



## **The Effects that the Following Hormones (Testosterone, Estrogen, and Progesterone) Have on the Human Body**

Curriculum Unit 88.05.04  
by Kathy René Harris

### **INTRODUCTION**

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This unit is designed for boys and girls in the six (6) thru eight (8) grade. These students will average between the ages of 11 to 15 years of age. It will take approximately three (3) to six (6) weeks to complete this unit of instruction.

The aim of this unit is to provide information about the effects that the following hormones (testosterone, estrogen, and progesterone) have on the human body.

The objectives throughout this unit will give the students an overall view of the identity of the following hormones (testosterone, estrogen, and progesterone) and how they work .

Hormones are chemical substances produced within animal or plant. All hormones in the human body are produced by endocrine, or ductless glands. The way in which these hormones work is related to their chemical structure.

Beginning at the age of about 10 to 14, young people go through a period of rapid growth and physical changes. Hormones control the development that occurs during this period, called puberty. Puberty is the period of rapid growth that marks the end of childhood and the beginning of physical and sexual maturity. In temperate climates, the age at which boys usually attain puberty is between 12 and 14 years; in girls, puberty is signaled by the beginning of the menses and occurs between the ages of 10 and 14. In warmer climates, puberty often occurs earlier, and in the Artic regions, one or two years later, However, the time of puberty varies from individual to individual.

Because of the fact that younger people today are reaching puberty at an early age, it is important that they know what is happening to their bodies.

Throughout this unit, the students will be able to develop a knowledge of understanding the responsibilities of the hormones responsible for these particular changes.

The students will study the pituitary gland. They will also study the responsibilities and functions of the anterior and posterior lobes of this particular gland

The students will then be introduced to several sex hormones of the male and female human body. The first sex hormone introduced is the study of testosterone. Provided throughout this unit is an introduction of this hormone and its effects on the male human body.

The study of the female sex hormones estrogen and progesterone will also be discussed. The students will study the effects that these two hormones have on the female human body.

Throughout this unit, I provided a diagram drawing of the male and female reproductive tract, the pituitary gland, and several other diagrams, to give the students a general overview of the identity of several organs that are affected by the three sex hormones (testosterone, estrogen, and progesterone).

This unit also consist of an outline of content, which presents the introduction of the pituitary gland, the male and female reproductive tracts, and the three sex hormones (testosterone, estrogen, and progesterone). Also included in the outline of content, I provided a list of vocabulary terms, clearly defined for the readers understanding, and a bibliography for the students and teachers.

In order to get the students involved in the lesson being taught, I presented initiatory activities such as, making attractive bulletin boards, demonstrations, study guides, books, and filmstrips.

To develop activities in which the students will perform, I used developmental activities such as, allowing students to perform several laboratory investigations, to develop a greater knowledge of understanding the lesson. This will give the students an overall study of hands-on-experiment.

To help summarize the lesson, I have developed culminating activities, such as, guest speakers, demonstrations, illustrations, textbooks, or other resource materials.

To evaluate the students level of comprehension of the lesson being taught, I used several evaluation techniques, such as, essay test, multiple choice test, true and false test, and skill test.

This unit consist of a variety of behavioral objectives, which will give the teachers a general overview of the students performance level throughout the lessons being taught. These objectives are presented in three different domains. They are as follows: cognitive, affective, and psychomotor.

To begin the teaching of this unit, I provided daily lesson plans, which will clearly define the objectives for each day.

The instructional procedures used in the daily lessons 'will consist of roll call, introduction of subject to be taught, class discussions, class assignments, homework assignments, a mention of lesson for the next day, and class dismissal.

In conclusion, this unit can be used as a basic tool of learning more about the effects that the sex hormones have on the human body. It will answer some of the questions and solve basic problems that young people today are having, in regards to physical and sexual changes in their young bodies.

## **Behavioral Objectives@4H(afterH):Cognitive After studying the definition of testosterone, estrogen, and progesterone, the students will have a brief understanding of its meaning.**

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After studying the basic concepts of testosterone, estrogen, and progesterone, the students will clearly understand its effects on the human body.

### ***Affective During the course of this month's study, the students will show appreciation for the research studied throughout this unit.***

During the course of this month's study, the students will combine research studies and give an overall generalization of the subject.

### ***Psychomotor The students will perform several laboratory investigations on the functions of the three sex hormones (testosterone, estrogen, and progesterone).***

The students will perform several laboratory investigations on the study of the effects that the three sex hormones (testosterone, estrogen, and progesterone) have on the human body, for a quality of points.

## **Outline Of Content**

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### **Content:**

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- I. Pituitary Gland
- II. Testosterone
- III. Male Reproductive Tract
- IV. Estrogen
- V. Progesterone
- VI. Female Reproductive Tract
- VII. Vocabulary
- VIII. Bibliography

## Content (Highlights)

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- I. Pituitary Gland
  - A. Anterior pituitary
  - B. Posterior pituitary
- II. Testosterone
- III. Male Reproductive Tract
  - A. The testes
  - B. The scrotum
  - C. The ductus deferens
  - D. The seminal vesicles
  - E. The prostate gland
  - F. The penis
- IV. Estrogen
- V. Progesterone
- VI. Female Reproductive Tract
  - A. The ovaries
  - B. The uterine (fallopian) tubes, or oviducts
  - C. The uterus or womb
  - D. The vagina
- VII. Vocabulary
- VIII. Bibliography

(figure available in print form)

## **PITUITARY GLAND**

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To begin with, the students will study the responsibilities and functions of the pituitary gland. The pituitary gland is one of the body's most important glands. It is a small oval structure which is attached to the base of the brain by a slender stalk. It consist of two lobes; the anterior and posterior.

### **ANTERIOR PITUITARY**

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The anterior lobe is called the adenohypophysis because of its glandular nature. Structurally, the anterior lobe consists of irregular cords, or nest, of large, polyhedral cells supported by delicate reticular fibers; sinusoids (capillary-like blood vessels) lie between the nests of cells (Fig. 1-0). There are relatively few nerve endings in this part of the pituitary gland. This gland secretes a number of hormones, which control a wide range of the body functions. Four of these hormones control the secretions of other hormone producing glands. The four hormones and the glands they control are: adrenocorticotrop hormone (ACTH), the adrenal glands; follicle-stimulating hormones (FSH) and luterizing hormone (LH), the sex glands; and thyroid stimulating hormone (TSH), the thyroid gland. The pituitary is often called the master gland of the endocrine system because of the great number of functions regulated by its hormones.

### **POSTERIOR PITUITARY**

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The posterior lobe of the pituitary is an outgrowth of the hypothalamus; it is called the neurohypophysis because it is derived from the nervous system. Thousands of axons descend into this lobe from cell bodies located in the hypothalamus. Capillary networks are found near the endings of the nerve fibers. The posterior lobe of the pituitary gland stores two hormones, antidiuretic hormone (ADH, also called vasopressin) and oxytocin. The hypothalamus manufactures and triggers the release of both these hormones. Antidiuretic hormones causes the kidneys to retain sufficient water for the body. Oxytocin causes the uterus to contract during childbirth and stimulates the release of milk during nursing.

## **TESTOSTERONE**

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Testosterone is a hormone that stimulates sexual development in male human beings. It is primarily responsible for maintenance of the male reproductive system. It belongs to a family of hormones called androgens. Androgens

are produced primarily by the testicles, a pair of male sex glands. The ovaries in females and the adrenal glands in both sexes also yield small amounts of testosterone and other androgens. Testosterone is a steroid compound, which also promotes masculinization.

During a boy's early teenage years, his testicles are stimulated by a hormone from the pituitary gland (LH and

FSH) to secrete increasing amounts of testosterone, particularly during sleep. Testosterone enters the blood and acts on certain tissues in the body to cause various physical changes. These changes include growth of hair on 'the face and in the genital area, muscle development, deepening of the voice, and maturation of the sex organs.

Testosterone, and pituitary FSH also helps in the reproduction of sperm by the testicles. After a man reaches old age, the testicles produce smaller amounts of testosterone.

## **MALE REPRODUCTIVE TRACT**

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The male reproductive tract, which delivers sperm to the female in a vehicle (semen) conducive to sperm viability, can be divided into a sequence of ducts and three major secretory glands. Moving from testes to penis, sperm pass through the epididymis, ductus (or vas) deferens, ejaculatory duct, and urethra (Fig. 1-1). The major accessory sex glands, which provide most of the semen, are the seminal vesicles, prostate, and bulbourethral gland. These organs include two testes that produce spermatozoa and ejaculatory ducts, epididymides (singular epididymis), bulbourethral (Cowper's <sup>1</sup>) glands, as well as the following single structures: the prostate gland, the penis, the urethra, and the scrotum.

## **THE TESTES**

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The testes are two glandular organs suspended from the inguinal region by the spermatic cord. The spermatic cord is made up of sheets of fascia derived from the abdominal muscles and contains the ductus or vas deferens, spermatic artery and veins, lymph vessels, and autonomic nerve fibers. Each testes is about the shape and size of a small egg and is attached to an overlying structure called the epididymis. It is covered by fibrous tissues which sends incomplete partitions into the central portion of the gland, dividing it into communicating cavities. In these cavities are winding tubules surrounded by blood vessels and supported by interstitial tissue. The seminiferous tubules provide for production of spermatozoa, and the interstitial or Leydig cells produce testosterone. These tubules intertwine and join together in a meshwork of exiting small ducts called the rete testis and finally all unite in the epididymis.

The epididymides are long bilateral narrow bodies that lie upon the superior portions of the testes and are composed of 15 to 20 tortuous tubules which eventually open into a single convoluted tubule. These tubules contain smooth muscle cells in their walls and are lined with mucous membrane, They connect the testes with the seminal ducts and serve as areas for final maturation of the spermatozoa.

*(figure available in print form)*

*FIGURE 1-1. MALE REPRODUCTIVE TRACT*

## THE SCROTUM

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The scrotum is a thin pouch of skin, muscles, and fascia that contains and supports the testes, the epididymides, and parts of the spermatic cords. The smooth-muscle layer of the scrotum that is covered by a thin layer of skin disposed in folds or rugae is called the dartos muscle. It contracts reflexly with the cord to raise the testes closer to body warmth. The tissues of the scrotum are continuous with those of the groin and perineum.

## THE DUCTUS DEFERENS

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The ductus deferens, which are bilateral continuations of the epididymides, are important storage sites for spermatozoa and are excretory ducts of the testes. Each duct conveys the spermatozoa along a devious course, from the scrotum through the layers of the inguinal ligament known as the inguinal canal into the pelvic cavity, where eventually the duct joins with the duct of a seminal vesicles to form an ejaculatory duct.

## THE SEMINAL VESICLES

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These are two membranous pouches located posterior to the bladder, between this organ and the rectum. Recently it has been shown that the seminal vesicles produce secretions containing fructose, amino acids, mucus, and small amounts of some vitamins. During ejaculation, these substances are added to the semen at the time spermatozoa are transported to the ejaculatory ducts from the vas deferens. The fructose and other substances contained in the seminal fluid provide nutrients and protection for the spermatozoa. All the various secretions added to the semen increase its bulk.

## THE PROSTATE GLAND

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The prostate gland is situated immediately inferior to the bladder and internal urethral orifice, It surrounds the first portion of the urethra, referred to as the prostatic urethra, and is comparable to a chestnut in shape, size, and consistency. The prostate is covered by a dense fibrous capsule and consists of glandular units surrounded by fibromuscular tissue that contracts only during ejaculation. The glandular tissue consists of tubules which communicate with the urethra by minute orifices, The function of the prostate gland is to secrete a thin, milky alkaline fluid that enhance spermatic motility.

## THE PENIS

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The penis, or organ of copulation of the male, is a short, cylindrical, pendulous body that is suspended from the front and sides of the pubic arch. It is composed of three cylindrical masses of cavernous erectile tissue bound together by fibrous strands and covered with skin. The lateral two masses are known as the corpora cavernosa penis. The third, known as the corpus cavernosum urethrae or spongiosum, makes up the ventral surface and contains the urethra.

At the end of the penis there is a slight enlargement known as the glans penis that contains the external urethral orifice (meatus) and the sensory end organs that are stimulated during sexual intercourse. These end organs convey impulses to the spinal cord via the pudendal nerves. Their endings synapse on the sacral preganglionic cell bodies of the parasympathetic nervous system to produce erection and upon preganglionic cell bodies of the sympathetic nervous system to produce emission of the semen.

## **ESTROGEN**

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Estrogen is any of a group of chemical similar hormones that causes the growth and development of female sexual characteristics in human beings and other animals.

In the human body, estrogens and all other steroids are manufactured from cholesterol. Estrogens are used to treat menopausal disturbances, certain vaginal inflammation, menstrual disorders, and cases of engorgement of the breast following pregnancy. They have also been used with some success in the treatment of cancer of the prostate and breast.

During a girl's preteen or early teenage years, her ovaries begin to secrete increasing amounts of estrogens into the bloodstream. Estrogen cause the girl to develop breast, rounded hips, and cause the ovaries and genital organs to enlarge and mature. Estrogens also stimulate the lining of the uterus to thicken. The uterine lining is shed during menstruation each month. The amount of estrogen secreted by the ovaries changes during the menstrual cycle.

As the women grows older, her ovaries secrete smaller amounts of estrogens. After the level of estrogens in the blood becomes too low to stimulate the uterine lining, menstruation no longer occurs. The women is then said to be in menopause. Estrogens are also produced in the adrenal glands and the male sex glands. The function of estrogens in male is unclear.

## **PROGESTERONE**

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Progesterone is a hormone produced mainly by the ovaries and the placenta in female animals during the period when they are able to bear young. This hormone can also be produced by the adrenal glands in both the females and males by the testes in males. It plays an important role in the normal menstrual cycle and in pregnancy. When the egg leaves its follicle in the ovary, the follicle is transformed into the corpus luteum. The corpus luteum manufactures progesterone, apparently from cholesterol. Progesterone then acts upon the uterine lining, which has already been primed by the female sex hormone, estrogen, in preparation for the egg. If the egg is not fertilized, progesterone production ceases, menstruation occurs, and the corpus luteum degenerates; if the egg is fertilized, the corpus luteum continues to secrete progesterone. This maintains pregnancy, prevents egg from maturing in ovary, inhibits menstruation, and stimulates growth of the breasts. Later in pregnancy progesterone manufacture is taken over by placenta, the structure through which the developing fetus receives nutrition.

Physicians use progesterone as a drug to treat disorders of the reproductive system, such as premenstrual tension, infertility, and miscarriage. Synthetic forms of progesterone are used alone and in combination with



synthetic estrogen in birth control pills.

## **FEMALE REPRODUCTIVE TRACT**

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The female reproductive tract (Fig. 1-2) consists of two oviducts, the uterus and cervix, the vagina, and the external genitalia. The oviducts (or fallopian tubes), which connect the ovaries to the uterus, can be divided into three segments. The most lateral part is the fimbriated infundibulum, which picks up the mature ovum when it leaves the ovary. Next is the ampulla, which is the site of fertilization; it leads into the isthmus, a relatively short straight tube running into the uterus. In cross-section, the oviduct consists of an outer layer of smooth muscle and an inner mucosal lining. Two types of epithelial cells are evident on the inner surface of the oviduct: ciliated epithelia, which beat toward the uterus, and secretory epithelia. These cells are thought to aid in the transport and nourishment of the ovum and fertilized embryo.

*(figure available in print form)*

FIGURE 1-2. FEMALE REPRODUCTIVE TRACT

## **THE OVARIES**

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The ovaries produce the ova and the sex hormone, progesterone and estrogen. Each ovary is a slightly flattened, almond-shaped body measuring from 1.5 to 3cm in width and about 8mm in depth. One is located on each side of the side of the pelvis, lateral to the uterus, inferior to the uterine tube, and attached to the posterior surface of the broad ligament. The broad ligament is a reflection of the peritoneum that supports the uterus laterally to the pelvis wall. Each ovary is attached to the lateral angle of the uterus by a short ovarian ligament, and to the tubal end of the uterine tube by the largest of the fringelike processes of the tubal fimbriated extremity, the ovarial fimbria.

## **THE UTERINE (FALLOPIAN) TUBES, OR OVIDUCTS**

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These are bilateral muscular ducts, lined with mucosa containing ciliated epithelium, that pass from the upper angles of the uterus in a somewhat tortuous course between the folds and along the superior margin of the broad ligament toward the sides of the pelvis. They are about 4 in. long, and the margin of the dilated end, or ampulla, is surrounded by a number of fringelike processes called fimbriae.

The functions of the uterine tubes are to convey the ova from the ovaries to the uterus, to aid in the upward passage of the spermatozoa, and to provide circular folds within which the ovum is nourished and delayed of the elapse between fertilization and implantation so that the uterine wall will be properly prepared for growth and development of the embryo.

## THE UTERUS OR WOMB

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The uterus is a hollow, thick-walled, pear-shaped muscular organ about 3in. long, situated in the pelvis cavity between the rectum and the bladder. Three parts of the uterus can be distinguished: (1) the body, or corpus uteri, with its superior expanded portion called the fundus extending above the entrance of the uterine tubes; (2) the isthmus, or middle, slightly constricted portion; and (3) the cervix, or cylindrical lower part, that surround the cervical canal and projects into the vagina. The short (2.5-cm) cervical canal extends from the internal orifice, or os, of the uterus to the external os at the termination of the cervix.

The cavity of the uterus is small because of the thickness of its walls. The part of the cavity within the body is triangular and has three openings, one very small one at each upper angle communicating with the fallopian tubes, and the third, the internal os, opening into the cervical canal. The uterus is the organ of the reproductive tract in which the embryo grows and develops until the time of delivery.

## THE VAGINA

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The vagina is a fibromuscular tube, 7.5 to 10cm in length, situated anterior to the rectum and anal canal and posterior to the bladder and urethra. It is parallel to the direction of the urethra; that is to say, it is directed upward and backward. It is the organ of copulation, for the deposition of semen in the female, and during parturition it serves as the exit from the uterus. The cervix projects into the vault of the vagina, and the vaginal recesses are formed around it. These recesses are known as the anterior, posterior, and lateral fornices (singular, fornix).

The vaginal wall consist of fascial, muscular, and mucous coats. The mucous coat is composed of stratified squamous epithelium with glycogen stored within its cells. Estrogen secretion during the menstrual cycle and pregnancy seems to cause an increase in glycogen stores and keratinization of the surface epithelium. The inner surface of mucous membrane is thrown into two longitudinal folds and transverse folds, or rugae. The circular and longitudinal smooth-muscle layers hypertrophy during pregnancy, and these layers, together with the rugae of the mucous coat and the interstitial elastic connective tissue, allow for extreme distensibility of the canal during parturition.

The vagina normally has a pH of between 4 and 6. This acidic environment impedes the growth of microorganisms and thus functions to prevent infection of the pelvic organs. The mucus that lubricates the vagina originates from the glands of the cervix. This mucus is acidified by the fermenting action of the vaginal bacteria, mainly lactobacilli, upon the glycogen from the vaginal epithelium. Striated muscle fibers form a ring-shaped sphincter around the introitus, or external orifice of the vagina. This opening may be partially occluded in the virgin by a fold of mucous membrane containing squamous epithelium with a thin connective tissue core called the hymen.

*FIGURE 1-3. ILLUSTRATION OF FSH/LH/TESTOSTERONE*

*(figure available in print form)*

*FIGURE 1-4. ILLUSTRATION OF FSH/LH/-P/E 2*

*(figure available in print form)*

## Vocabulary

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adrenocorticotropid hormone (ACTH)—stimulating the activity of the adrenal cortex.

androgens— any sex hormone, produced especially by the testes.

antidiuretic hormone (ADH)—causes the kidneys to retain sufficient water for the body.

ductus deferens—bilateral continuations of the epididymides.

estrogen—group of chemical similar hormones that causes the growth and development of female sexual characteristics.

follicle—stimulating hormone (FSH)—sex gland which stimulates development of ovarian follicles and the secretions of estrogen.

hormone—secretions produced by endocrine glands.

lutering hormone (LH)—sex gland which works with FSH in final stages of follicular growth.

ovaries—produce the ova and the sex hormone, progesterone and estrogen.

oxytocin—causes the uterus to contract during childbirth.

pituitary gland—a small oval structure which is attached to the base of the brain by a slender stalk.

penis—a short, cylindrical pendulous body that is suspended from the front and sides of the pubic arch.

progesterone—a hormone produced mainly by the ovaries and the placenta in female animals during the period when they are able to bear young.

prostate gland—surrounds the first portion of the urethra.

scrotum—a thin pouch of skin, muscle, and fascia that contains and supports the testes, the epididymides and parts of the spermatic cord.

semen—the fluid containing the male reproductive cells that fertilize the female ova.

seminal vesicles—two membranous pouches located posterior to the bladder, between this organ and the rectum.

testes—two glandular organs suspended from the inguinal region by the spermatic cord.

testosterone—a hormone that stimulates sexual development in male human beings.

thyroid stimulating hormone (TSH)—regulates the growth and secretory activity of the thyroid gland.

uterine (fallopian) tubes—bilateral muscular ducts, lined with mucosa containing ciliated epithelium.

vagina—a fibromuscular tube, 7.5 to 10cm in length.

THE TYPE OF TEST THAT WILL BE USED TO EVALUATE THE STUDENTS

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MULTIPLE CHOICE TEST

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ESSAY TEST

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TRUE OR FALSE TEST

## Notes

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1. Williams Cowper, English anatomist (1666-1709).

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## Multiple Choice Test

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DIRECTIONS: Please choose the correct answer for each question below.

1. Which term below describes this definition? (The body's most important gland. A small oval structure which is attached to the base of the brain by a slender stalk.)
  - a. testosterone
  - b. pituitary gland
  - c. estrogen
  - d. progesterone
2. Which one of these concepts do not belong into the category of sex hormones?
  - a. estrogen
  - b. progesterone
  - c. hormone
  - d. testosterone
3. Which of the materials below do not belong in a science laboratory?
  - a. beaker
  - b. test tube
  - c. ruler
  - d. record player
4. All of the following are hormones discussed in this unit except;
  - a. testosterone
  - b. progesterone
  - c. estrogen
  - d. semen
5. Which organ below is not a female organ?
  - a. ovary
  - b. scrotum
  - c. vagina
  - d. uterine

## Essay Test

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DIRECTIONS: Write a complete statement when answering the essay questions below.

- A. Define and explain the role that testosterone play in the human body.
- B. Define and explain the role that estrogen play in the human body.
- C. Define and explain the role that progesterone play in the human body.

## True Or False Test

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DIRECTIONS: Please mark (T) if the statement is true and (F) if the statement is false.

- 1. Testosterone is the chief sex hormone.
- 2. Progesterone is the only sex hormone found in females.
- 3. Pituitary gland is the only sex hormone found in the human body.
- 4. The pituitary gland have two different lobes.
- 5. Scrotum is a female organ.
- 6. ACTH means, Androgens circulating thyroid hormones.
- 7. The vagina is an organ of the female.
- 8. A man has two ovaries.
- 9. The fallopian tubes are another name for uterine tubes.
- 10. Estrogens cause the kidneys to retain sufficient water for the body.

## Weekly Lesson Plans

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**Unit The Effects That The Following Hormones (testosterone, estrogen, and progesterone) Have On The Human Body.**

### **Objectives**

A. Cognitive: From the information given by the teacher, the students will gain a knowledge of understanding the effects that testosterone, estrogen, and progesterone have the human body.

B. Psychomotor: The students will listen and observe carefully while the teacher introduce the lesson being taught, After the introduction of the lesson, the students will perform several research activities which will give a clear understanding of the lesson.

C. Affective: During the course of this month's study, the students will show appreciation for the subject being taught.

## Instructional Procedures

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### **Monday**

Subject Matter	Procedure and Techniques
1. Roll Call	1. Names called in seating order.
2. Review (previous lesson)	2, Give analysis
3. Introduction of the pituitary gland the pituitary gland.	3. The teacher will introduce After the introduction of the pituitary gland, the students will make a generalization of its meaning
4. Assignment	4. Outline chapter for understanding.
5. Mention of Tuesday's lesson	
6. Class dismissal	

### **Tuesday**

Subject Matter	Procedure and Techniques
1. Roll Call	1. Names called in seating order.
2. Review (previous lesson)	2. Give analysis
3. Introduction of the	3. The teacher will introduce

- three sex hormones (testosterone, estrogen, and progesterone) the three sex hormones. After the introduction of these hormones, the students will make a generalization of the three sex hormones.
4. Assignment 4. The students will be able to answer several objective questions throughout the chapter, relating to the meaning of the three sex hormones.
  5. Mention of Wednesday's lesson
  6. Class Dismissal

Wednesday, Thursday, and Friday is not included

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