UNIT 1  PHYSICAL CHANGES IN 
BOYS AND GIRLS

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1.0  OBJECTIVES

After going through this unit you will be able to:

- state the various changes that take place during adolescence;
- list the physical changes occurring in boys and girls;
- explain the factors responsible for these changes;
- recognize your role in knowing; and
- explain these changes to your students.

1.1  INTRODUCTION

The human body is changing at all stages of life but some stages are associated
with a growth spurt – one is during infancy and the other significant one is during
adolescence. This is the period of life when a child is transformed into an adult
man or woman. It starts from the onset of growth spurt of puberty and goes on
till sexual and mental maturation is completed. However, this growth and maturation
occurs at different times for different people often leading to confusion and doubts in the minds of the young adolescent. There is often a very worrying question in most minds –“Am I normal?” It is difficult to cope up with so many changes taking place all of a sudden.

By going through this unit, you will become aware of the various expected changes that occur during adolescence and will be able to reassure your students when they have their various doubts.

### 1.2 CONCEPT OF PHYSICAL CHANGES

As babies – and even in small children, there is no visible difference between a boy and a girl. If dressed similarly, all children would look very similar. However, with the onset of puberty, in a span of seven to nine years, boys and girls grow up to be young men and women. The body not only grows in size but the features that distinguish boys and girls also develop during these years.

For a brief period of two or three years both boys and girls experience what is referred to as the growth spurt. Adolescents shoot up in height and gain weight. The growth spurt begins two years earlier for girls than for boys but it lasts longer for boys. Approximately, 50% of body weight, and 25% of adult height are attained at puberty.

The rapid acceleration in height and weight is accompanied by changes in body proportions. The different parts of the body have their own sequence and growth. Some grow slowly while others grow fast. At this age, hands and feet become almost adult size before the legs and arms reach their full length. This gives the young adolescent a gawky look. Girl’s hips become wider in relation to their shoulders whereas boys develop broader shoulders.

There is a slight change in facial features. The jaw and the nose become larger, while the mouth widens and the chin becomes prominent. The scalp hairline also changes in boys whereas it remains the same in girls.

In both boys and girls, as the height increases, there is a rapid increase in the development of muscles. However, boys show a more rapid increase than girls; as a result they gain more muscle tissue. That is why boys are more muscular as compared to girls. The rate of development of muscles in adolescents is faster than the development of fatty tissue. This is more so in boys than in girls. As a result girls tend to retain some of their fat, especially on their arms, legs and hips. The boys, having lost their childhood fat, become lean and muscular as their height increases.

Along with changes in body size physical changes in the reproductive system also occur leading to sexual maturity. For the first time in life obvious differences in girls and boys emerge. Sexual maturation consists of two types of changes in the reproductive system. Those that relate to primary sex organs such as the penis and testes in males, and the vagina, uterus and the ovaries in the females are called primary sexual characteristics. You will read about them in later units. Associated changes visible on the body are referred to as secondary sexual characteristics. These include breast development in females, facial hair or beard in males and growth of underarm and pubic hair in both sexes.
Before discussing the factors, let us discuss the definition of puberty as follows:

**Puberty**: It is the time when external and internal physical changes in sex organs occur due to secretion of reproductive hormones.

Adolescence is the time when a boy develops into a man and a girl develops into a woman and they become physically capable of having children. The changes in the body that take place from childhood to the end of adolescence are controlled by the central nervous system. It regulates growth through its influence on the glands in the endocrine system namely thyroid gland, the pituitary gland and the adrenal gland. These glands secrete chemicals called hormones directly into the blood when they receive a signal from the nervous system. The ovaries of the female and the testes of the male are the other glands that become active during puberty and secrete sex hormones. **Both sexes have a little of the opposite sex hormone too.**

Now let us discuss the factors influencing physical changes both in boys and girls separately in detail.

### 1.3.1 Boys

In this section the content is explained on factors affecting changes in boys. The male hormone **testosterone**, secreted by the testes is responsible for the various physical changes taking place in the body of the male adolescent. The various effects that testosterone has on the body are:

- Body hair distribution
- Effect on the voice
- Increased secretions by skin glands often leading to acne formation
- Muscle development and distribution
- Increased bone growth
- Increased metabolic rate
- Increased production of red blood cells
- Increased size of penis and scrotum
- Production of sperms.

In addition to the hormones causing the various physical changes, the **nutrition** received at this time will have an effect on the physical growth of the individual. The body needs more proteins, calcium and iron rich foods for a complete and proper development. You will learn more about the importance of nutrition in adolescence in theory Course-2, Block-2, Unit-2.

**Exercise** too plays a role in the growth and development of the adolescent boy. Exercise increases the production of a hormone called ‘Growth hormone’. As its name suggests, growth hormone is responsible for increased growth. So regular exercise will result in a good physique stature. However, strenuous exercise may even delay puberty.
Genetic background has also been seen to have an effect on the onset of puberty and the growth of the individual. Short parents are unlikely to have a tall son.

Environmental factors may also play a role in determining the onset of puberty and the features associated with it. Children living at higher altitudes have been seen to have a delayed onset of puberty.

1.3.2 Girls

Now let us discuss the factors affecting changes in girls.

With the onset of puberty, the ovaries start secreting the female sex hormones viz., estrogen and progesterone. These hormones are responsible for the various physical changes taking place in the body of the adolescent girl. The effects of estrogens are:

- Body hair distribution
- Soft and smooth skin
- Increased fat deposition in the body
- Slight increase in metabolic rate
- Small increase in protein deposition
- Increased deposition of calcium in bones and increased bone growth
- Development of breast tissue
- Increase in size of all reproductive organs – internal as well as external
- Initiation of menstruation (menarche).

The other female hormone – progesterone works in conjunction with estrogen in causing an increase in the size of the internal reproductive organs as well as complete breast development. The two hormones are secreted in different quantities at different times of the monthly cycle and regulate the process of menstruation.

As you have seen in the case of boys, nutrition plays a very important role in the growth and development of the adolescent girl also. This is actually a phase where an undernourished and underdeveloped girl can ‘catch up’ on her growth! If adequate nourishment is available, growth will be proper. However, if the amount of body fat increases beyond the required limit – as happens in cases of obesity – puberty may set in earlier than expected. A girl requires an adequate amount of iron rich foods to compensate for the regular blood loss during menstruation.

Exercise is another factor affecting the physical growth. Strenuous exercise delays puberty as has been seen in female athletes.

Genetics has a role to play here too. The growth pattern of the mother often determines that of the daughter.

As with boys, environment is another factor affecting the development of the adolescent girl. Higher altitudes and a colder climate lead to a later age of menarche.
Figure 1.1: Physical Changes in Boys and Girls

Check Your Progress 1

a) State the various factors that influence the various physical changes taking place in adolescents.

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b) State three effects of testosterone and three effects of estrogen.

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c) State True or False:

i) All adolescents grow at the same rate. (T/F)

ii) Boys have a small amount of estrogen in their bodies. (T/F)

iii) Boys tend to show a growth spurt a little later than girls. (T/F)

iv) Our height depends on our parental height. (T/F)
1.4 TYPES OF CHANGES

Let us learn about primary and secondary changes in the Boys and Girls.

1.4.1 Primary Changes in Boys

1. **Growth spurt occurs:** The growth spurt occurs about two years later in boys than in girls. In India this would be anytime between 12 and 15 years. Within three to five years, boys gain an average of **36 cm** in height and **25 kg** in weight. However, these are only average values and wide variation in these figures should not be considered abnormal. Approximately, **50% of body weight, and 25% of adult height are attained at puberty**.

2. **Overall increase in size of body parts:** The hands, face, legs, arms – all parts increase to attain adult size. However, the rate at which they increase is different due to which the adolescent often appears to be clumsy and disproportionate! However, all this soon settles down.

3. **Dental changes:** The jaw size enlarges, the ‘milk’ teeth fall and the permanent teeth appear. The complete set of permanent teeth erupt during adolescence. The ‘wisdom’ teeth or third molar appears towards the end of adolescence.

4. **Skin becomes oily and pimply, the body sweats more and smells:** These are the effects of the hormone testosterone on the skin. This hormone is mainly responsible for the development of acne.

5. **Appearance of body hair:** Hair appears in the pubic area, underarms, limbs, and face.

1.4.2 Primary Changes in Girls

1. **Growth spurt occurs:** Girls show a growth spurt at least two years before boys. Thus a girl and boy of the same age do not appear so during the adolescent stage. In a class where both girls and boys study, girls look older than boys. A girl would therefore start growing between 10 – 13 years of age. This growth continues for a shorter period than for boys and lasts about 2-4 years. Girls gain about **24 cm** in height and **21 kg** in weight. However, there are individual variations and this does not apply as a rule for all girls. As with boys, about **50% of adult weight and 25% of adult height is added at this age**.

2. **Overall increase in all body parts including hands, legs and face:** All body parts increase to attain the adult dimensions though this does not occur in a very proportionate manner. As an example, the feet grow to the adult size before the full adult height is gained and this gives rise to worry in the mind of the growing teen. Increase in **body fat** occurs giving girls their characteristic shape.

3. **Dental changes:** Permanent teeth appear as the deciduous teeth are shed. The jaw size increases but the final shape is different from a boy’s jaw. Permanent teeth appear slightly earlier in girls than they do in boys.

4. **Skin becomes oily and pimply:** The presence of small amounts of testosterone causes excessive secretion from the sebaceous glands which in turn leads to the formation of acne.

5. **Appearance of body hair:** Hair appears in the pubic area, underarms and limbs. The distribution, however is different from boys.
Now let us discuss secondary changes in both boys and girls separately.

### 1.4.3 Secondary Sexual Characteristics in Boys

The secondary sexual characteristics in boys are as follows:

- **Penis and testes enlarge**: The testes enlarge as the first sign of puberty in males. This is visible as an increase in the size of the scrotum which starts looking pendulous. This occurs on an average at about 11-15 years. This is followed by an increase in the size of the penis. This growth goes on till about the age of 18 years.

- **Pubic hair appears**: The pubic hair are the first to appear after the testes start enlarging as a sign of growing up. These gradually increases in amount, become coarser and darker and under the influence of testosterone grows in a ‘male pattern’ i.e., upwards towards the umbilicus (triangle with apex up), sideways towards the inner sides of the thighs, and backwards the anal region.

- **Underarm, arm, leg and chest hair appears**: The underarm hair appear before the hair on the arms, legs and chest increase and darken. There is a large range in amount of body hair among adult men, and significant differences in timing and quantity of hair growth among different people. All men may not have hair on their chest.

- **Facial hair appears**: Under the influence of testosterone, hair starts appearing on the face, usually starting from the upper lip and is followed by hair on the sideburns and beard area. The hair is initially soft but gradually gets coarser over a period of 2 to 4 years. However, the sequence and amount varies from person to person. These usually appear about two years after the appearance of pubic hair. The hairline on the scalp recedes on the sides and takes a V-shape unlike the female who retains the childhood hairline.

- **Muscles develop**: Increased muscle mass due to the effects of testosterone causes increased strength and increased metabolic rate.

- **Shoulders and chest broaden**: As mentioned earlier, testosterone has an effect on the development of muscle and this helps in giving boys a typical ‘male’ shape with broad shoulders and chest accompanied by a narrow waist.

- **Larynx (voice box) enlarges, voice deepens**: This causes the voice to initially ‘crack’. This may be a very embarrassing phenomenon for most boys, especially those who are not prepared for it. It is perfectly natural and soon the voice settles down into a normal deep and ‘manly’ voice.

- **Sperm production begins**: As the testes enlarge, the production of sperms begins. The first ejaculation also usually occurs after increase in penis size has taken place. This will be seen as a ‘wet dream’ (*nocturnal emissions*) in which the adolescent boy has an involuntary ejaculation while he is asleep. You will learn more about this in a later session.

- **The breast** may show a small increase in size as puberty sets in due to the presence of small amounts of estrogen, but this soon resolves on its own and does not need any treatment. However, this may cause undue anxiety in the adolescent but all he needs now is reassurance.
The sequence of events in boys is as follows:

- enlargement of testes visible as enlargement of scrotum
- appearance of pubic hair
- enlargement of penis and growth spurt
- larynx starts to grow and voice deepens, slight enlargement of breast tissue may occur
- hair growth on upper lip
- nocturnal emissions may occur
- increase in muscle tissue and increased physical strength
- appearance of acne and increased body hair including hair on face.

The nocturnal emissions – or wet dreams – cause a lot of worry, concern and even guilt to the growing adolescent. He needs reassurance at such a time and needs to be told that he is normal and that this phenomenon is perfectly natural. He has not done anything wrong – nor is he dirty! You will learn more about this phenomenon in a later session.

**Figure 1.2: Stages of Puberty in boys**

**Figure 1.3: Hairline of scalp in children, adolescent girls and adolescent boys**

### 1.4.4 Secondary Sexual Characteristic in Girls

- **Breasts develop:** This is the first sign that develops in a girl indicating that she has entered puberty. The growth spurt comes later. Breast development begins as a ‘breast bud’ (Stage 2 of breast development.). Slowly, with the
development of the glandular tissue and deposition of fat, this breast typically assumes its adult shape (Stage 5 of breast development). There may be a difference in the size of the breasts as they are developing, but this usually resolves by the time development is complete. However, most girls do have a difference in the size of their breasts even though it may be visible only to them! Size of the breast does not affect the function i.e., lactation (production of milk); or we can say that even if size of two breast is different that also is normal as functionally they are same. It is normal for breasts to start growing as early as nine years of age and it is also normal if they do not begin growing until 14 years of age.

- **Hips widen, waistline narrows:** As the adolescent girl’s body is growing, the skeleton is assuming its adult shape and the hips widen because the pelvic bone widens to provide a wider birth canal. The fat deposited on the hips further widen the hips. Progressive differences in fat distribution as well as sex differences in local skeletal growth contribute to the typical female body shape by the end of puberty. Fat tissue increases to a greater percentage of the body composition than in males, and assumes the typical female distribution of breasts, hips, buttocks, thighs, upper arms, and pubis.

- **Pubic hair, underarm hair appears:** Following the appearance of the breast bud, pubic hair start developing and then the hair in the underarm also appear. These hair are initially soft but gradually darken and become coarser. It usually grows in a triangle shape with the apex pointing down. However, in some women it may grow upward towards the navel as is seen in the male pattern.

- **Uterus and ovaries enlarge:** These changes are taking place inside the body and are therefore not visible changes.

- **Ovulation occurs, menstruation begins:** The beginning of menstruation – menarche – indicates the puberty has been attained in a girl. This is an indication that a girl is now sexually mature and can conceive a baby. However, her body in adolescence is not as yet ready for this and conception should not occur at this age. Moreover, it is important to remember that a girl can become pregnant even if she has not had her first menstrual period as ovulation occurs about 14 days before menstruation.. You will be learning about the menstrual cycle, menstrual hygiene and conception in Block-3 of theory course, where this will be explained in detail.

Development in girls is seen sequentially as the following:

i) appearance of breast bud

ii) development of pubic hair

iii) peak growth velocity

iv) further development of breast and growth of pubic hair and hair in underarms

v) menarche
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Figure 1.4: Stages of Puberty in girls

Understanding that menstruation is normal and managing herself during that period are early initial issues that cause concern and worry in the mind of the young girl. Added to that, there are many social restrictions attached to menstruation that cause the girl to feel unclean and impure. She needs reassurance at this time and has to be told that she is perfectly normal! and shall feel empowered to live normal life.

Figure 1.5: Age vs Height in girls
The rapid growth that takes place in both boys and girls during adolescence leads to certain ‘body image’ issues. Body image is the way one perceives one’s body. The sudden changes that the adolescents undergo makes them acutely conscious of their bodies. Adolescents will more often than not feel dissatisfied with their bodies. They suffer from poor body image and this can lead to a number of problems e.g. eating disorders, depression and suicide, violence, risk taking behaviour, substance abuse and a poor self-concept. Since growth is not proportional there is a stage where the adolescent starts appearing awkward. Added to that, seeing the other children around oneself growing at different speeds also adds to the problem. This leads to a poor body image. The consequences of this are undesirable. Some of the issues which really trouble the adolescent boys are discussed in the following content.

Issues troubling boys:

1) Built – The current trend of having a well built, muscular body puts a lot of pressure on the young adolescent. If he feels he does not have a muscular body, he has poor body image lead to self-esteem.
2) Genitals – Small genitals seem to indicate less masculinity.
3) Height – A short boy feels inferior to his taller peers.
4) Body Hair – Lack of body hair make a boy feel less manly.
5) Acne and skin problems.
6) Weight – Being underweight or overweight is associated with a lack of attractiveness
7) Spectacle wearing.
8) Specific areas of the body may cause concern to different people e.g., nose, hands, buttocks.

Similarly, the issues which may be troubling to girls are discussed below:

1) Body weight – The ‘size zero’ phenomenon makes girls desire to lose weight.
2) General attractiveness.
3) Breast size – Small breasts seem to indicate a lack of feminity.
4) Complexion – ‘Fair’ is beautiful. Most girls will spend time and money trying to become fair.
5) Body hair – The appearance of hair in the underarms, the darkening and coarsening of body hair become a cause of concern.
6) Acne, blemishes are serious concerns for girls.
7) Spectacles.
8) Problems related to specific areas, e.g., legs, thighs, buttocks, lips, etc.
9) Height – even being tall could be seen as a problem.

As you have seen pimples are a very common problem that occurs in both boys and girls as they are growing up and is one of the developments that causes a lot
of distress to them especially to girls. Pimples lead to poor body image and therefore a low self-esteem. In order to get rid of them, the adolescent will often try to burst them and this can only cause further problems. All they need is proper guidance and reassurance.

**Following are the tips that need to be done for pimples:**

- Wash the face with a mild soap and water twice a day. Wash in between with only water. A very vigorous washing may be harmful.
- Keep hair away from face. The oil in the hair may make the skin more oily and add to the problem.
- Keep hair clean. It may need to be washed more frequently.
- Keep nails trimmed and hands clean.
- Avoid unnecessary touching of the face.
- Do NOT break pimples.
- Drink plenty of water and eat fresh fruits and vegetables. Even though there are no foods that in particular cause pimples, some teenagers may have particular food allergies that may aggravate the pimples.
- Do not apply make up to hide the pimples – it only makes them worse.
- If the problem appears severe, medical treatment may also be required.

**Activity**

Make a collage of pictures of celebrity/leaders, who you may think have poor body image. Discuss does this any way hampered their progress to be the celebrity or leader.

**Check Your Progress 2**

a) State the primary changes that take place in boys and girls.

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b) What are the secondary sexual characteristics that differentiate a boy from a girl?

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**1.6 ROLE OF TEACHERS**

As teacher, you can fulfill a very important role of providing the correct information to your students and helping them out with their confusion. The adolescent age is one filled with doubts and confusion, and you as a teacher, can provide all the necessary information in a safe and secure environment. In our society, adolescents
are very often unable to ask their parents for any kind of information on their bodies and if a teacher is approachable, they will be able to get correct information.

Growing up brings with it a number of ‘body image’ issues. Adolescents will more often than not feel dissatisfied with their bodies. They suffer from poor body image and this can lead to a number of problems and a poor self-concept. They need to be reassured constantly and as a teacher you can help out to a large extent. A class of growing adolescents will have the students at different stages of growth – some would look more grown up while a few may still be appearing as children. A teacher can help in creating a comfortable environment for all the students by being accepting and explaining to the class that this is a normal part of growing up. Very often students make fun of each other, sometimes they may even bully each other. If the teacher creates a safe environment in the classroom, it will help in preventing such incidences.

The following are some ways in which you as a teacher can help them in tackling poor body image:

1) **Enhance self-esteem:** The positive points of the adolescent should be highlighted to her/him and s/he should be motivated to concentrate on personal strengths not related to physique, e.g., hard work, determination, patience, courage, etc.

2) **Build up critical thinking:** Is physical beauty/muscles the only criteria for success/popularity? Even film stars have to work very hard to make a movie. Many successful and famous people may not have been very good looking.

   Deconstruct advertisements for beauty aids, weight reducing centers, etc.

   Once they are able to see the marketing strategies behind such advertisements they are likely to cope better with the pressures.

### Activity

Rashmi is a bright young girl, who always scores good marks in academics. Recently she has gained lot of weight and her friends now call her “Fat”. She has lost interest in studies and slowly getting addicted to television and her studies are falling too. Discuss the body image issues of rashmi.

3) **Build up positive aspects:** Everyone has some positive points. These should be developed and highlighted, e.g., sports, studies, music, art, etc.

4) **Explain cultural variation:** The colour of skin and shape of body vary from country to country and even within a country from state to state. The definition of “beauty” also varies from region to region. In Africa, fair skin is not appreciated.

5) **Correct the myths:**

   “Being thin is in”

   “Protein supplements for body building are healthy”

   “Fair & Lovely” & “Fair & Handsome”

6) **Utilize cultural /religion symbols:** Many gods and religious heads are
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dark complexioned, e.g., Lord Krishna. Sachin Tendulkar, a role model for many teens, is not very tall and yet is looked up to by the whole world; Michael Johnson, the fastest runner and winner of four Olympic gold medals, is a dark complexioned man; film stars in our country – Bipasha Basu, Rani Mukherji, Kajol, are not fair complexioned. The physical self does not determine the success of a person.

7) **Utilization of life skills:** Life skills like critical thinking, self-awareness, refusal skills and negotiation skills are useful to prevent them from getting anxious about their bodies. They can be utilized to promote or develop a positive body image.

Teachers also need to see that the school time table is made in a way that a healthy balance is maintained between studies as well as sports. If play time is included as a compulsory part of the day’s routine, even those teens who avoid physical activity, will necessarily have to take part in outdoor activities. As you will remember from the previous discussion, exercise has a beneficial effect on the adolescent’s health.

All the above would make it very clear to you that your role in helping a teenager grow up as a happy and healthy individual is of major importance.

### 1.7 ROLE OF PARENTS

It is important as a parent to know the various changes that will take place in your adolescent as s/he grows up to become an adult. Information, provided at the right time, from a reliable source, can be of great help to the growing adolescent. It is also important to keep all channels of communication open with your children so that they may approach you with their various queries. It is only when children do not know from where to get the information they need that they approach other sources – usually peers – who are as unaware of things as they themselves are.

Two very significant changes that take place in the growing adolescent are onset of menstruation in girls and nocturnal emissions in boys. If they have been prepared for this by the parents, and these are accepted very normally by the parents, the adolescent would grow up in a more secure environment.

The appearance of pimples is also a very troublesome part of growing up. The tips mentioned in a previous section above are very useful for tackling this issue.

As it is very clear from the session, correct and adequate nutrition at this age is very important for the rapidly growing adolescent. It is a parent’s duty to see to it that the teen gets what his/her body needs at this time. Keeping meal times as family times often helps in providing the correct nutrition to the adolescent. In addition to nutrition, adolescents also need sufficient amount of exercise. As has been discussed before, growth hormone secretion increases with exercise. Thus an adequate amount of time should be devoted to outdoor activities that may include play or involvement with any active sports. As this is also a time for the adolescent to be appearing for various exams, often parents tend to make the teen put in many hours of study to perform well. This then leaves little time for exercise which is unhealthy. A balance needs to be made between study, rest, as well as exercise.
Accepting your adolescent as s/he is, taking care of his/her nutritional needs, rest, exercise, and providing unconditional love are very important things that are the responsibility of any parent and the right of all adolescents.

1.8 LET US SUM UP

In this session you have learnt about the various physical changes that take place in the growing boys and girls that changes their appearance from children to adult men and women. You have also learnt that this occurs at different times for girls and boys and varies from child to child. All these variations are within a normal accepted range.

This unit must have helped you to identify your role as a teacher and parents to help adolescence.

1.9 KEY WORDS

**Puberty**: Process of physical changes by which a child’s body becomes an adult body capable of reproduction.

**Testosterone**: Male hormone

**Estrogen, progesterone**: Female hormone

**Lactation**: Production of milk

**Pelvis**: Hip bone

**Menarche**: First menstrual period

**Body image**: How a person feels about how she or he looks.

**Nocturnal emissions**: An involuntary ejaculation that occurs during sleep – also known as ‘wet dreams’ or ‘night emissions’.

1.10 ANSWER TO CHECK YOUR PROGRESS

Check Your Progress 1

a) The various factors influencing physical changes are hormones that begin to get produced at this age, nutrition, environment and genetics.

b) Effects of testosterone:

- Body hair distribution
- Effect on the voice
- Increased secretions by skin glands often leading to acne formation
- Muscle development and distribution
- Increased bone growth
- Increased metabolic rate
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- Increased production of red blood cells
- Increased size of penis and scrotum
- Production of sperms

Effects of estrogen:
- Body hair distribution
- Soft and smooth skin
- Increased fat deposition in the body
- Slight increase in metabolic rate
- Small increase in protein deposition
- Increased deposition of calcium in bones and increased bone growth
- Development of breast tissue
- Increase in size of all reproductive organs – internal as well as external
- Initiation of menstruation (menarche)

c) State True or False:
   i) False
   ii) True
   iii) True
   iv) True

Check Your Progress 2

a) The primary changes that take place in both the sexes are:

- **Growth spurt occurs**: The growth spurt occurs about two years later in boys than in girls. Approximately, 50% of body weight, and 25% of adult height are attained at puberty.

- **Overall increase in size of body parts**: The hands, face, legs, arms – all parts increase to attain adult size. However, the rate at which they increase is different due to which the adolescent often appears to be clumsy and disproportionate! However all this soon settles down.

- **Dental changes**: The jaw size enlarges, the ‘milk’ teeth fall and the permanent teeth appear. The complete set of permanent teeth erupt during adolescence. The ‘wisdom’ teeth or third molar appears towards the end of adolescence.

- **Skin becomes oily and pimply, the body sweats more and smells**: These are the effects of the hormone testosterone on the skin. This hormone is mainly responsible for the development of acne.

- **Appearance of body hair**: Hair appear in the pubic area, underarms, limbs, and face.
The remaining changes that take place are the distinguishing features that differentiate a boy and a girl.

b) The secondary sexual characters that differentiate a boy from a girl are:

**Boys:** The distribution of hair, breaking of voice, broadening of shoulders, development of muscles,

**Girls:** Body hair distribution, development of breasts, widening of pelvis, deposition of fat on hips and thighs, menstruation.

### 1.11 REFERENCES

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- William F. Ganong, *Review of Medical Physiology*
- Guyton and Hall, *Textbook of Medical Physiology*

**Web resources**

- [http://www.avert.org](http://www.avert.org)
- [http://www.collegejolt.com](http://www.collegejolt.com)
- [http://www.cincinnatichildrens.org/health/info/growth](http://www.cincinnatichildrens.org/health/info/growth)