

NCERT Solutions for Class 12 Biology

Chapter 2 – Human Reproduction

2.1

Fill in the blanks:

- (a) Humans reproduce _____
(asexually/sexually)
- (b) Humans are _____ (oviparous,
viviparous, ovoviviparous)
- (c) Fertilisation 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) Fertilisation 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 :

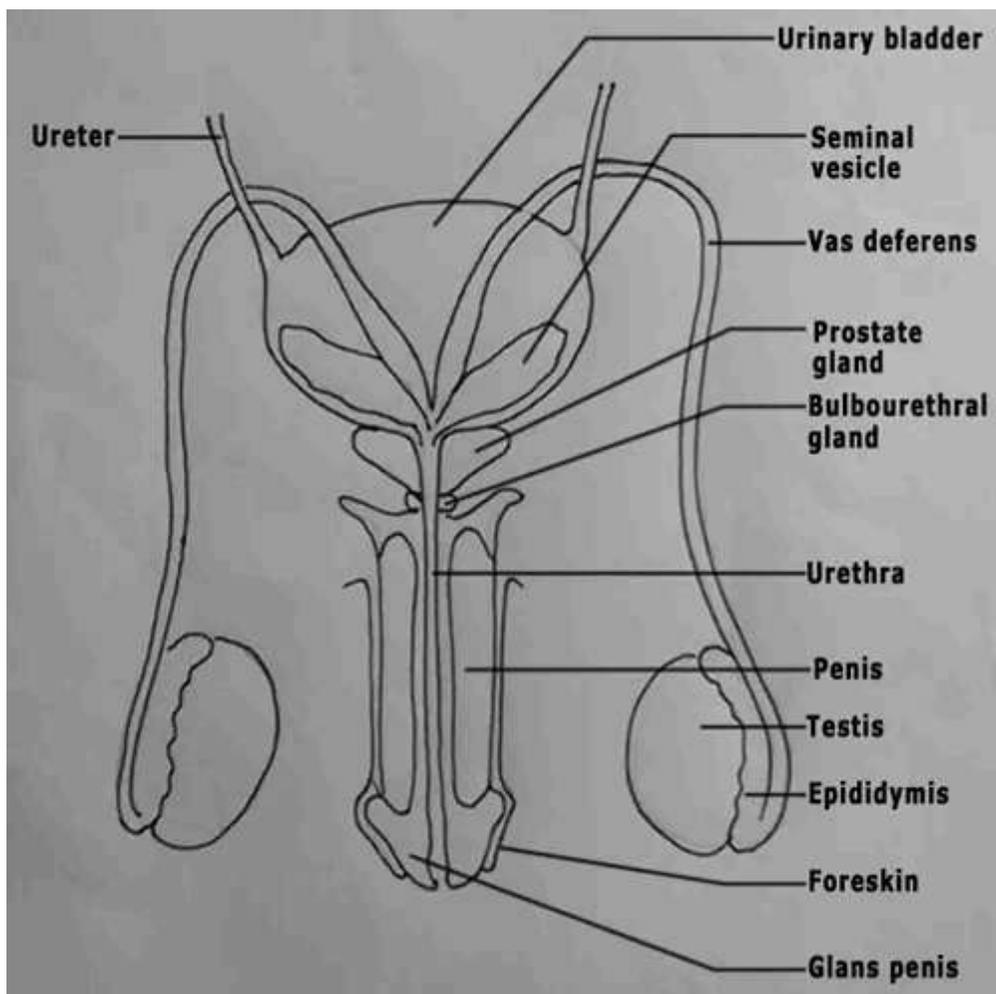
- Humans reproduce sexually.
- Humans are viviparous.
- Fertilization is internal in humans.
- Male and female gametes are haploid.
- A zygote is diploid.
- The process of release of the ovum from a mature follicle is called ovulation.
- Ovulation is induced by a hormone called the luteinizing hormone.

- 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.

2.2

Draw a labelled diagram of male reproductive system.

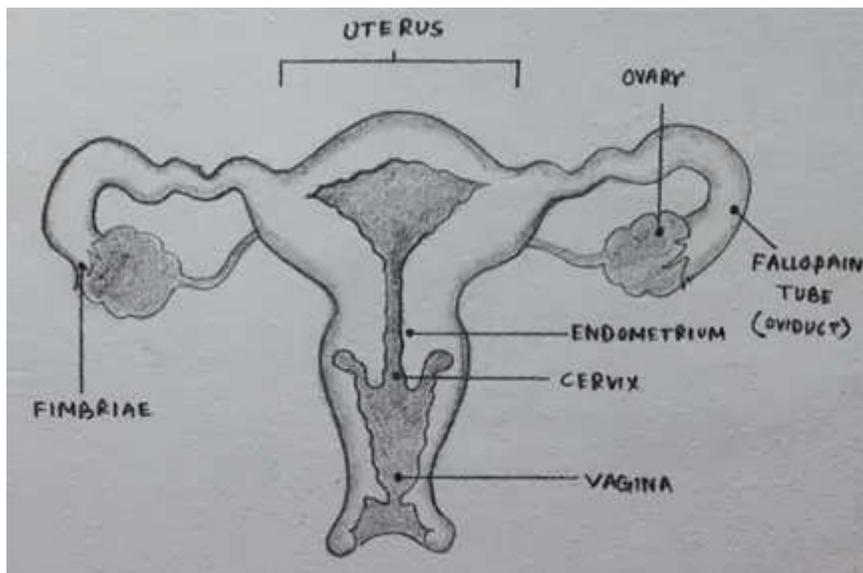
Ans :



2.3

Draw a labelled diagram of female reproductive system.

Ans :



2.4

Write two major functions each of testis and ovary.

Ans: The testis is the reproductive gland present in male organisms which secretes sperms and androgens. These are generally defined as testosterone. Whereas, the ovary is a secretory gland that creates the ovum that is commonly found in female organisms.

Here are the major functionalities of the Testis

- Using the process of spermatogenesis, a new element named spermatozoa is formed.
- A male reproductive hormone known as testosterone gets secreted by the Leydig cell present in the seminiferous tubules.
- The creation of secondary sexual features in the male human body is accomplished by a hormone named 'Testosterone.'

Here are the major functionalities of the ovary

- The estrogen hormone has been accountable for the creation of additional sex features within females.
- The female ovaries create a female gamete known as ova through the procedure of oogenesis.
- The developed Graffian follicle secretes estrogen, a female sex hormone.

2.5

Describe the structure of a seminiferous tubule.

Ans: The testicles contain a cord-based framework identified as a seminiferous tubule, which is covered with germinal epithelial cells and is composed of sustentacular tissues or Sertoli cell membranes. These cells store the general arrangement of the various germinating cellular

structures by producing a liquid-type substance consisting of vital protein molecules. It actively participates in the ejection of spermatozoa inside the tubule's lumen. The heavily coiled component known as seminiferous tubules is kept firmly in place where sperm generation happens within the testosterone glands. The testicular segments contain these tube-like structures.

The germinal epithelial wall of seminiferous tubules contains 2 distinct cell categories such as Spermatogonia & Sertoli cell structures. Male germinal cells called spermatogonia divide meiotically to form the initial spermatocytes. To create supplementary spermatocytes and ultimately spermatids, the initial spermatocytes must undergo additional division via the meiotic process. The spermatids undergo a metamorphosis process to develop spermatozoa. The cells that are responsible for Sertoli were additionally recognized as nurse tissue cells since they nurture the elements called germinal cells. Among the seminiferous tubules are massive ranged polygonal cells called Leydig-type cells or cells with interstitial spaces formed. These types of cells release a masculine hormonal substance termed testosterone.

2.6

What is spermatogenesis? Briefly describe the process of spermatogenesis.

Ans: The process by which the cells of sperm originate while creating within the testes of the male sexual body organ is defined as spermatogenesis. These cells can produce sperm that develop inside the exterior walls of the seminiferous tubules, which are a large number of narrow, closely connected tubules that make up the testes. Spermatogenesis involves the method by which adult males produce sperm from their undeveloped germinal cells. Seminiferous tubules found within the testes are where it occurs.

For a pair of diploid basic spermatocytes, a diploid spermatogonium (male germline cell) enlarges during spermatogenesis. To create two equivalent haploid additional spermatocytes, this diploid main spermatocyte must successfully undergo the starting level of meiotic division (meiosis I), which corresponds to a reductional partition.

For the production of 2 identical haploid spermatids, every alternate spermatocyte subsequently proceeds to an additional meiotic division process which is commonly known as meiosis II. Thus, a type of diploid spermatogonium produces 4 haploid spermatids. Through a procedure known as spermatogenesis, most spermatids develop into Spermatozoa or sperm.

2.7

Name the hormones involved in regulation of spermatogenesis.

Ans: Testosterone is a luteinizing hormone (LH) & also a follicle-stimulating hormone (FSH) that is responsible for the vital hormonal substances to manage the process of spermatogenesis. Follicle-stimulating hormone (FSH) & luteinizing hormones (LH) are secreted within the hypothalamus region by gonadotropin-emitting hormonal activity. These kinds of hormones must be present for the spermatogenesis mechanism. While LH operates on the testis' Leydig cell population & activates them, FSH operates on Sertoli cells. Both FSH & LH boost the spermatogenesis process.

2.8

Define spermiogenesis and spermiation.

Ans:

Spermiogenesis

Spermatids are transformed into fully developed spermatozoa, or sperms, throughout this procedure.

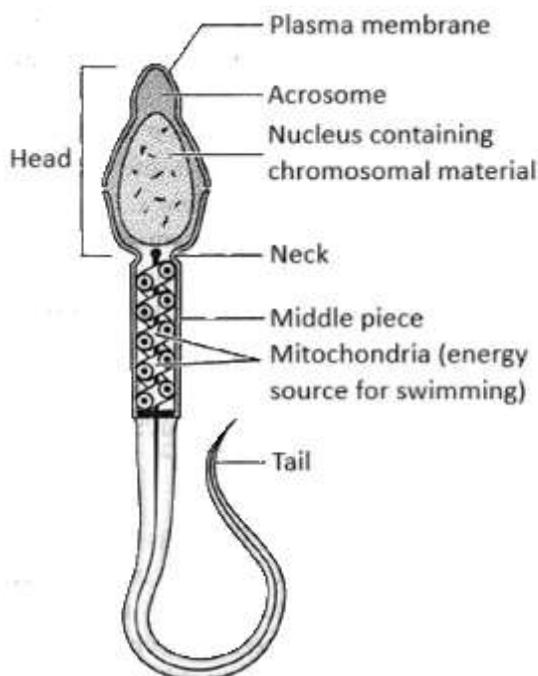
Spermiation

Spermiation refers to the process by which sperms are released from Sertoli cells into the lumen of seminiferous tubules.

2.9

Draw a labelled diagram of sperm.

Ans:



2.10

What are the major components of seminal plasma?

Ans: The fluid-based alkaline substance that males ejaculate from their reproductive organs is designated as semen. The design is composed of seminal plasma & sperm. The main constituents of the reproductive system of men include spermatozoa, mucus, and several accessory duct releases. The fluid-like contents of the prostate glandular system, bulbourethral glands, seminal sacs, and seminiferous tubules make up the fluid component of human sperm. The seminal fluid also includes fructose, calcium, ascorbic acid & a few other vital enzymes that are necessary for the male sperm to continue being functional. As a result, sperm receive safety & sustenance.

2.11

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

Ans: An essential part of the male reproductive system is the male accessory tubes & glands. The auxiliary ducts are important in the developmental process and movement of sperm. Sperm growth, preservation, and transit from the testes to the urethra—where they are subsequently expelled during ejaculation—all depend on these channels.

Male Accessory Ducts	Main Functions
Vasa Efferentia	Sperm transportation & short-term preservation.
Epididymis	Sperm development, retention & transportation.
Vasa Deferentia	Sperm movement.

Male Accessory Glands	Main Functions
Seminal Vesicles	Release of substances that feed and stimulate male reproductive cells.
Prostate Glands	Seminal fluid discharge increases sperm movement and balances the pH levels of urination.

Bulbourethral or Cowper's Glands	Lubricating fluid production that improves motion and counteracts the effects of female vaginal feces that are highly acidic.
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2.12

What is oogenesis? Give a brief account of oogenesis.

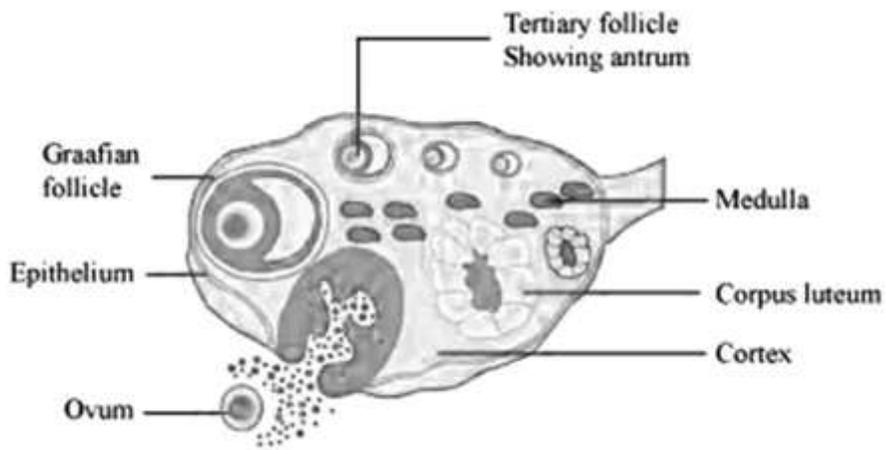
Ans:

- The technique by which female gametes are formed is called oogenesis. Before the time of birth, this mechanism starts within the fetus. The exterior regions of the ovaries are where oogenesis takes place. The oogenesis method occurs in 3 subsequent stages – Prenatal, Preovulatory & Antral.
- Oogenesis represents the process by which eggs or ova are formed within the ovary. When the dimensions of the egg parent cells or diploid oogonium rise, it becomes a diploid main oocyte.
- The diploid main oocyte divides into 2 uneven haploid offspring cells by its initial meiotic division, also known as reductional division or meiosis I, upon reaching maximum size.
- The subsequent oocyte, which comprises the whole cytoplasm & the central core of the yolk, represents a bigger cell than the initially formed polar corpulence also known by the term polocyte.
- A supplementary polar nucleus & an ovum are produced when the additional oocyte divides again, a process known as meiosis II or equational separation.
- Therefore, throughout the whole oogenesis procedure. a diploid oogonium generates either 2 or 3 polar reproductive organs in addition to a single haploid ovum.

2.13

Draw a labelled diagram of a section through ovary.

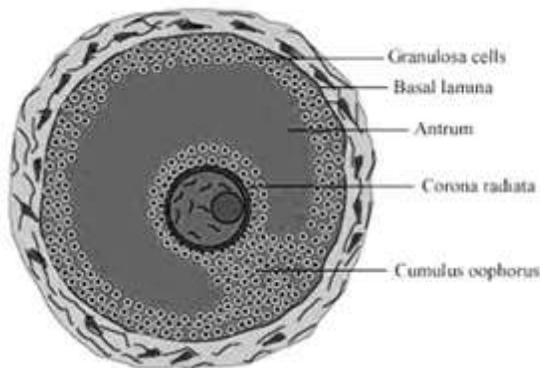
Ans:



2.14

Draw a labelled diagram of a Graafian follicle?

Ans:



2.15

Name the functions of the following:

(a) Corpus luteum (b) Endometrium

(c) Acrosome (d) Sperm tail (e) Fimbriae

Ans:

(a) Corpus luteum:

A structure known as the Corpus luteum grows from the Graafian follicle that has been torn. During the luteal part of the menstrual cycle, a hormone called progesterone. Because there is more progesterone in the body, FSH and LH can't get out, which stops ovulation. The corpus luteum also facilitates the implantation process and the proliferation of the endometrium of the uterus.

(b) Endometrium:

The endometrium is the layer on the inside of the uterus. During the menstrual cycle, it is taken out during menstrual discharge each month to make room for the embryo to implant.

(c) Acrosome:

A cap like structure called the acrosome can be found in the anterior part of the sperm. Hyaluronidase is an enzyme that hydrolyses the egg's exterior membrane. In the process of fertilization, the acrosome releases enzymes that help the sperm get into the egg by breaking down the membrane of the egg.

(d) Sperm tail:

The area of the sperm that is several times longer than the head is sperm tail. This is the part of the sperm that is longer than the head. The sperm's tail controls how it moves inside the female reproductive tract.

(e) Fimbriae:

Fimbriae are the finger like projections at the end of the ovarian fallopian tube. After ovulation, they help catch the ovum, which is made easier by the cilia beating.

2.16

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 synthesise 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)**

2.17

What is menstrual cycle? Which hormones regulate menstrual cycle?

Ans:

- During a woman's reproductive existence, the period known as menstruation is a regular sequence of physiological alterations in the female reproductive system that take place roughly every twenty-eight days. The disintegration of the uterine endothelium occurs after the menstrual period & is expelled via the vaginal tract as slime & bloodstream. It's been defined by the term menses.
- Follicle Stimulation Hormone (FSH), Luteinizing Hormone (LH), female estrogen & hormone progesterone all play a role in controlling the cycle of menstruation. Throughout the stage of follicular development, the anterior part of the pituitary gland produces more FSH & LH. When RH (releasing hormone) is present, FSH transforms an initial follicle into another Graafian spindle.
- Follicle development & the release of the hormone estrogen are the outcomes of the progressive rise in LH output.
- The hormone estrogen promotes the release of the hormone known as luteinizing hormone while inhibiting the release of FSH. Additionally, it results in the uterine endometrium being thicker.
- The Graafian follicle ruptures because of the elevated LH threshold, releasing the fertilized egg into the fallopian tube. Throughout the period known as luteal development, the damaged Graafian follicle transforms into the wall of the corpus luteum & begins to secrete a substance called progesterone.
- The estrogen-like substance progesterone assists in maintaining and stimulating the lining of the reproductive tract for the development of embryos. Elevated plasma concentrations of progesterone hormone limit subsequent ovulation by reducing the release of LH & FSH in the body of a woman.

2.18

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

Ans: Each woman must go through parturition, the last phase of your pregnancy to give birth to your child. The other term for this period can be described as the time across labor & delivery. Parturition is the systematic mechanism of labor or delivery, that happens about 38 weeks post-conception. There are 3 separate labor steps in this procedure. The initial phase of dilation lasts from the start of the uterus's typical strong contractions through the cervix's full dilatation.

When the developing kid is born, the hormone cortisol is released. Lactation eventually starts, and the preliminary breast milk produced is known as colostrum. Following the full state of growth of the developing baby inside its mother's womb, the procedure associated with giving birth to the young infant is termed Parturition.

The 2 distinct types of hormones needed for the whole procedure are oxytocin & relaxin. The uterine myometrium's delicate muscles tighten in response to oxytocin, pushing the completely developed fetus through the direction of the labor tract. On the other end, the relaxin hormone produces flexibility within the pelvic tendons using a hormonal substance called relaxin which stimulates the uterine cavity for birthing.

2.19

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

Ans: Considering Indian culture, it is common for women to be held responsible for having daughters. This is caused because of inadequate education & improper knowledge. They view their daughters as an obligation. The modest sex ratio results from several actions taken to avoid pregnancy and delivery of girl children. People are born with a haploid collection of 23 distinct sets of chromosomes. Twenty-two of the above twenty-three chromosomes are referred to by the terms non-sex chromosomes or autosomes. The spare pair of chromosomes are commonly referred to as sexual chromosomes since they determine the sexuality of a particular individual.

The female beings are determined to be homogametic and possess an identical pair of chromosomes indicated by XX. Meanwhile, male humans are said to be heterogametic and consist of 2 distinct chromosomal variants, represented by the characters XY. Every human being has twenty-three sets of chromosomes, with men having one or two kinds of sex chromosomes & twenty-two sets of autosomes. They might be X or Y. In contrast, females only have the X sexual chromosome & twenty-two sets of autosomes.

Someone's sexual identity is determined by the kind of male gamete (X or Y) over spermatogenesis before it combines with the portion of the X chromosome that contains the egg produced by the female cellular structure. A female child is expected to be conceived if the germinated sperm includes X & a male child would be produced when it comprises Y.

Therefore, mothers shouldn't be held responsible for their kid's sexuality. In our country, it is illegal to determine the sexual orientation of the fetus. This has occurred as a result of the rise in incidences of female foeticide. As a result, government legislation forbids determining the gender of an individual until childbirth. Additionally, many ordinances have recently been implemented to control abortions.

2.20

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: About once every month, the female ovary normally produces a single fertilized egg or ovum throughout every phase of menstruation. Being produced through one zygote is referred to by the term "monozygous." Whenever two infants are born in succession, they are called twins or twin children. These twin babies are often produced from only one egg through an individual sperm. The zygote separates from both embryos following fertilization.

Consequently, a single egg gets released & developed in the event of identical twins. These result from the initial zygotic split and division of the initial blastomeres. As a result, the mature children, known as identical twins, will have the same hereditary composition. Fraternal twins, which might have grown from 2 distinct fertilized eggs, can occasionally be produced. This occurs whenever fertilization occurs by 2 different sperm & two embryos (one from every ovary) get released simultaneously. As a result, the mature offspring will possess distinct genes & are referred to be fraternal or non-identical twins.

2.21

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

Ans: Polyovulatory mammals include rodents & dogs. They release more than a single egg at the time of ovulation is known as poly-ovulation. The female ovary produces many eggs or ova from either of the ovaries throughout ovulation. A total of 6 eggs had managed to emerge from the female dog's ovaries. After fertilization, every single one of these 6 eggs develops into a fertilized zygote. These zygotes eventually matured into infants or pups.

To successfully give birth to 6 puppies, the mother dog consequently discharged six eggs. In animals, luteinizing hormones (LH) initiate the moment of conception period. Around 48 hours after the LH surge or post-LH (day 2), the female puppy had ovulated. The amount of progesterone rises & estrogen levels fall with an LH burst.