

SCIENCE

Chapter 8: Reaching the Age of Adolescence



Reaching the Age of Adolescence

- The word adolescence means to grow into adulthood.
- Adolescence can be defined as the period of growth during which a child develops into an adult.
- The period of adolescence begins around the age of 10 -11 years and continues till 18-19 years of age. Growing up is a natural process.
- It is the period between puberty and adulthood in human development.
- In this time period, the body undergoes different changes alongside reproductive maturity.
- Adolescents are also called teenagers because the period covers the teens thirteen to nineteen years of age.
- In girls, adolescence may begin a year or two earlier than in boys. The period of adolescence varies from person to person. It is a stage of rapid growth and development.
- When the human body undergoes several changes during the adolescence, it marks the onset of puberty.
- Puberty can be defined as the process of physical changes by which a child becomes an adult and is capable of reproduction.
- The capability of reproduction is the most important change which marks the puberty.

Changes that mark adolescence

- Growth Spurt
- Change in body shape.
- Change in voice
- Increased activity of sweat and sebaceous gland
- Development of sex organs
- Reaching mental, intellectual and emotional maturity.
- Development of secondary sexual characters.

Adolescence

- The period of life of a person when the body undergoes a lot of changes leading to reproductive maturity is called **adolescence**.

- It begins around the age of 10 or 11 years and lasts up to 18 or 19 years.

Puberty

- The period during which adolescent boys and girls reach sexual maturity and become capable of reproduction is called **puberty**.
- Girls attain puberty at the age of 10–13 years, while boys reach puberty at the age of 12–14 years.

Changes at the Time of Puberty

Increase in height	<ul style="list-style-type: none">• Sudden increase in height occurs due to elongation of the bones of the arms and legs.
Change in body shape and appearance	<ul style="list-style-type: none">• Boys develop broader shoulders and hips and wider chests than girls.• Girls develop breasts while boys develop facial hair.
Change in voice	<ul style="list-style-type: none">• The voice box or larynx becomes bigger in boys which imparts a deep or low-pitched voice.
Increased activity of sweat and sebaceous glands	<ul style="list-style-type: none">• Several young boys and girls suddenly get a lot of acne and pimples on their face due to increased secretion from the sweat glands and sebaceous glands during puberty.
Development of sex organs	<ul style="list-style-type: none">• In males, the male sex organs i.e. the testes and the penis enlarge and develop completely. The testes begin to produce sperms.• In females, the female sex organs i.e. the ovaries, the oviducts and the uterus enlarge and develop completely. The eggs begin to mature. The ovaries start releasing mature eggs.
Reaching mental, intellectual and emotional maturity	<ul style="list-style-type: none">• Adolescence brings about physical, emotional and intellectual changes. There is a change in the individual's way of thinking.• They become more independent and self-conscious.

Secondary Sexual Characters in Humans

- Secondary sexual characters are controlled by hormones.
- **In males**- hair growth on the face, broadening of shoulders and chest, deepening of voice, Adam's apple.
- **In females**- development of breasts, broadening and curving of hips thereby leading to their prominence, development of a shrill voice.

Hormones

- **Hormones** are chemical substances secreted by the endocrine glands which coordinate the activities of living organisms along with their growth.
- **Endocrine glands** are ductless glands which secrete hormones directly into the bloodstream.

The endocrine glands produce hormones in very small quantities.

A hormone produced in one part of the body produces an effect in another part of the body called the target site.

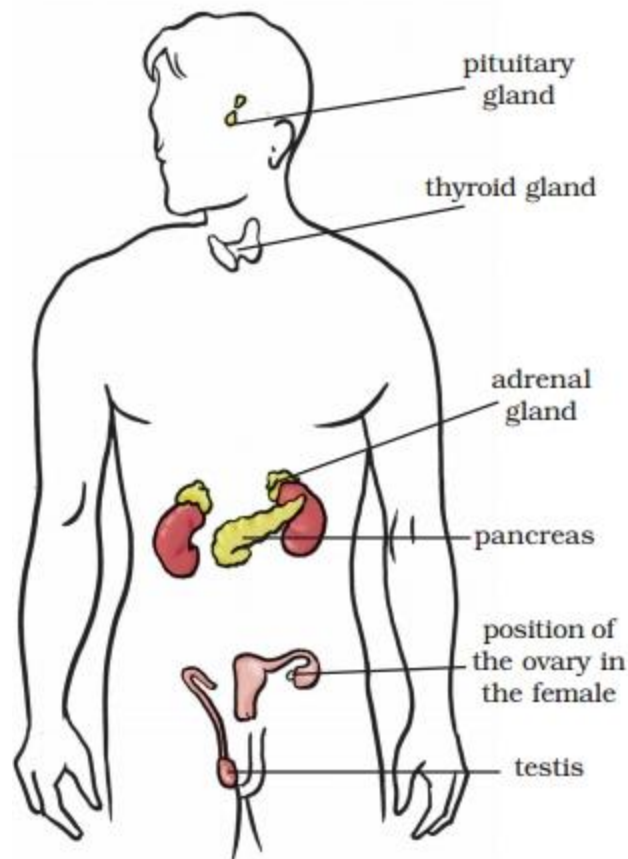
The target site then responds to the effect of the hormone.

Role of Hormones in Initiating Reproductive Function

- At the onset of puberty, the male sex hormone **testosterone** is released by the testes in males. In females, the ovaries begin to produce the female sex hormone **oestrogen**.
- The production of both these hormones is controlled by **gonadotropin-releasing hormone** secreted by the **pituitary gland**, which is an endocrine gland.

Hormones Other than Sex Hormones

ENDOCRINE GLAND	HORMONES PRODUCED
Pituitary gland	Secretes various hormones such as Growth hormone (<u>GH</u>), Thyroid-stimulating hormone (<u>TSH</u>), Follicle-stimulating hormone (<u>FSH</u>) etc. some of which regulate the activities of other endocrine glands.
Thyroid gland	Secretes <u>thyroxine</u> which controls metabolism of carbohydrates, fats and proteins and <u>calcitonin</u> which regulates calcium and phosphate levels in the blood.
Pancreas	The alpha cells of the pancreas secrete the hormone <u>glucagon</u> . The pancreatic beta cells secrete the hormones <u>insulin</u> and <u>amylin</u> . Glucagon and insulin together regulate the metabolism of sugars in the body.
Adrenal gland	The adrenal gland secretes <u>aldosterone</u> which regulates the metabolism of minerals, specifically sodium Na^+ and potassium K^+ ions. It also produces <u>adrenaline</u> which regulates the heart rate, the blood pressure, the breathing rate and the carbohydrate metabolism.



Role of Hormones in Metamorphosis

- Insects and amphibians produce hormones for regulating their development. They undergo changes in their form through the process of **metamorphosis**.
- In the **silk moth**, the changes in the life cycle from an egg to larva to pupa and finally to an adult are controlled by hormones produced by the insect.
- In **frogs**, metamorphosis is controlled by the hormone **thyroxine** produced by the thyroid gland.

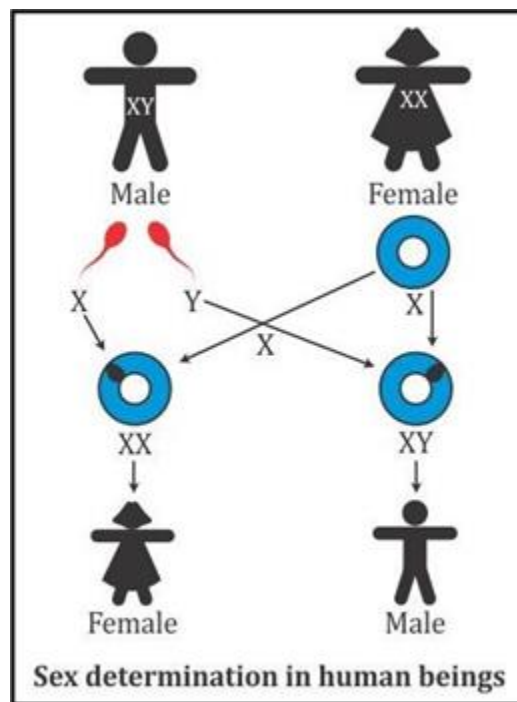
Reproductive Phase of Life in Humans

- The reproductive phase in males lasts throughout their life while in females, it begins around the age of 10-12 years and lasts until the age of 45-50 years.
- The release of an ovum from an ovary is termed as **ovulation**. Once in every 28-30 days, a single ovum matures and is released by one of the two ovaries.
- Several changes begin to occur in the uterus before ovulation. The inner lining or the walls of the
- **uterus become thick, soft and spongy**, full of tiny blood vessels to receive the fertilised egg.
- If the ovum gets fertilised, it results in pregnancy. If fertilisation does not occur, the released egg, and the thickened lining of the uterus along with its blood vessels are shed off.
- **Menstruation** or menstrual flow is the breaking off and removal of the inner thick lining of the uterus along with its blood vessels and tissues in the form of vaginal bleeding.
- It occurs once in about 28 to 30 days and lasts for about 3 to 5 days.

- The menstrual cycle is controlled by **hormones**.
- The first menstrual cycle begins at puberty and is known as **menarche**. It begins at around the age of 13 years.
- The menstrual cycle stops around the age of 45-50 years. It is known as **menopause**. It marks the end of the reproductive phase in females.

Sex Determination

- The phenomenon or the process which determines whether the developing embryo will be a male or a female is known as **sex determination**.
- The sex of the baby is determined by the type of sex chromosome present in the fertilised egg from which the baby develops.



Reproductive Health

- **Reproductive health** is defined as a state of physical, mental and social well-being of a person in all matters relating to the reproductive system at all stages of life.

Conditions to Maintain Good Reproductive Health during Adolescence

Nutritional needs of adolescents

- A balanced diet which contains each food constituent in the correct amount sufficient for the normal growth and development of the body to keep one healthy should be consumed.

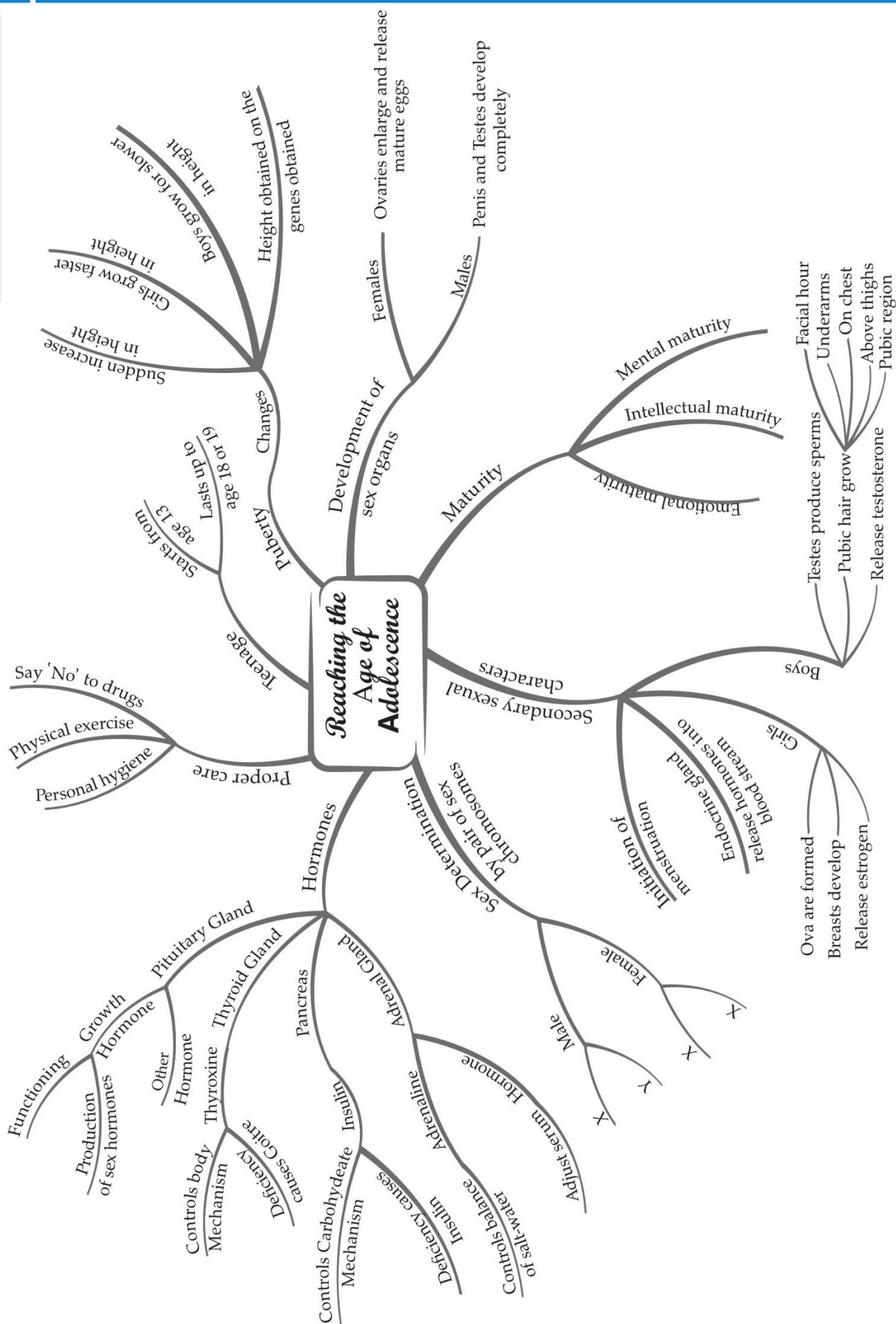
Personal hygiene	<ul style="list-style-type: none">• Maintenance of personal hygiene is necessary for preventing diseases and preserving good health.
Physical exercise	<ul style="list-style-type: none">• Physical exercises such as brisk walking, jogging, swimming, cycling, dancing, playing outdoor games etc. should be performed regularly.
No consumption of drugs	<ul style="list-style-type: none">• Drugs are addictive.• They cause damage to the liver, brain, lungs and kidney.

Myths and Taboos Regarding Reproduction

- A widely held but false belief is known as a **myth**, and something prohibited by social customs is called a **taboo**.
- An important myth in the minds of many people is that the mother is responsible for the sex of her child. Scientifically, it is the father who determines the sex of the unborn child.
- An important taboo in the minds of many people is that a girl should not be allowed to work in the kitchen during the days of menstruation. Menstruation is a natural process and there is no harm if a girl works in the kitchen or goes out for work. However, proper care of personal hygiene should be taken during the days of menstrual flow.

MIND MAP : LEARNING MADE SIMPLE

CHAPTER-8



Important Questions

Multiple Choice questions-

Question 1. Adolescence is the period of

- (a) 5 to 10 years
- (b) 11 to 19 years
- (c) 22 to 28 years
- (d) 30 to 40 years

Question 2. When a sperm having X-chromosome fuses with the ovum, the child born will be

- (a) male
- (b) female
- (c) male as well as female twin
- (d) it depends on the chance of fusion

Question 3. How many pairs of Chromosomes are found in nuclei of their cells?

- (a) 22 pairs
- (b) 23 pairs
- (c) 24 pairs
- (d) 25 pairs

Question 4. Children gain height during

- (a) adolescence
- (b) endocrine
- (c) balanced food
- (d) menarche

Question 5. Testes secrete

- (a) thyroxin
- (b) estrogen
- (c) testosterone
- (d) iodine

Question 6. Adam's apple is

- (a) enlarged larynx
- (b) mammary glands
- (c) apple of adam
- (d) red apple

Question 7. The chemical substances which are secreted from endocrine glands are called

- (a) puberty
- (b) hormones
- (c) estrogen
- (d) adolescence

Question 8. Out of these which one determines the sex of the baby?

- (a) Hormones
- (b) Chloroplast
- (c) Chromosomes
- (d) Pituitary gland

Question 9. What is the stoppage of menstruation called?

- (a) Menarche
- (b) Menopause
- (c) Gametes
- (d) Insulin

Question 10. Which hormone is secreted by adrenal glands?

- (a) Adrenalin
- (b) Insulin
- (c) Testosterone
- (d) Estrogen

Question 11. Reproduction age in women starts when their

- (a) menstruation starts
- (b) breasts start developing
- (c) body weight increases
- (d) height increases

Question 12. Which is male gonads?

- (a) Hair
- (b) Chest
- (c) Moustache
- (d) Testis

Question 13. The beginning of menstruation at puberty is called

- (a) ovulation
- (b) menstruation
- (c) menarche
- (d) menopause

Question 14. In males, the sex chromosome consists

- (a) one X and one Y
- (b) both X and X
- (c) both Y and Y
- (d) one M and one X

Question 15. Production of thyroxin requires

- (a) sodium
- (b) magnesium
- (c) iodine
- (d) bromine

Very Short :

1. When does the growth start in human?
2. When do sudden and noticeable changes begin in human?
3. What do the changes in the body of a child indicate?
4. What is the age of adolescence in human?
5. What is puberty?
6. What changes occur during puberty?
7. Do both boys and girls grow at the same rate?
8. Do all the parts of the body grow at the same rate?
9. Which organ is called voice box?

10. What is Adam's apple?

Short Questions :

1. What is the relation between adolescence and puberty?
2. Define the following:
 - a. **Adolescence**
 - b. **Puberty**
3. Define the following:
 - a. **Adam's apple**
 - b. **Secondary sexual characters**
4. Write short notes on increase in height during puberty.
5. Write short notes on changes in body shape during puberty.
6. Write short notes on voice change at puberty.
7. What are the effects of increased activity of sweat and sebaceous glands?
8. Write short notes on development of sex organs at puberty.
9. Define secondary sexual characters.
10. Why changes in the body occur at adolescence?

Long Questions :

1. What changes occur in human at puberty?
2. Explain the reproductive phase of life in humans.
3. Mention different types of glands, their functions and hormones secreted by them.
4. Explain sex determination in human.
5. Explain the term reproductive health. What should we do to maintain reproductive health?

ANSWER

MCQ Answer:

1. Answer: (b) 11 to 19 years
2. Answer: (b) female
3. Answer: (b) 23 pairs
4. Answer: (a) adolescence
5. Answer: (c) testosterone
6. Answer: (a) enlarged larynx
7. Answer: (b) hormones

8. Answer: (c) Chromosomes
9. Answer: (b) Menopause
10. Answer: (a) Adrenalin
11. Answer: (a) menstruation starts
12. Answer: (d) Testis
13. Answer: (c) menarche
14. Answer: (a) one X and one Y
15. Answer: (c) iodine

Very Short Answer :

1. Answer: Growth begins from the day the child is born.
2. Answer: The sudden and noticeable changes begin in human in adolescence age.
3. Answer: The changes in the body of a child indicate that a child is on the way to become an adult.
4. Answer: The age between 11 to 18 or 19 years is called the age of adolescence.
5. Answer: The age at which boys and girls become capable of reproduction.
6. Answer: At the time of puberty the bones of the arms and the legs elongate and make a person tall.
7. Answer: No, girl grows faster than boys.
8. Answer: No, all the parts of the body do not grow at the same rate.
9. Answer: Larynx.
10. Answer: The protruding part of the throat in boys is called Adam's apple.

Short Answer :

1. Answer: Adolescence is the period of life when a body undergoes changes leading to reproductive maturity. These changes mark the onset of puberty.
2. Answer: (a) Adolescence: Human beings become capable of reproduction after the puberty sets in. The period of life when the body undergoes changes, leading to reproductive maturity, is called adolescence. Between the age of 11 years and 19 years children are called adolescents.

(b) Puberty: Puberty is the process of physical changes by which a child's body matures into an adult body and it becomes capable of sexual reproduction to enable fertilisation. The human body undergo several changes during adolescence; these changes mark the onset of puberty.
3. Answer: (a) Adam's apple: In boys, at puberty, there develop a larger voice box which can

be seen as a protruding part of the throat called Adam's apple. Sometimes the muscles of the growing voice box go out of control and the voice becomes hoarse.

(b) Secondary sexual characters: During puberty many features develop in boys and girls that help to distinguish male from female, which is called secondary sexual character. This causes changes in boys like production of sperms, growth of beard and moustaches, growth of hair on chest, under the arms and in pubic region, this causes changes in girls like production of ova, development of breast, development of mammary gland inside the breast, growth of hair under the arms and in pubic region.

4. Answer: There is sudden increase in height during puberty, at this time the bones of arms and legs elongate and make a person tall.
5. Answer: There is change in body shape during puberty which includes broader shoulder and wider chests in boys and in girls region below the waist becomes wider.
6. Answer: In boys, at puberty, there develop a larger voice box which can be seen as a protruding part of the throat called Adam's apple. Sometimes the muscles of the growing voice box go out of control and the voice becomes hoarse.
7. Answer: The increased secretion of sweat and sebaceous gland in the skin causes acne and pimples on the face of young people.
8. Answer: At puberty male sex organs like testes and penis develop completely, the testes also begin to produce sperms, in the girls ovaries enlarge and start releasing mature eggs, these are mainly controlled by hormones like testosterone in male and estrogen in female.
9. Answer: During puberty many features develop in boys and girls that help to distinguish male from female, which is called secondary sexual character. This causes changes in boys like production of sperms, growth of beard and moustaches, growth of hair on chest, under the arms and in pubic region, this causes changes in girls like production of ova, development of breast, development of mammary gland inside the breast, growth of hair under the arms and in pubic region.
10. Answer: The changes occurring in body at adolescence are mainly controlled by the action of hormones. Hormones are chemical substances secreted by endocrine glands that reach to a particular body part via bloodstream. Changes in boys like production of sperms, growth of beard and moustaches, growth of hair on chest, under the arms and in pubic region are all because of release of male hormone testosterone and changes in girls like production of ova, development of breast, development of mammary gland inside the breast, growth of hair under the arms and in pubic region are all because of the female hormone estrogen produced by ovaries.

Long Answer:

1. Answer:

There are various changes in human at puberty. They are as follows:

(i) Change in height: During puberty, there is sudden increase in height in boys and girls. Initially, girls grow faster in height than in boys. But both reach their maximum height at

the age of 18 years.

(ii) Change in voice: Boys develop larger voice box or larynx to form protruding part of throat called Adam's apple making their voice hoarse, girls have high pitched voice.

(iii) Change in body shape: In boys, shoulders broaden and muscles grow more prominently than in girls. In girls the region below the waist becomes wider.

(iv) Secretion of sweat and sebaceous glands (oil glands) in both boys and girls increases and acne or pimples grow on faces of many youths.

(v) Development of sex organs: In males, testes and penis develop completely. Testes begin producing sperms. In girls, ovaries are enlarged and begin to produce eggs. Both boys and girls reach reproductive maturity.

(vi) In girls, menstruation or periods starts.

(vii) All human beings attain mental, intellectual and emotional maturity at puberty.

(viii) Facial hair like moustache and beard are grown in boys. Hair are grown in armpit and pubic region in both boys

and girls. Breasts are developed in girls. These characters are called secondary sexual characters as they distinguish a male from a female.

2. Answer:

Boys and girls become capable of reproduction at puberty because their testes and ovaries begin to release gametes, i.e., sperms and ova respectively. In girls, reproductive phase of life begins at puberty from 10 to 12 years of age and generally lasts till the age of 45 to 50 years. The ova begin to mature with the onset of puberty. The ovum matures and is released by one of the ovaries once in 28 to 30 days. During this period, the wall of the uterus becomes thick so as to receive the egg, in case it is fertilised and begins to develop. This results in pregnancy.

If fertilisation does not occur, the released egg, and the thickened lining of the uterus along with its blood vessels are shed off. This causes menstruation. It occurs once in about 28 to 30 days. The first menstrual flow begin at puberty and is termed as menarche. The menstruation stops at the age of 45 to 50. This stage is known as menopause. In male, the reproductive phase begins at puberty at the ages 14-15 and lasts as long as he is healthy.

3. Answer:

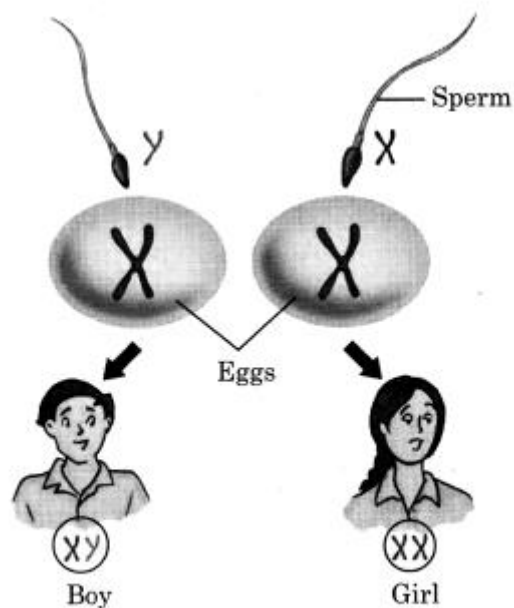
There are different types of glands in our body and they secrete different types of hormones which control growth, behaviour, development and reproduction. The following table shows different types of glands, hormones secreted by them and their functions:

S. No.	Name of glands	Hormones secreted	Functions
1.	Pituitary	Several hormones including	(i) Produces thyroxine hormone and stimulate

		growth hormone, thyroid stimulating hormones, etc.	thyroid gland. (ii) Controls growth. (iii) Keeps a check on the activity of other glands.
2.	adrenal	Adrenaline	(i) Regulates blood pressure, breathing rate, heart beat, etc. (ii) Helps the body to adjust the stress condition.
3.	Thyroid	Thyroxine	(i) Helps in controlling growth, respiration and metabolism. (ii) Prevents from goitre disease.
4.	Testes	Male hormone or testosterone	Develops secondary sexual characters and control releasing of sperms.
5.	Ovaries	Female hormone or estrogen	Develop secondary sexual character, maturation and release of ovum and helps in maintaining the growth of uterus during pregnancy.
6.	Pancreas	Insulin	Controls sugar level and prevents from diabetes.

4. Answer:

Sex determination of a baby is done at the time of fertilisation when a male gametes fuse with a female gamete. It depends on male partner whether the baby will be a male child or female child. The chances of child to be male or female actually depend on the chromosomes present in the fertilised eggs or ova. There are 23 pairs of chromosomes in the nuclei of all human beings out of which two are sex chromosomes named X and Y.



► Fig. 10.5 Sex determination in humans

A male has one X and one Y chromosome and a female has two X chromosomes. The gametes (egg and sperm) have only one set of chromosomes. The unfertilised egg always has one X chromosome. But sperms are of two kinds. One kind has an X chromosome, and the other kind has a Y chromosome.

When a sperm containing X chromosome fertilises the egg, the zygote would have two X chromosomes and develop into a female child. If the sperm contributes a Y chromosome to the egg (ovum) at fertilisation, the zygote would develop into a male child. Fig. 10.5 shows sex determination in humans.

5. Answer:

The state of physical, mental and social well being of an individual is regarded as an individual's health. A healthy person is free from disease, tension and anxiety. Reproductive health refers to a state of physical, mental and social well-being in all matters relating to the reproductive system, at all stages of life.

We should take following measures to maintain reproductive health:

- To have a balanced diet: As far as practicable, we should have a balanced diet, i.e., a diet containing proteins, vitamins, carbohydrates, fats and minerals. We can have our food which contain these nutrients.
- To take physical exercise: We should take physical exercise like morning walk, running, etc., daily.
- To maintain personal hygiene: We should maintain personal hygiene to stay fit and healthy. We should wash our body especially pubic region, armpit, etc., properly.
- Avoid harmful drugs: We should avoid taking harmful drugs and alcohol.