



NCERT Class 12 Biology Exercise Solutions

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 ovum from a mature follicle is called———— .
(g) Ovulation is induced by a hormone called———— .
(h) The fusion of male and female gametes is called———— .
(i) Fertilization takes place in———— .
(j) Zygote divides to form———— which is implanted in uterus.
(k) The structure which provides vascular connection between foetus and uterus is called———— .

Ans: (a) sexually

(b) viviparous

(c) internal

(d) haploid

(e) diploid

(f) ovulation

(g) LH (Luteinizing hormone)

(h) fertilization

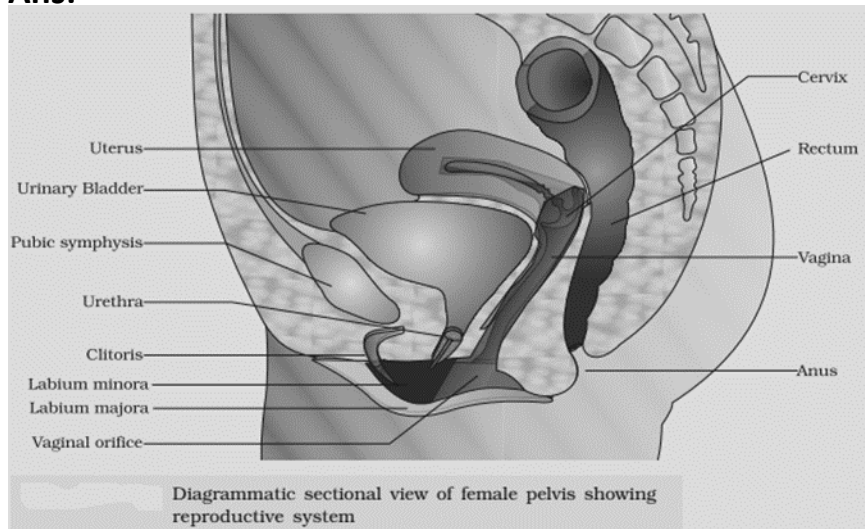
(i) ampullary-isthmic junction (fallopian tube)

(j) blastocyst

(k) placenta (Umbilical cord)

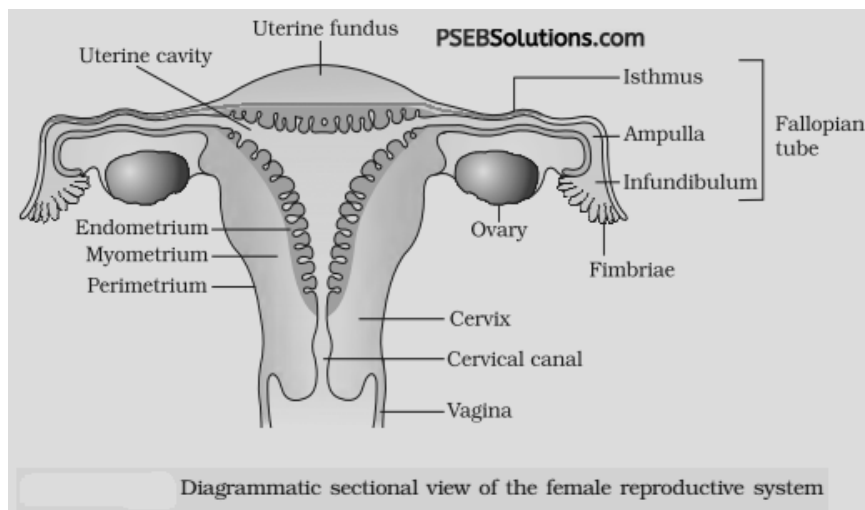
2. Draw a labelled diagram of male reproductive system.

Ans:



3. Draw a labelled diagram of female reproductive system.

Ans:



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

Ans: Two functions of testis and ovary are as follows:

Testis:

- The process of spermatogenesis produces sperms through the seminiferous tubules
- Testosterone, the male sex hormone, is secreted by the Leydig cells

Ovary:

- In the process of oogenesis, ovaries produce ova
- Progesterone and oestrogen, the female sex hormones, are secreted

5. Describe the structure of a seminiferous tubule.

Ans: The seminiferous tubule is a structural unit in the adult testis. The seminiferous tubules are situated in testicular lobules. Seminiferous tubule consists of two types of cells – Sertoli or supporting cells & spermatogenic cells. Sertoli cells, are elongated and pyramidal & partially envelop the spermatogenic cells. The cells provide nourishment to the developing spermatogenic cells. Spermatogenic cells are stacked in 4-8 layers. These cells divide several

times & differentiate to produce spermatozoa. Between seminiferous tubules lie the interstitial cells or leydig cells which produces testosterone hormone.

6. What is spermatogenesis? Briefly describe the process of spermatogenesis.

Ans: Spermatogenesis is the process by which sperm cells are produced in the testes of males. It is a continuous and highly regulated process that begins at puberty and continues throughout the reproductive years. The entire process takes place within the seminiferous tubules of the testes and involves several stages of cell division and differentiation. Here is a brief overview of spermatogenesis:

1. Spermatogonial Phase:

- Spermatogonia are undifferentiated cells that reside along the walls of the seminiferous tubules.
- At puberty, spermatogonia undergo mitotic division to produce more spermatogonia, ensuring a continuous supply of germ cells.
- Some spermatogonia differentiate into primary spermatocytes, marking the beginning of the actual process of sperm production.

2. Meiotic Phase:

- Primary spermatocytes undergo the first meiotic division (meiosis I) to produce two haploid secondary spermatocytes.
- Each secondary spermatocyte then undergoes the second meiotic division (meiosis II), resulting in four haploid spermatids.

3. Spermiogenesis:

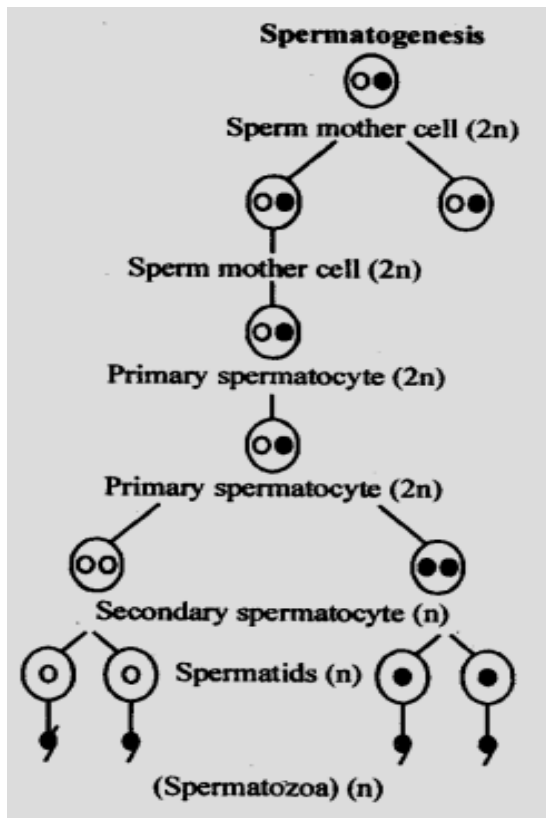
- Spermatids, which are round cells with a haploid set of chromosomes, undergo a series of structural changes known as spermiogenesis.
- During spermiogenesis, the spermatids develop into elongated sperm cells with a distinct head, midpiece, and tail.
- Unnecessary cellular components are shed, and the mature sperm cells are now called spermatozoa.

4. Sperm Maturation:

- The newly formed spermatozoa are not yet fully functional and must undergo further maturation.
- This maturation process occurs as the sperm cells move through the epididymis, a coiled tube connected to the testes, where they gain motility and acquire the ability to fertilize an egg.

5. Release of Sperm:

- Mature sperm are stored in the epididymis until ejaculation.
- During ejaculation, sperm travel through the vas deferens and mix with fluids from the seminal vesicles and prostate gland to form semen.



7. Name the hormones involved in regulation of spermatogenesis.

Ans: Some hormones involved in the regulation of spermatogenesis are as listed below:

- Luteinising hormone (LH) – It serves as Leydig cells triggering synthesis & secretion of androgens
- Gonadotrophin-releasing hormone (GnRH) – It is a hypothalamic hormone that is secreted at the age of puberty, acting at the anterior pituitary gland and stimulating the secretion of LH & FSH
- Follicle-stimulating hormone (FSH) – It acts on Sertoli cells, stimulating the secretion of factors which aid in the spermiogenesis process
- Androgens – It triggers inhibin production regulating the spermatogenesis process

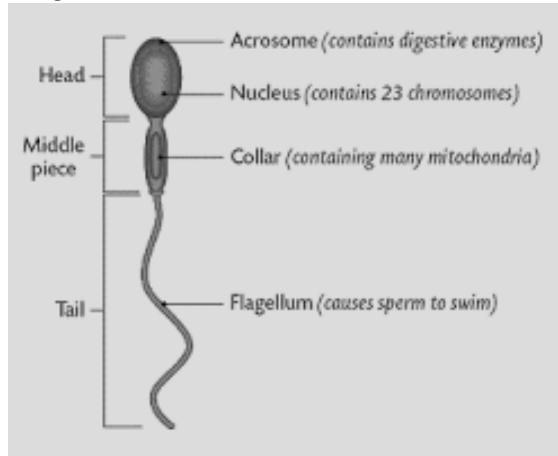
8. Define spermiogenesis and spermiation.

Ans: Spermiogenesis - Spermiogenesis is the final stage of spermatogenesis during which round spermatids, which are immature and non-motile cells with a haploid set of chromosomes, undergo a series of structural and functional changes to become mature, motile sperm cells or spermatozoa.

Spermiation - Spermiation is the process by which mature spermatozoa are released from the supportive Sertoli cells into the lumen of the seminiferous tubules in the testes.

9. Draw a labelled diagram of sperm.

Ans:



10. What are the major components of seminal plasma?

Ans: Seminal plasma is the fluid in which sperm is ejaculated. Major components of seminal plasma are secretions from seminal vesicles, prostate and bulbourethral gland and sperms from testis. It is rich in fructose and contains enzymes, citric acid, hormones like prostaglandins, calcium and clotting proteins.

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

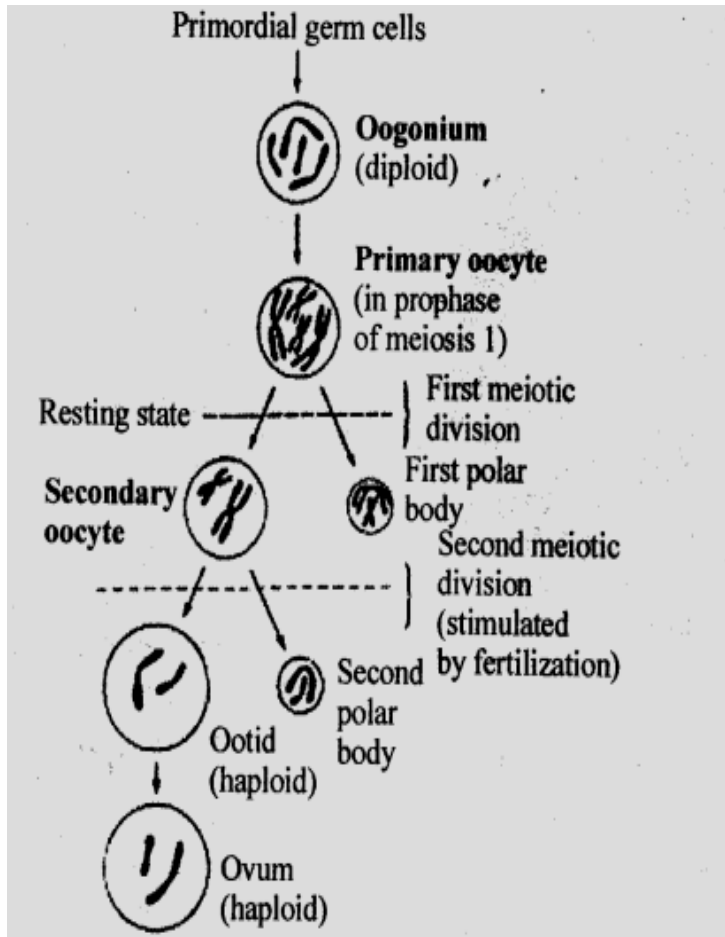
Ans: Male accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens. These ducts store and transport sperms from the testis to the outside through urethra. The male accessory glands include paired seminal vesicles, a prostate and paired bulbourethral glands. Secretions of these glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. The secretions of bulbourethral glands also helps in the lubrication of the penis.

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

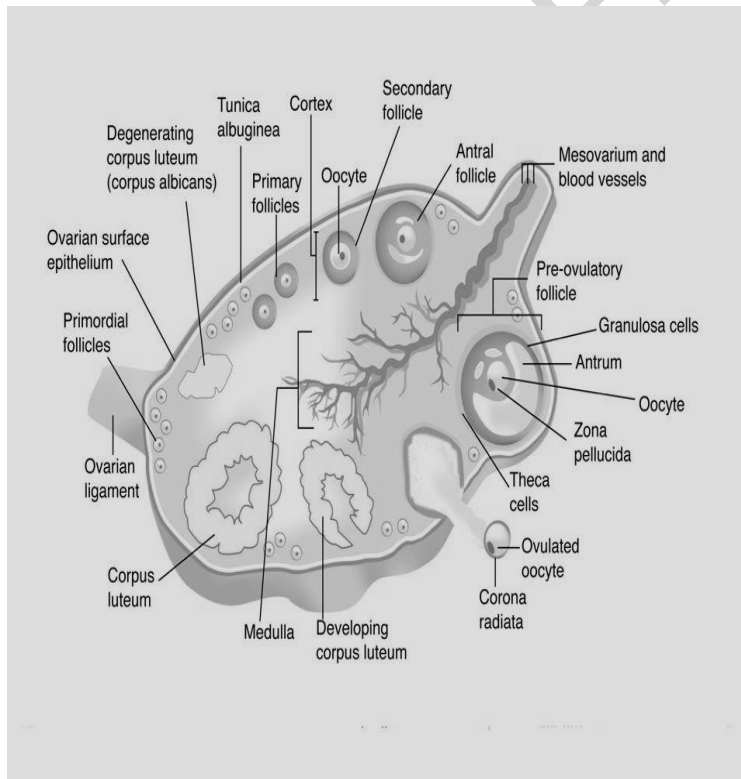
Ans: The process of formation of a mature female gamete (ovum) is called oogenesis. It occurs in the ovaries of female reproductive system. Oogenesis is a discontinuous process it begins before birth, stops in midprocess & only resumes after menarch. It occurs in three phases : Multiplicative phase (formation of oogonia mitotically from the primary germ cells), Growth phase (growth of oogonia into primary oocyte) & Maturation phase (formation of mature ova from primary oocyte through meiosis). Maturation phase produces two haploid cells – Larger one called secondary oocyte & the smaller one called polar bodies (1st polar body). Meiosis II of secondary oocyte results in the formation of functional egg or ovum and a second polar body: The first polar body may also divide to form two polar bodies of equal sizes which do not take part in reproduction & ultimately degenerates. First maturation division may be completed in the ovaries just prior to ovulation but second one (Final) is completed outside the ovary after fertilization. Secondary oocyte is female gamete in which the 1st meiotic division is completed & second meiotic division (Metaphase stage) has

begin. The egg is released at secondary oocyte stage under the effect of LH.



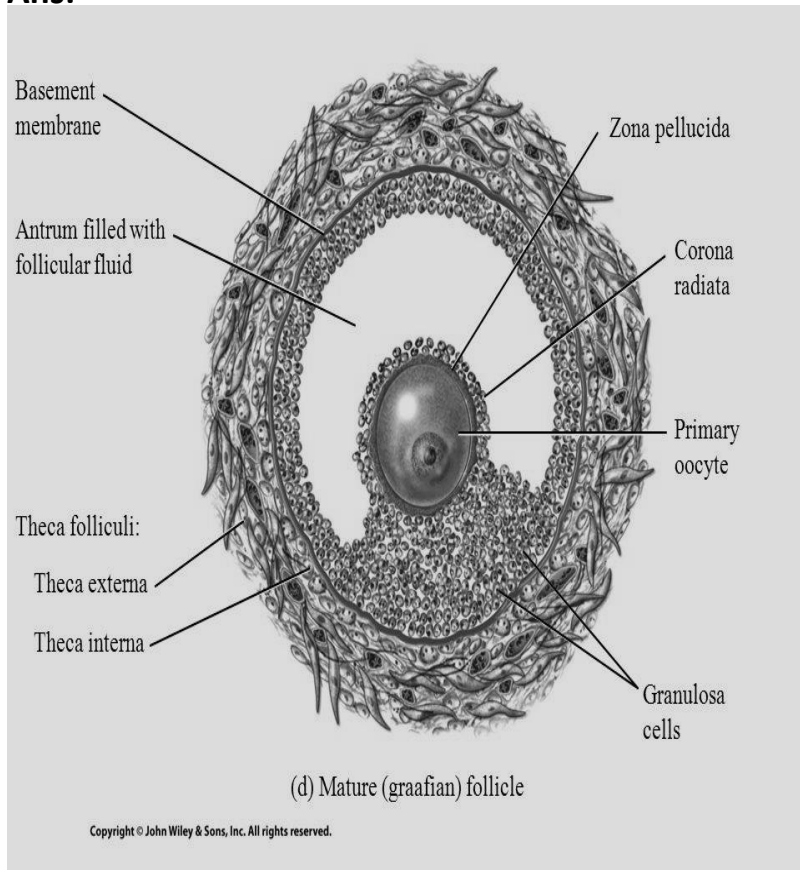
13. Draw a labelled diagram of a section through ovary.

Ans:



14. Draw a labelled diagram of a Graafian follicle.

Ans:



15. Name the functions of the following:

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

Ans: (a) Corpus luteum : The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium.

(b) Endometrium is necessary for implantation of the fertilized ovum and other events of pregnancy.

(c) The acrosome is filled with enzymes that help during fertilization of the ovum.

(d) Sperm tail: Tail facilitates sperm motility which is essential for fertilization.

(e) Fimbriae: Fimbriae help in collection of the ovum after ovulation.

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 ovary. (True/ False)**
- (d) Leydig cells synthesize androgens. (True/ False)**
- (e) Oogenesis takes place in corpus luteum. (True/False)**

(i) 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) False, Androgens or male sex hormones (e.g, testosterone) are secreted by Leydig cells.

(b) True.

(c) False, Leydig cells are found in testis.

(d) True.

(e) False, Oogenesis takes place in ovary.

(f) True.

(g) True.

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

Ans: The menstrual cycle is a regular, natural process that occurs in the reproductive system of females of childbearing age. It involves a series of physiological changes in the body that prepare it for the possibility of pregnancy. The menstrual cycle is typically around 28 days long, although it can vary from person to person. It may be temporarily stopped only in pregnancy.

The hormones that regulates menstrual cycles are

(i) FSH (Follicle stimulating hormone),

(ii) LH (Luteinizing hormone),

(iii) Oestrogens,

(iv) Progesterone.

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

Solution:

Parturition (or labour) means child birth. Parturition is the sequence of actions by which a baby and the afterbirth (placenta) are expelled from the uterus at childbirth. The process usually starts spontaneously about 280 days after conception, but it may be started by artificial means.

The process of parturition is induced by a complex neuroendocrine mechanism involving cortisol, estrogen and oxytocin.

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

Ans: The sex chromosome pattern in the human females is XX and that of male is XY.

Therefore, all the haploid female gametes (ova) have the sex chromosome X, however, the haploid male gametes have either X or Y. Thus 50% of sperms carry the X-chromosome while the other 50% carry the Y-chromosome. After fusion of the male and female gametes, the zygote carries either XX or XY depending upon whether the sperm carrying X or Y

fertilizes the ovum. The zygote carrying XX would be a female baby and XY would be a male baby. That is why it is correct to say that the sex of the baby is determined by the father.

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: One egg is released by human ovary in a month. Identical twins: Identical twins are formed when a single fertilized egg splits into two genetically identical parts. The twins share the same DNA set; thus, they may share many similar attributes. However, since physical appearance is influenced by environmental factors and not just genetics, identical twins can actually look very different.

Fraternal twins: These twins are formed when two fertilized eggs are formed. The twins share the different DNA set; thus, they may share different attributes (dizygotic embryo).

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

Ans: Since dogs have multiple births, several eggs mature and are released at the same time. If fertilised, the egg will implant on the uterine wall. Dogs bear their litters roughly 9 weeks after fertilisation, although the length of gestation can vary from 56 to 72 days. An average litter consists of about six puppies, though this number may vary widely based on the breed of dog. On this basis 6 eggs were released by the ovary of a female dog which gave birth to 6 puppies.