

NCERT Solutions for Class 12 Biology

Chapter 2 – Human Reproduction

1. Fill in the blanks:

- a. Humans reproduce. (asexually/sexually)
- b. Humans are. (oviparous/viviparous/ovoviviparous)
- c. Fertilization is in humans. (external/internal)
- d. Male and female gametes are. (diploid/haploid)
- e. Zygote is. (diploid/haploid)
- f. The process of release of the ovum from a mature follicle is called.
- g. Ovulation is induced by a hormone called the.
- h. The fusion of the male and the female gametes are called.
- i. Fertilization takes place in the.
- j. The zygote divides to form, which is implanted in the uterus.
- k. The structure which provides a vascular connection between the fetus and uterus is called

Ans:

- a. Humans reproduce sexually.
- b. Humans are viviparous.

- c. Fertilization is internal in humans.
- d. Male and female gametes are haploid.
- e. A zygote is diploid.
- f. The process of release of the ovum from a mature follicle is called ovulation.
- g. Ovulation is induced by a hormone called the luteinizing hormone.
- h. The fusion of the male and the female gametes is called fertilization.
- i. Fertilization takes place in the fallopian tube.
- j. The zygote divides to form a blastocyst, which is implanted in the uterus.
- k. The structure which provides a vascular connection between the foetus and uterus is called the placenta.

2. Draw a labeled diagram of the male reproductive system.

Ans:

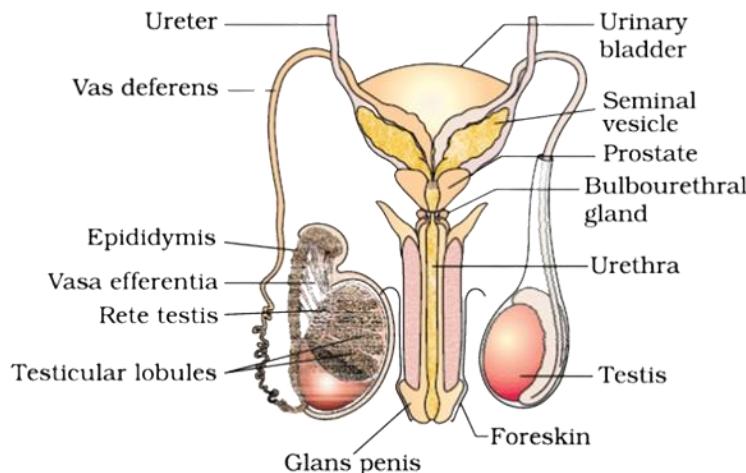


Image: Male Reproductive System, Image Credit NCERT

3. Draw a labeled diagram of the female reproductive system.

Ans:

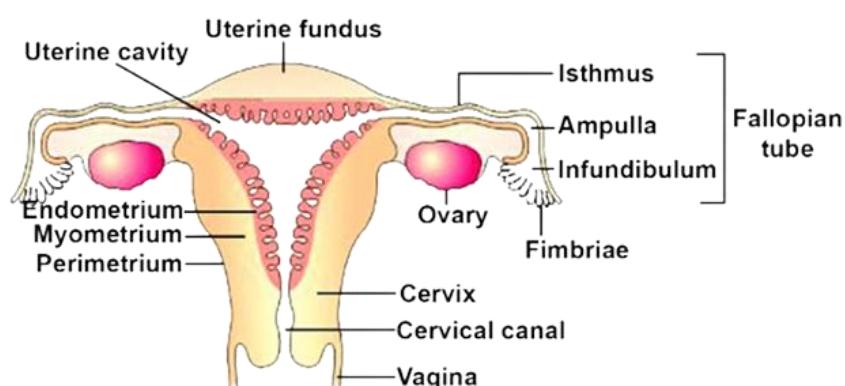


Image: Female Reproductive System

4. Write two major functions each of the testis and ovary.

Ans:

Functions of the Testis

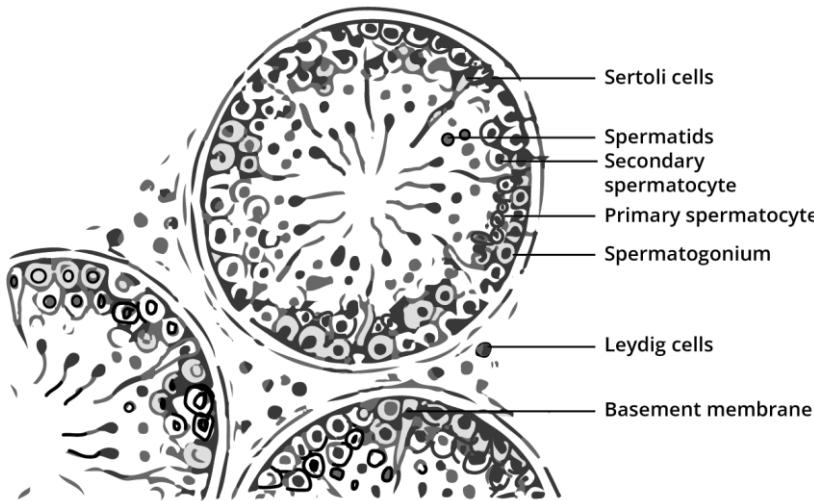
- Spermatozoa are produced by the process of spermatogenesis.
- Male hormone called testosterone is secreted by the Leydig cell of the seminiferous tubules.
- The development of secondary sex characteristics in males is done by a hormone called Testosterone.

Functions of the ovary

- By the process of oogenesis, the ovary produces a female gamete called ova.
- A female sex hormone called estrogen is secreted by the mature Graffian follicle. The development of secondary sex characteristics in females is done by a hormone called Estrogen.

5. Describe the structure of a seminiferous tubule.

Ans: Seminiferous tubules are a highly coiled structure where the production of sperms in the testes takes place. These tubules are located within the testicular lobules. The two types of cells namely spermatogonia and Sertoli cells are found in the germinal epithelial lining of seminiferous tubules. Spermatogonia produces primary spermatocytes by meiotic divisions which are male germ cells. Primary spermatocytes undergo further meiotic division to form secondary spermatocytes and eventually, spermatids. Spermatozoa are produced by the metamorphosis of the spermatids. Though the Sertoli cells provide nourishment to the germ cells, they are also referred to as nurse cells. The large polygonal cells known as interstitial cells or Leydig cells are present between the seminiferous tubules. Male hormone called testosterone is secreted by these cells.



Structure of Seminiferous Tubule

6. What is spermatogenesis? Briefly describe the process.

Ans: The production of sperms from the immature germ cells in males is referred to as spermatogenesis. It takes place in seminiferous tubules present inside the testes. During spermatogenesis, a diploid spermatogonium (male germ cell) increases its size to make a diploid primary spermatocyte. This diploid primary spermatocyte undergoes first meiotic division (meiosis I), which is a reductional division to form two equal haploid secondary spermatocytes. Each secondary spermatocyte then undergoes a second meiotic division (meiosis II) to form two equal haploid spermatids. Hence, four haploid spermatids are produced by a diploid spermatogonium. These spermatids by the process called spermatogenesis are transformed into spermatozoa (sperm).

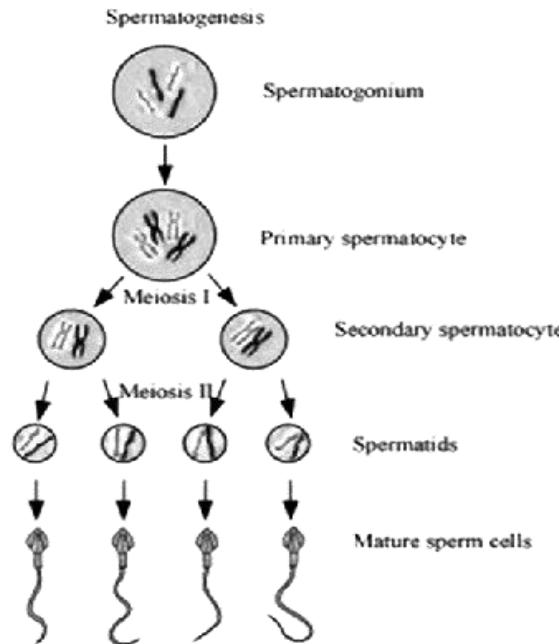


Image: Process of Spermatogenesis

7. Name the hormones involved in the regulation of spermatogenesis.

Ans: Gonadotropin-releasing hormones secrete Follicle-stimulating hormones (FSH) and luteinizing hormones (LH) from the hypothalamus. In the process of spermatogenesis, these hormones are required. FSH acts on Sertoli cells, whereas LH acts on Leydig cells of the testis and stimulates The method of spermatogenesis gets stimulated by FSH and LH.

8. Define spermiogenesis and spermiation.

Ans: Spermiogenesis

It is the process of changing spermatids into mature spermatozoa or sperms.

Spermiation

The releasing of sperms from the Sertoli cells into the lumen of seminiferous tubules is called spermiation.

9. Draw a labeled diagram of sperm.

Ans:

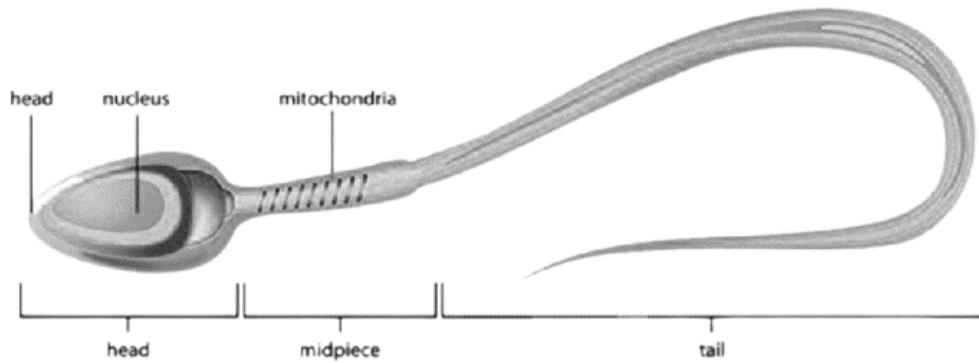


Image: Structure of Sperm

10. What are the major components of seminal plasma?

Ans: Semen is the alkaline fluid ejaculated by man. It consists of sperms and seminal plasma. In the male reproductive system, its major components are mucus, spermatozoa, and various secretions of accessory glands. For the sperm to be active, the seminal plasma also contains fructose, calcium, ascorbic acid, and certain enzymes. Thus, nourishment and protection to sperms are provided.

11. What are the major functions of male accessory ducts and glands?

Ans:

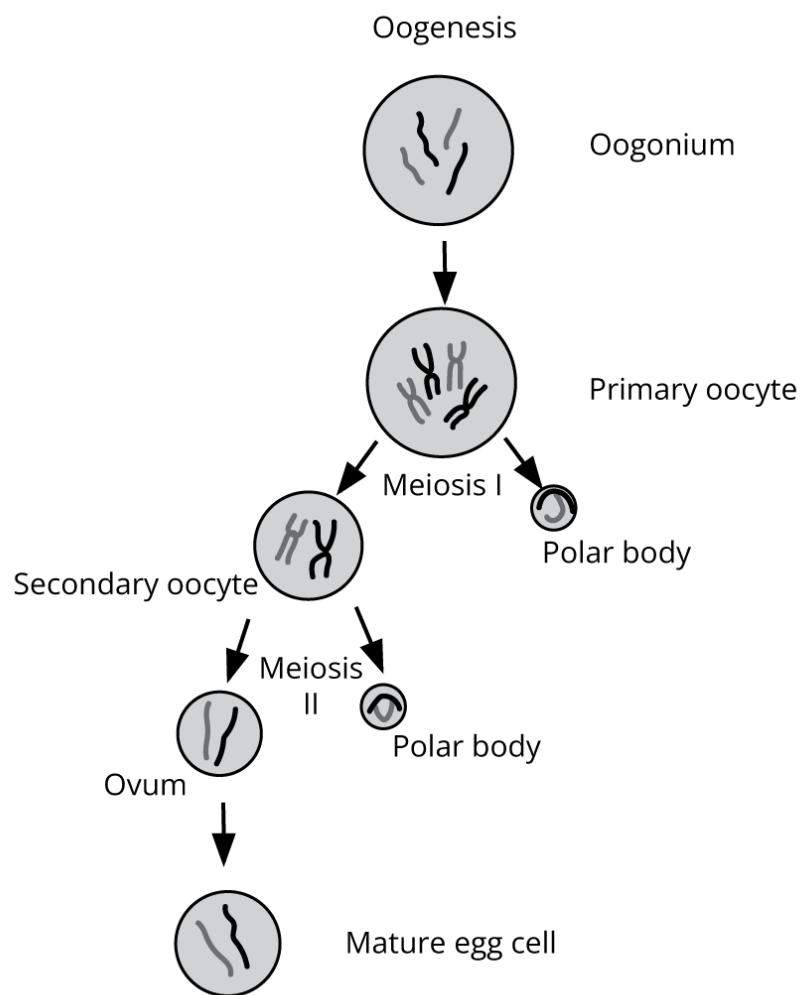
Male accessory ducts	Functions
Vasa Efferentia	Transport and temporary storage of sperms
Epididymis	Storage, maturation, and transport of sperm

Vasa deferentia	Transport of sperm
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Male accessory glands	Functions
Seminal vesicles	Secretion of fluids that nourish and activate sperm
Prostate gland	Secretion of seminal fluid, neutralises urine acidity, enhances sperm motility
Bulbourethral Cowper's glands	Secretion of lubricating fluid that enhances motility and neutralises the activity of acidic female vaginal secretions

12. What is oogenesis? Give a brief account of oogenesis.

- **Ans:** The formation of eggs or ova in the ovary is referred to as oogenesis. In this process, a diploid oogonium or egg mother cell size increases, and it gets transformed into a diploid primary oocyte.
- The diploid primary oocyte after attaining full growth undergoes first meiotic division i.e., meiosis I or reductional division to form two unequal haploid daughter cells.
- A very smaller cell is known as the first polar body or polocyte, while the larger cell is known as the secondary oocyte which contains the nucleus and entire cytoplasm with the yolk.
- The secondary oocyte undergoes a second meiotic division i.e., meiosis II or equational division, giving rise to a second polar body and an ovum.
- Thus, A single haploid ovum is produced by a diploid oogonium and also two or three polar bodies are produced in the entire process of Oogenesis.



Process of Oogenesis

13. Draw a labeled diagram of a section through the ovary.

Ans:

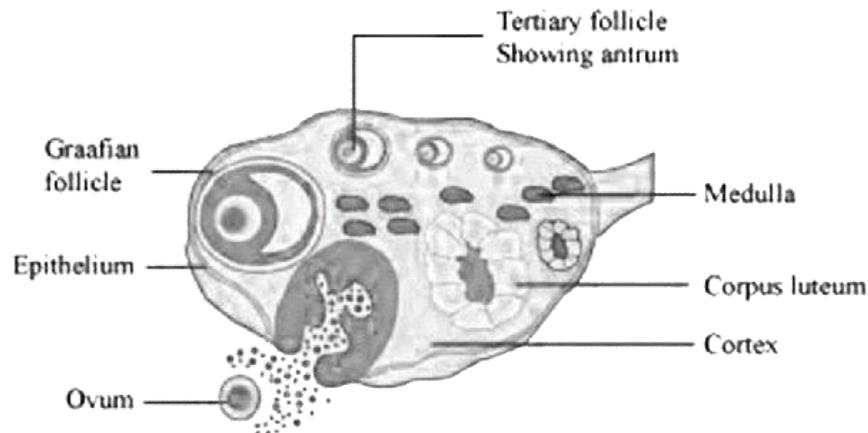


Image: Transverse Section of Ovary

14. Draw a labeled diagram of a Graafian Follicle?

Ans:

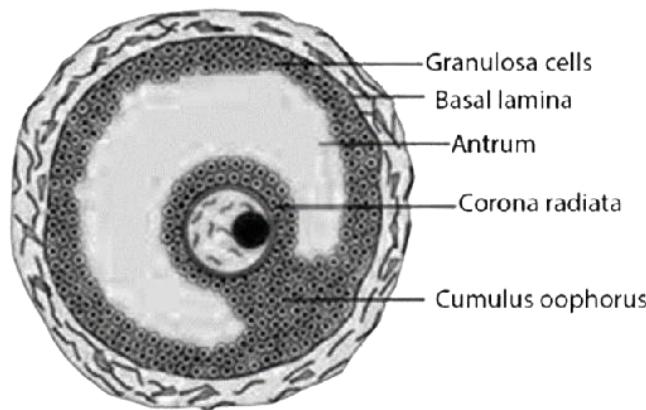


Image: Structure of Graafian Follicle

15. Name the functions of the following.

- a. Corpus luteum**
- b. Endometrium**
- c. Acrosome**
- d. Sperm tail**
- e. Fimbriae**

Ans:

(a) Corpus luteum:

The ruptured Graafian follicle gives rise to a structure called the Corpus luteum. A hormone Progesterone hormone during the luteal phase of the menstrual cycle. The increased amount of progesterone inhibits the secretions of FSH and LH, thereby preventing ovulation. The proliferation of the endometrium of the uterus and the process of implantation is also allowed by the corpus luteum.

(b) Endometrium:

The innermost lining of the uterus is the endometrium. It is removed during menstrual discharge each month in the menstrual cycle and thus it prepares itself for the implantation of the embryo.

(c) Acrosome:

In the sperm, there is a cap-like structure present in the anterior part called the acrosome. There is a presence of an enzyme called hyaluronidase enzyme, which hydrolyses the outer membrane of the egg. The acrosome secretes enzymes that help in the penetration of sperm into the egg by dissolving the egg membrane during fertilization.

(d) Sperm tail:

It is the region of the sperm which is several times longer than the head. The locomotion of the sperm is determined inside the female reproductive tract by the tail of the sperm.

(e) Fimbriae:

The finger-like projections at the ovarian end of the fallopian tube are called fimbriae. After the process of ovulation, they help in the collection of the ovum which is facilitated by the beating of the cilia.

16. Identify True/False statements. Correct each false statement to make it true.

- a. **Androgens are produced by Sertoli cells. (True/False)**
- b. **Spermatozoa get nutrition from Sertoli cells. (True/False)**
- c. **Leydig cells are found in the ovary. (True/False)**
- d. **Leydig cells synthesize androgens. (True/False)**
- e. **Oogenesis takes place in corpus luteum. (True/False)**
- f. **Menstrual cycle ceases during pregnancy. (True/False)**
- g. **Presence or absence of hymen is not a reliable indicator of virginity or sexual experience. (True/False)**

Ans:

(a) Androgens are produced by Sertoli cells. (False)

Androgens are produced by Leydig cells found in seminiferous tubules of the testis.

(b) Spermatozoa get nutrition from Sertoli cells. (True)

(c) Leydig cells are found in the ovary. (False)

Leydig cells are found in the seminiferous tubules of the testis.

(d) Leydig cells synthesize androgens. (True)

(e) Oogenesis takes place in corpus luteum. (False)

Oogenesis takes place in the ovary.

(f) Menstrual cycle ceases during pregnancy. (True)

(g) Presence or absence of the hymen is not a reliable indicator of virginity or sexual experience. (True)

17. What is the menstrual cycle? Which hormones regulate the menstrual cycle?

- **Ans:** The menstrual cycle is a rhythmic series of physiological changes in the sex organs that occur about 28 days throughout a woman's reproductive life. The end of the cycle is accompanied by the breakdown of the uterine endothelium, which gets released in the form of blood and mucus through the vagina. This is known as menses.
- The menstrual cycle is regulated by the follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone. The anterior pituitary gland secretes FSH and LH which increase during the follicular phase. A primary follicle is converted into a Graafian follicle by FSH under the influence of RH (releasing hormone).
- The secretion of LH increases gradually which results in the growth of follicles and secretion of estrogen.
- The secretion of FSH is inhibited by Estrogen and it stimulates the secretion of luteinizing hormone. It also causes the thickening of the uterine endometrium.
- The increased level of LH causes the rupturing of the Graafian follicle and releases the ovum into the fallopian tube. The ruptured Graafian follicle changes to the corpus luteum and starts secreting progesterone hormone during the luteal phase.
- Progesterone hormone helps in the maintenance and preparation of the endometrium for the implantation of the embryo. High levels of progesterone hormone in the blood decrease the secretion of LH and FSH, therefore inhibiting further ovulation.

18. What is parturition? Which hormones are involved in induction of parturition?

Ans: After the complete development of the foetus in the mother's womb, the process of giving birth to a newborn baby is called Parturition. Oxytocin and Relaxin are the two hormones required in this entire process. Oxytocin results in the contraction of smooth muscles of the myometrium of the uterus, which pushes the fully formed foetus towards the birth canal. On the opposite hand, the relaxin hormone causes there is relaxation of the pelvic ligaments by a hormone called relaxin and it thus prepares the uterus for childbirth.

19. In our society the women are often blamed for giving birth to daughters. Can you explain why this is not correct?

Ans: The number of chromosomes present in each individual is 23. 22 pairs of autosomes in and one or two types of sex chromosomes are present in males. They may be either X or Y. Whereas, 22 pairs of autosomes and only the X sex chromosome is found in females. The type of the male gamete (X or Y) during spermatogenesis determines the sex of an individual, which further fuses with the X chromosome containing the female's egg cell. If the fertilized sperm contains X, then the baby born will be a girl and if it contains Y, then the baby born will be a boy.

Thus, for the gender of the child, women should not be blamed.

20. How many eggs are released by a human ovary in a month? How many eggs do you think would have been released if the mother gave birth to identical twins? Would your answer change if the twins born were fraternal?

Ans: Every coming month, a single egg is released by the ovary. Twins are produced when two babies are in a sequence. Generally, a single egg gives rise to twins which are produced by the separation of early blastomeres, emerging from the first zygotic cleavage. Thus, there will be the same genetic make-up in the developed young ones and so, they are called identical twins.

Sometimes, twins born are fraternal, which means they would have developed from two separate eggs. This happens when at the same time two eggs (one from each ovary) are released and fertilization takes place by two separate sperms. Thus, the developed young ones will have separate genes and are, therefore, called non-identical or fraternal twins.

21. How many eggs do you think were released by the ovary of a female dog that gave birth to 6 puppies?

Ans: Dogs and rodents are poly-ovulatory species. More than one ovum is released from the ovary in these species at the time of ovulation. Therefore, Ovary released six eggs from a female dog to produce six puppies.