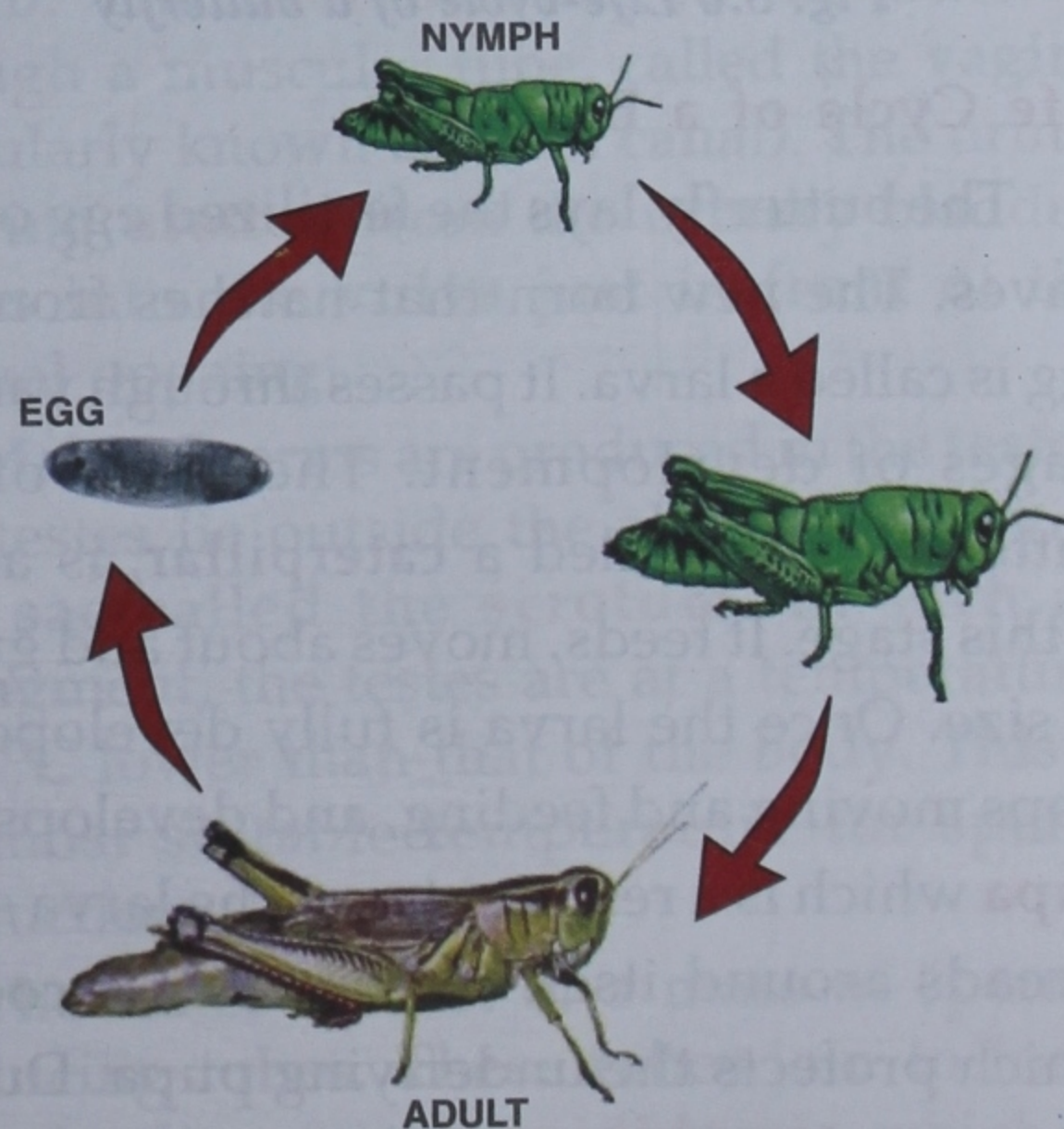


Fig. 5.5 Stages in the life-cycle of Grasshopper showing incomplete metamorphosis

But in case of a butterfly, the egg hatches out in a **larva**, which undergoes transformation to form a **pupa**. This pupa

ultimately gives rise to an **Adult**. In the case of a butterfly, the transformation of egg to an adult undergoes the following stages :

Egg → Larva → Pupa → Adult

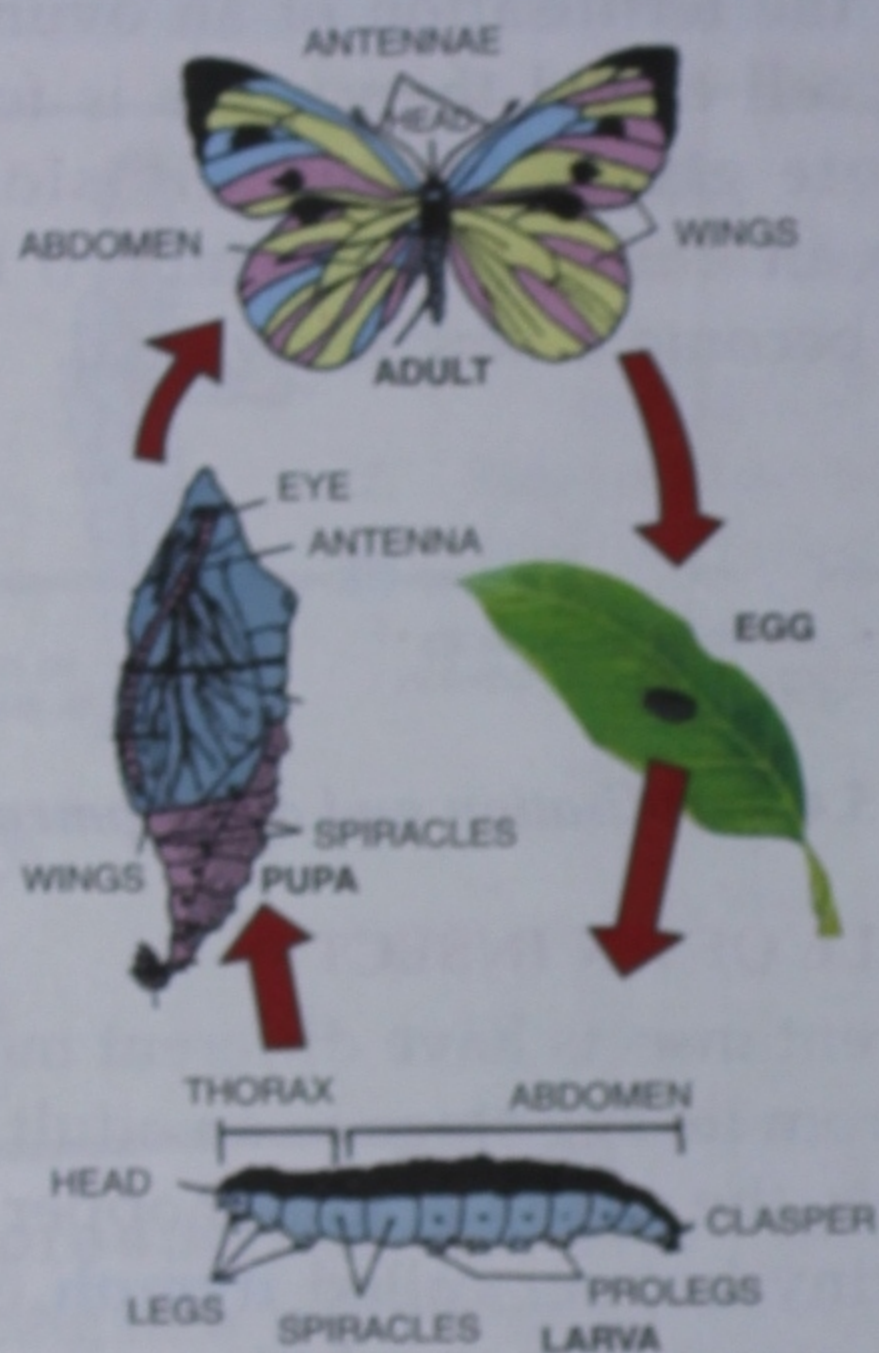
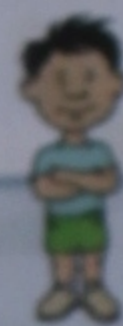


Fig. 5.6 Life-cycle of a butterfly

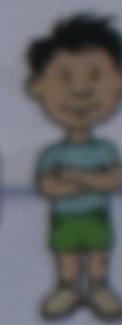
Life Cycle of a Butterfly

The butterfly lays the fertilized egg on the leaves. The new born that hatches from the egg is called a larva. It passes through various stages of development. The larva of the butterfly, also called a **caterpillar**, is active at this stage. It feeds, moves about and grows in size. Once the larva is fully developed, it stops moving and feeding, and develops into **pupa** which is a resting stage. The larva spins threads around itself to construct a **cocoon** which protects the underlying pupa. During this period, the pupa develops the features of an adult, though it appears to be at rest. The pupa undergoes reorganisation of tissues and organs and emerges out as a butterfly after breaking open the cocoon.

The complete transformation of an egg to an adult butterfly described above is called complete **metamorphosis**.

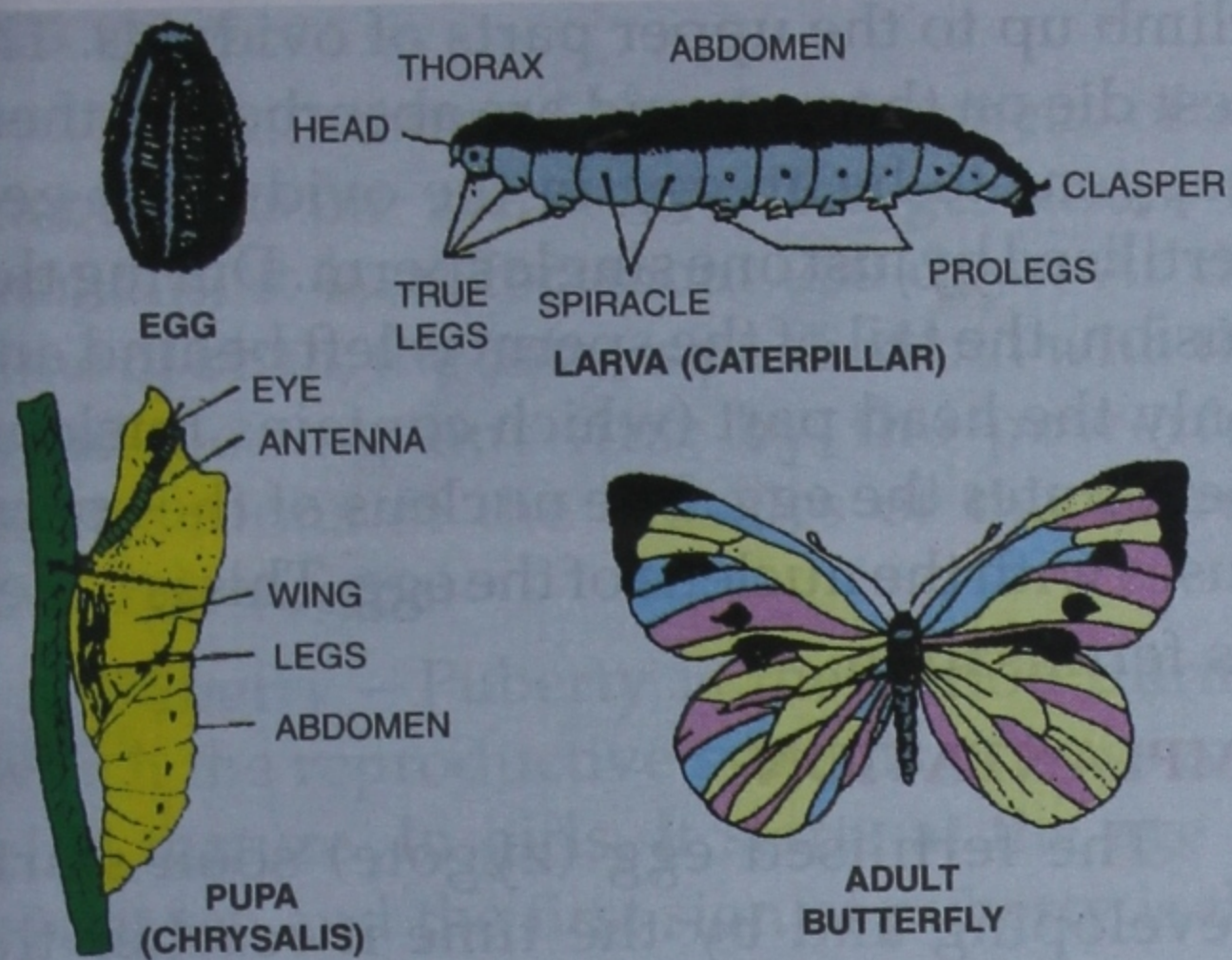


Activity 3



The life-cycle of a butterfly.

- Visit a garden where citrus plants (such as lemon, orange, etc.) are growing. These plants can easily be identified by the peculiar smell of their leaves.
- You may find some of these leaves cut up in a semi-circular manner. This is a clear symptom of the activity of a butterfly.
- Carefully, look at the plants. You may find tiny yellowish white eggs sticking on the young tender leaves.
- Pluck these leaves, put them in a plastic bag, and bring them to your classroom. Remove some of the eggs from the leaf.
- Take a clean wide-mouthed glass bottle or a plastic container. Put some moist sand in it, and cover the sand with a piece of blotting paper. Put a few leaves (with eggs) in the container and cover it with a piece of fine cloth. Leave this container at a safe place.
- After a few days, the eggs will hatch and the tiny brown coloured caterpillars (larvae) will come out. The caterpillars start feeding on the tender leaves. In the next 2-3 days, the caterpillars will develop irregular white marks on their body surface.



- Replace the old and dried leaves with fresh and tender leaves. Pour some water on the blotting paper everyday to keep it moist. Pick up 1 or 2 young caterpillars.
- The caterpillars continue to feed, grow in size and moult (shed off their old skin) at regular intervals. Every time the caterpillar moults, it increases in its size. Such moulting occurs 4-5 times.
- In about 15-20 days, the caterpillars become fully grown and acquire green colour. These fully grown caterpillars do lot of feeding.
- When they stop feeding, they fix themselves on the leaves with a thread secreted by themselves and change into pupa (*chrysalis*). The larva keep spinning the thread around its body to construct a cocoon. This cocoon protect the pupa which is a resting stage and does not feed.
- After about 10-12 days from this time, the skin of the pupa ruptures, and the adult butterfly comes out, leaving the pupal case hanging empty on the leaf.
- The wings of the freshly emerged butterfly are wrinkled and soft. In an hour or so, they become fully stretched and the butterfly begins to fly.

HUMAN REPRODUCTIVE SYSTEM

Female – The eggs are produced from the **ovaries**. The ovaries are two whitish oval bodies, lying within the lower half of the abdomen, one on each side of the **uterus**. There is an expanded, funnel-shaped tube called **oviduct** or **Fallopian tube** close to each ovary. It is through this tube that the egg passes down when released from the ovary.

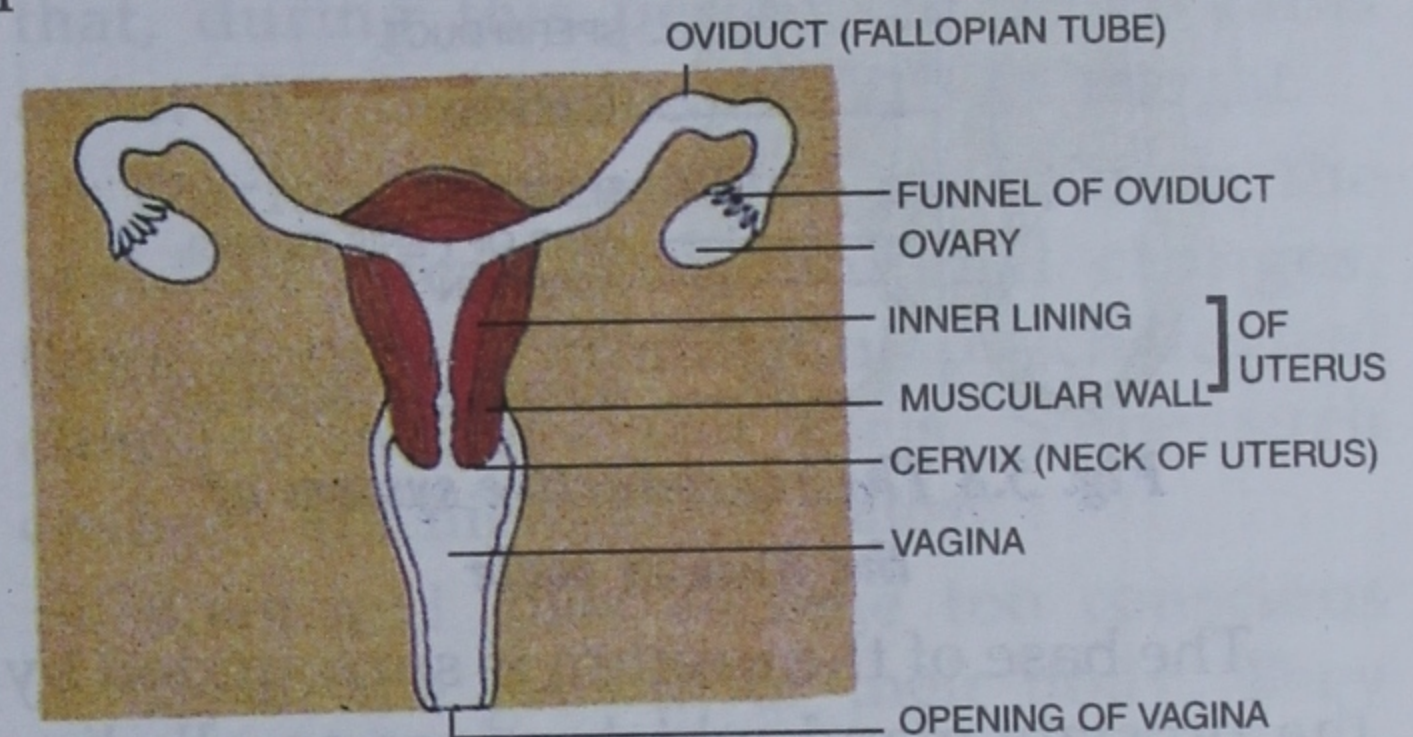


Fig. 5.7 The reproductive system of the human female

The two oviducts open into the **uterus** or womb. The **uterus** leads to the outside through a muscular tube, called the **vagina** (popularly known as birth canal). The urine-carrying **urethra** from the urinary bladder, opens into the **vulva** just in front of the vaginal opening.

Male – Sperms are produced in the **testes**. The testes lie outside the abdominal cavity in a sac called the **scrotum**. In such an arrangement, the testes are at a temperature, 2 – 3°C lower than that of the body. This is the most suitable temperature for sperm production.

The testes consist of a mass of sperm-producing tubes. These tubes join to form ducts leading to the **epididymis** which in turn leads into a muscular sperm duct. The two sperm ducts, one from each testis, open at the top of the urethra.

The **seminal vesicles** are a pair of lobulated glands, each opening into the corresponding

sperm duct just before it unites with the urethra. The seminal vesicles produce a secretion which serves as a medium for the transportation of the sperms. The mixture of this fluid and the sperms produce a milky fluid, called the semen.

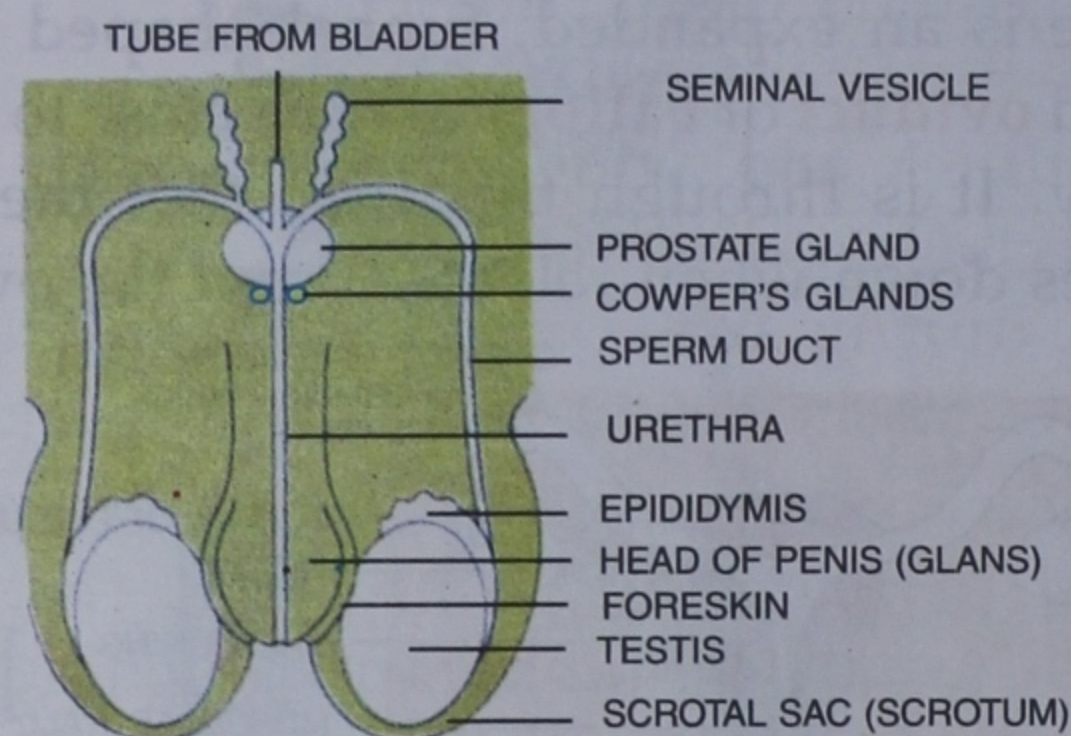


Fig. 5.8 The reproductive system of the human male

The base of the urethra is surrounded by the prostate gland which pours an alkaline secretion into the semen as it passes through the urethra.

Two small ovoid glands open into the urethra just before it enters the penis. These glands are called Cowper's glands. The secretion of Cowper's glands serves as a lubricant.

The urethra passes through the **penis** and carries either urine or semen.

Semen is a mixture of sperms and secretions from seminal, prostate and Cowper's glands. It is a milky fluid. Its average amount is 2 – 3 ml in a single ejaculation, and contains 20,000,000 – 40,000,000 sperms.

FERTILISATION

During sexual intercourse, the semen gets deposited in the female's vagina. The sperms (present in the semen) released in the vagina actively swim upwards with the help of their tail. Out of the millions of sperms released into the vagina, only a few of them are able to

climb up to the upper parts of oviducts. The rest die on the way and are absorbed. If there happens to be an egg in the oviduct, it gets fertilised by just one single sperm. During this fusion, the tail of the sperm is left behind and only the head part (which contains nucleus) penetrates the egg. The nucleus of the sperm fuses with the nucleus of the egg. This is called as fertilisation.

IMPLANTATION

The fertilised egg (zygote) soon starts developing and by the time it reaches the uterus, a small ball of numerous cells is already formed. This is a kind of embryo which forms a pit in the wall of the uterus and gets fixed in it. This natural way of fixing of the embryo in the wall of the uterus is called **implantation**. This produces the state of pregnancy.

By the end of five weeks of pregnancy, the embryo is in quite advanced stage. During this period, the heart and circulatory system are formed. After two months, limbs are also formed.

GROWTH

Growth means any type of irreversible increase in the size and weight of an individual during the process of development.

In the growth process, a single-celled fertilised egg *i.e.*, a zygote divides and redivides to form a cluster of cells. This division is accompanied by another process *i.e.*, specialisation of cells. The specialisation of cells lead to the formation of different parts of the body. This whole process is called **differentiation**. This process also gives rise to various tissues, and further, various organs and organ systems. Thus, the zygote grows into an embryo, an embryo into a baby, and a baby ultimately into an adult.

BIRTH

The full term of the development of an embryo in the uterus is called **gestation**. In humans, it lasts for about 280 days. At the time of birth, the baby is pushed out with the head oozing out first by the powerful contractions of the muscles of the uterus through vagina.

Puberty – Puberty is the period during which the reproductive systems of boys and girls mature. In girls, it starts at the age of about ten and the first sign of puberty is the development of breasts. In boys, it starts at about 11 years of age and the enlargement of the testes is its first sign.

The table given below shows the important physical changes in boys and girls that takes place during puberty.

Boys	Girls
1. Enlargement of testes.	1. Ovaries mature, release of eggs starts.
2. Penis and scrotal sac grow.	2. Uterus, vagina grow in size. Menstruation cycle starts (bleeding followed by formation of eggs.)
3. Sudden spurt in growth, shoulder girdle grows more than hip girdle.	3. Sudden spurt in growth for a short time, hip girdle becomes trough shaped and bigger than shoulder girdle, breasts grow.
4. Beards, moustaches, pubic and chest hair grow.	4. No hairs on chest or abdomen.
5. Voice becomes deep and hoarse, low pitch voice.	5. High pitch voice.

Adolescence and the related problems

The period between 10-19 years of age in an individual's life is called adolescence. Adolescence is a very critical period. During this period, boys and girls

experience a spurt of growth in all the areas of development. The period is distinctly marked by rapid physical as well as emotional growth. The most noticeable changes in boys are broad shoulders, oily skin, facial hair, muscular body and cracked voice. Similarly, girls have narrow waistlines and wide hips, oily skin and enlarged breasts. It is important to note that, during this period, an adult gains about 25% in height and 50% in weight.

During adolescence, apart from the rapid physical and emotional changes, there occurs a number of psychological changes in boys and girls. Some such changes are highlighted below :

- Boys and girls become too conscious about the growth of their body. They start worrying about the growth in the various parts of their body. They start feeling shy from each other and they are hesitant to share their problems with others. Most of the time, they go on finding fault in themselves and develop a complex. Also, they spend a lot of their time in grooming.
- They become worried about their future although it is an infant stage to think about the future. Since they have no set goals, they start fearing, which develops a stage of depression in them. Scientifically, the cause of depression is the dramatic increase in the hormone level in the body. The hormones affect the brain that control emotions and moods. It is a temporary phase that goes away with the increase in age.
- Boys and girls like to remain most of the time with their fellow colleagues (also called peers), since they feel safe in groups and they also imitate what others do in their groups.

- This is that crucial age when some boys and girls are trapped in a bad company and become addict to many bad things. So, they have to be careful while making friends.



Activity 1



To observe changes in the self with the help of photographs.

Introduction :

Though amazing, but it is a fact that from the time we are born up to the old age, our physical features keep changing with the passage of time. As the new born babies grow, the changes are quite sharp, almost, week by week. In somewhat older babies, the changes are evident almost month by month. In adolescents, the changes are conspicuous year by year. In older people, the changes are slow but quite conspicuous.



Carefully observe the facial features in the photographs in the increasing order of their ages. Note the changes in the following :

- Size of the face.
- Change in the outline of cheeks, from bulging to somewhat flattened.
- Width of the forehead.
- Any change in the shape of the hair line.
- Shape of the eyebrows.

- Colour/shine of the eyes.
- Size/shape of the nose.
- Outline of the lips.
- Any moustaches (in boys).
- Any other change that you notice.

Note down all the changes in your record book.

Conclusion :

During growth and development, the evident changes occur in — body size, face.



Activity 2



To measure the height and weight of children in different age groups, tabulate the readings, find their averages and arrive at conclusions.

The average height and weight of children in different age groups vary. Such comparisons are interesting to note. In this activity, you are to take the measurements in four age groups: Group (i) 8–9 years (Class IV), Group (ii) 11–12 years (Class VI), Group (iii) 13–14 years (Class VIII) and Group (iv) 15–16 years (Class X).

- Select three children (one tall, one medium height and one short) each from Classes IV, VI, VIII and X respectively.
- For measuring the height, fix the measuring tape in the class room by the side of a window with a cellotape.
- Measure the heights and take the weights on the weighing machine. Record these in the table given below (or in your note-book).

CLASS	CATEGORIES	HEIGHT	AVERAGE HT.	WEIGHT	AVERAGE WT.
Class IV	Tall				
	Medium	
	Short				
Class VI	Tall				
	Medium	
	Short				
Class VIII	Tall				
	Medium	
	Short				
Class X	Tall				
	Medium	
	Short				

[You can conveniently go up to millimetres in measuring the height, but for taking the weight, follow the needle up to the middle point between the kg mark to record the fractional $\frac{1}{2}$ kg].



- Calculate the average heights and weights of the three children each from four classes and write them in the respective columns.
- Compare the average heights and weights of the students of age groups (i) to (ii), (ii) to (iii) and (iii) to (iv),

and find out which age group has maximum differences in these measurements.

- Find out the difference in the average heights and weights between age groups (ii) and (i), (iii) and (ii) and (iv) and (iii), respectively.
- Make the entries of these differences in the table given below :

Differences in average heights and weights in different age groups

Age groups	Difference	
	height	weight
(ii) minus (i)		
(iii) minus (ii)		
(iv) minus (iii)		

Conclusion :

Draw your own conclusion regarding which age group shows relatively faster growth in height and weight.

ADULTHOOD

The stage that follows adolescence is adulthood. An individual attains full physical growth and a great amount of emotional stability. By this time the values learnt during childhood and adolescence are grounded and a strong vision for the future dominates. Stable relationships, intellectual and career pursuits and shouldering responsibilities take priority.

REVIEW QUESTIONS

Multiple Choice Questions :

1. Put a tick mark (✓) against the correct alternative in the following statements :
 - (a) The testes are located within the :

(i) Penis	(ii) Scrotum	(iii) Ureter	(iv) Urinary bladder
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- (b) Amoeba is most commonly reproduced by :
 - (i) Budding
 - (ii) Regeneration
 - (iii) Binary fission
 - (iv) Multiple fission
- (c) Which one of the following stages is formed after the fertilisation of the egg by the sperm ?
 - (i) Ovule
 - (ii) Foetus
 - (iii) Embryo
 - (iv) Zygote
- (d) Internally, the uterus opens into :
 - (i) Urethra
 - (ii) Vagina
 - (iii) Oviduct
 - (iv) Vulva
- (e) Which one of the following represents the correct sequence in the life history of a butterfly ?
 - (i) Egg → Larva → Adult → Pupa
 - (ii) Egg → Pupa → Adult → Larva
 - (iii) Egg → Larva → Pupa → Adult
 - (iv) Egg → Pupa → Larva → Adult

Short Answer Questions :

1. How do sperms differ from ova in their shape and structure ? (Give any *two* points)

- (a)
-
- (b)
-

2. Distinguish between sexual reproduction and asexual reproduction.

Sexual reproduction

Asexual reproduction

- (a)
- (b)

3. Define the term fertilisation.

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-

4. What is the significance of the testes lying within the scrotum ?

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5. Why is it important that a very large number of sperms should be present in the semen ?

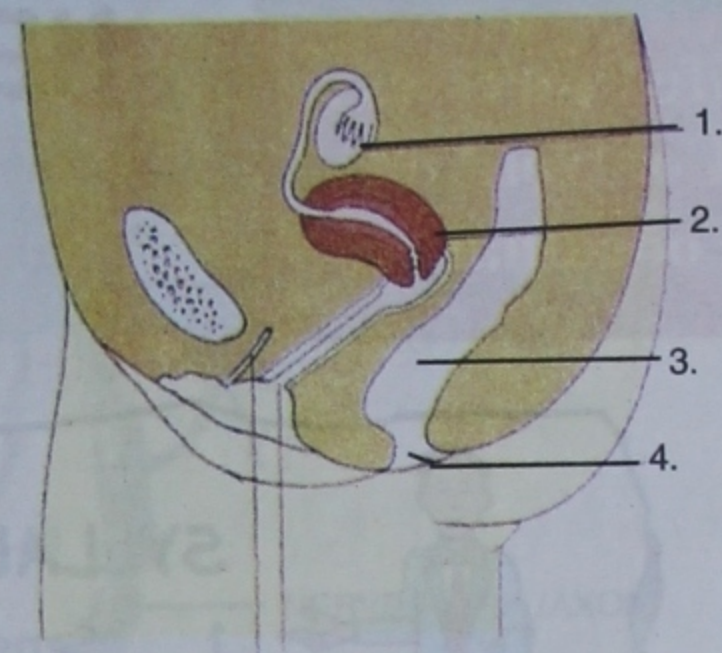
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6. List the structures, in their correct sequence, through which the sperms must pass from the time they are produced in the testes to the time they leave the urethra.

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7. Given here is a section of the female reproductive system of human beings.

(a) Name the parts labelled 1 to 4



.....

(b) Name the part where fertilisation occurs in human beings.

.....

8. State the functions of the following :

(a) Ovary :

(b) Testes :

(c) Fallopian tubes :

(d) Seminal vesicle :

(e) Uterus :

Long Answer Questions (Write the answer in your notebook)

1. Define the term metamorphosis. Briefly describe the various stages occurring in the life-cycle of a butterfly.
2. What is fertilization ? Describe the process in human beings.
3. How does a single celled fertilized egg grows into an adult in human beings ?
4. Tabulate the important physical changes in the boys and girls that take place during puberty.
5. Describe the female reproductive system in human beings.
6. 'Adolescence is a crucial stage'. Justify this statement.