CBSE Class 12 Biology
NCERT Exemplar Solutions
CHAPTER 3
HUMAN REPRODUCTION

Multiple Choice Questions (MCQs)

1. Choose the incorrect statement from the following:

(a) In birds and mammals internal fertilisation takes place

(b) Colostrum contains antibodies and nutrients

(c) Polyspermy in mammals is prevented by the chemical changes in the egg surface

(d) In the human female implantation occurs almost seven days after fertilization

Ans. (c) Polyspermy in mammals is prevented by the chemical changes in the egg surface

Explanation: Absorption of water by zona pellucida results in its swelling. This prevents further entry of sperms and thus polyspermy is prevented. So physical change rather than chemical change is responsible for prevention of polyspermy in mammals.

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2. Identify the correct statement from the following:

(a) High levels of estrogen triggers the ovulatory surge.

(b) Oogonial cells start to proliferate and give rise to functional ova in regular cycles from puberty onwards.

(c) Sperms released from seminiferous tubules are highly motile.

(d) Progesterone level is high during the post ovulatory phase of menstrual cycle.

Ans. (d) Progesterone level is high during the post ovulatory phase of menstrual cycle.

Explanation: High levels of LH and FSH trigger the ovulatory surge. Sperms released from seminiferous tubules are non-motile. Oogonial cells cease activity when the girl child is still

in the womb. Hence, option ‘d’ is the correct answer.

3. Spot the odd one out from the following structures with reference to the male reproductive system.:

(a) Rete testis

(b) Epididymis

(c) Vasa efferentia

(d) Isthmus

Ans. (d) Isthmus

Explanation: Isthmus is a part of the oviduct in female reproductive system. Others are parts of the male reproductive system.

4. Seminal plasma, the fluid part of semen, is contributed by.

(i) Seminal vesicle

(ii) Prostate

(iii) Urethra

(iv) Bulbourethral gland

(a) (i) and (ii)

(b) (i), (ii) and (iv)

(c) (ii), (iii) and (iv)

(d) (i) and (iv)

Ans. (b) (i), (ii) and (iv)

Explanation: Urethra has no contribution to seminal plasma.

5. Spermiation is the process of the release of sperms from:

(a) Seminiferous tubules

(b) Vas deferens

(c) Epididymis

(d) Prostate gland

Ans. (a) Seminiferous tubules

Explanation: (a) Seminiferous tubules

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6. Mature Graafian follicle is generally present in the ovary of a healthy human female around stet:

(a) 5 – 8 day of menstrual cycle

(b) 11– 17 day of menstrual cycle

(c) 18– 23 day of menstrual cycle

(d) 24– 28 day of menstrual cycle

Ans. (b) 11– 17 day of menstrual cycle

Explanation: This is the period during which ovulation takes place after rupture in Graafian follicle.

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7. Acrosomal reaction of the sperm occurs due to:

(a) Its contact with zona pellucida of the ova

(b) Reactions within the uterine environment of the female

(c) Reactions within the epididymal environment of the male

(d) Androgens produced in the uterus

Ans. (a) Its contact with zona pellucida of the ova

Explanation: Enzyme from acrosome breaks down the zona pellucida so that sperm can enter the ova.

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8. Which one of the following is not a male accessory gland?

(a) Seminal vesicle

(b) Ampulla

(c) Prostate

(d) Bulbourethral gland

Ans. (b) Ampulla

Explanation: Ampulla is a part of fallopian tube.

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9. The immature male germ cells undergo division to produce sperms by the process of spermatogenesis. Choose the correct one with reference to above.

(a) Spermatogonia have 46 chromosomes and always undergo meiotic cell division

(b) Primary spermatocytes divide by mitotic cell division

(c) Secondary spermatocytes have 23 chromosomes and undergo second meiotic division

(d) Spermatozoa are transformed into spermatids

Ans. (c) Secondary spermatocytes have 23 chromosomes and undergo second meiotic division

Explanation: Spermatogonia have 46 chromosomes and they undergo meiotic cells division, primary spermatocytes undergo meiotic cell division, spermatids are transformed into spermatozoa. So, option ‘a’, ‘c’ and ‘d’ are incorrect.

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10. Match between the following representing parts of the sperm and their functions and choose the correct option.

Column A	Column B
(A) Head	(i) Enzymes
(B) Middle piece	(ii) Sperm motility
(C) Acrosome	(iii) Energy
(D) Tail	(iv) Genetic material

Options:

(a) (A)-(ii), (B)-(iv), (C)-(i), (D)-(iii)
(b) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)
(c) (A)-(iv), (B)-(i), (C)-(ii), (D)-(iii)
(d) (A)-(ii), (B)-(i), (C)-(iii), (D)-(iv)

Ans. (b) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

Explanation: The nucleus is present in the head. Acrosome releases enzyme which dissolves zona pellucida. Tail helps in swimming of sperm and middle piece is the place where mitochondria are present.

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11. Which among the following has 23 chromosomes?

(a) Spermatogonia

(b) Zygote

(c) Secondary oöcyte

(d) Oögonia

Ans. (c) Secondary oöcyte

Explanation: Secondary oöcyte

12. Match the following and choose the correct options:

Column I	Column II
(A) Trophoblast	(i) Embedding of blastocyst in the endometrium
(B) Cleavage	(ii) Group of cells that would differentiate as embryo
(C) Inner cell mass	(iii) Outer layer of blastocyst attached to the endometrium
(D) Implantation	(iv) Mitotic division of zygote

Options:

(a) (A)-(ii), (B)-(i), (C)-(iii), (D)-(iv)
(b) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)
(C) (A)-(iii), (B)-(i), (C)-(ii), (D)-(iv)
(d) (A)-(ii), (B)-(iv), (C)-(iii), (D)-(i)

Ans. (b) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)

Explanation: (b) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)

13. Which of the following hormones is not secreted by human placenta?

(a) hCG

(b) Estrogens

(c) Progesterone

(d) LH

Ans. (d) LH

Explanation: LH (Luteinizing hormone) is secreted by pituitary gland.

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14. The vas deferens receives duct from the seminal vesicle and opens into urethra as:

(a) Epididymis

(b) Ejaculatory duct

(c) Efferent ductile

(d) Ureter

Ans. (b) Ejaculatory duct

Explanation: (b) Ejaculatory duct

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15. Urethral meatus refers to the:

(a) Urinogenital duct

(b) Opening of vas deferens into urethra

(c) External opening of the urinogenital duct

(d) Muscles surrounding the urinogenital duct

Ans. (c) External opening of the urinogenital duct

Explanation: (c) External opening of the urinogenital duct

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16. Morula is a developmental stage:

(a) Between the zygote and blastocyst

(b) Between the blastocyst and gastrula

(c) After the implantation

(d) Between implantation and parturition

Ans. (a) Between the zygote and blastocyst

Explanation: (a) Between the zygote and blastocyst

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17. The membranous cover of the ovum at ovulation is:

(a) Corona radiata

(b) Zona radiata

(c) Zona pellucida

(d) Chorion

Ans. (a) Corona radiata

Explanation: (a) Corona radiata

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18. Identify the odd one from the following:

(a) Labia minora

(b) Fimbriae

(c) Infundibulum

(d) Isthmus

Ans. (a) Labia minora

Explanation: All other structures are associated with fallopian tubes. Hence, ‘a’ is the correct answer.

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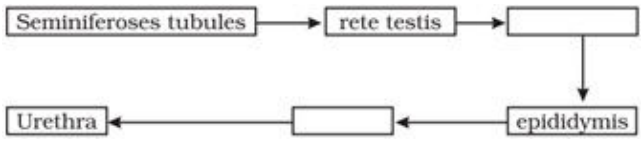
Very Short Answer Type Questions

1. Given below are the events in human reproduction. Write them in correct sequential order.

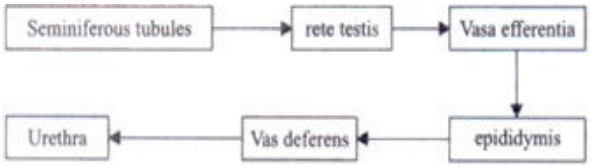
Insemination, gametogenesis, fertilization, parturition, gestation, implantation

Ans. Gametogenesis → Insemination → Fertilization → Implantation → Gestation → Parturition

2. The path of sperm transport is given below. Provide the missing steps in blank boxes.



Ans.



3. What is the role of cervix in the human female reproductive system?

Ans. Along with the vagina; cervix forms the birth canal. Parturition happens through the birth canal.

4. Why are menstrual cycles absent during pregnancy.

Ans. High level of progesterone and estrogens during pregnancy suppress the gonadotropins which is required for the development of new follicles. Therefore, a new cycle cannot be

initiated.

5. Female reproductive organs and associated functions are given below in column A and B. Fill the blank boxes.

Column A	Column B
Ovaries	Ovulation
Oviduct	a
b	Pregnancy
Vagina	Birth

Ans. (a) Fertilization, (b) Uterus

6. From where the parturition signals arise-mother or foetus? Mention the main hormone involved in parturition.

Ans. Parturition singals arise from the foetus. This triggers release of oxytocin from the maternal pituitary gland. Oxytocin is the main hormone involved in parturition.

7. What is the significance of epididymis in male fertility?

Ans. Secretion from epididymis is essential for maturation and motility of sperms. Secretions from vas deferens, prostate and seminal vesicle are also involved in this. Thus, these organs; along with epididymis play an important role in male fertility.

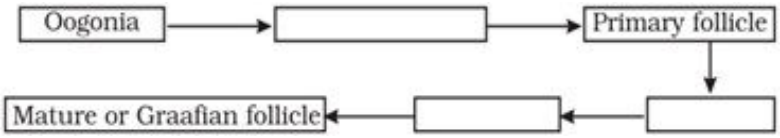
8. Give the names and functions of the hormones involved in the process of spermatogenesis. Write the names of the endocrine glands from where they are released.

Ans.

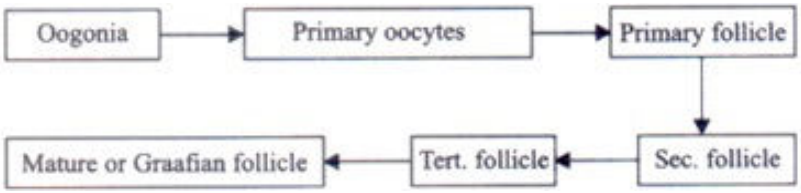
Hormone	Function	Origin of hormone

Gonadotropin Releasing Hormone (GnRH)	Act on anterior pituitary gland and stimulates the release of LH and FSH	Hypothalamus
Luteinizing hormone (LH)	Acts at Leydig cells and stimulates secretion of androgen.	Pituitary
Follicle Stimulating Hormone (FSH)	Acts on Sertoli cells and stimulates factors which are involved in spermatogenesis.	Pituitary

9. The mother germ cells are transformed into a mature follicle through series of steps. Provide the missing steps in the blank boxes.



Ans.



10. During reproduction, the chromosome number (2n) reduces to half (n) in the gametes and again the original number (2n) is restored in the offspring, What are the processes through which these events take place?

Ans. Gametogenesis involves meiosis which results in haploid number of chromosomes in daughter cells. Thus, chromosome number is half (n) in gametes. Fertilisation is the step in which the chromosome number becomes diploid (2n) because of fusion of male and female gametes.

11. What is the difference between a primary oöcyte and a secondary oöcyte?

Ans.

Primary Oocyte	Secondary Oocyte
(i) Primary oocyte is formed when the female is still in the womb.	(i) Secondary oocyte is formed at the onset of puberty.
(ii) It is surrounded by secondary follicle.	(ii) It is surrounded by tertiary follicle as well.
(iii) Chromosome number is 46.	(iii) Chromosome number is 23.

12. What is the significance of ampullary–isthmic junction in the female reproductive tract?

Ans. First cleavage division of zygote occurs in the ampullary-isthmic junction in the female reproductive tract.

13. How does zona pellucida of ovum help in preventing polyspermy?

Ans. Once a sperm comes in contact with zona pellucida of the ovum, it induces changes in its membrane. These changes prevent the entry of other sperm into the ovum and thus prevent polyspermy.

14. Mention the importance of LH surge during menstrual cycle.

Ans. Rapid surge in LH induces rupture of Graafian follicle. This facilitates the release of ovum. Thus, rapid surge in LH facilitates ovulation.

15. Which type of cell division forms spermatids from the secondary spermatocytes?

Ans. Meiosis results in formation of spermatids from secondary spermatocytes.

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Short Answer Type Questions

1. A human female experiences two major changes, menarche and menopause during her life. Mention the significance of both the events.

Ans. Significance of Menarche: Menarche marks the onset of puberty. Thus, it marks the beginning of reproductive phase in female. Significance of Menopause: Menopause marks the culmination of reproductive phase in female.

2. (a) How many spermatozoa are formed from one secondary spermatocyte?

(b) Where does the first cleavage division of zygote take place?

Ans. (a) Four spermatids are formed from one secondary spermatocyte. All of them subsequently develop into spermatozoa through a process called spermiogenesis.

(b) The first cleavage division of zygote takes place in the ampullary-isthmus junction.

3. Corpus luteum in pregnancy has a long life. However, if fertilisation does not take place, it remains active only for 10-12 days. Explain.

Ans. Corpus luteum secretes progesterone which is essential for maintaining the endometrium. This essential for proper development of the foetus. Hence, corpus luteum has a long life during pregnancy. On the other hand, in the absence of fertilization; there is no work for corpus luteum and hence it remains active only for 10-12 days.

4. What is foetal ejection reflex? Explain how it leads to parturition?

Ans. Mild uterine contraction at the time of child birth is called foetal ejection reflex. This triggers the release of oxytocin from the maternal pituitary. Oxytocin induces strong uterine

contraction which finally leads to parturition.

5. Except endocrine function, what are the other functions of placenta.

Ans. Other than endocrine function; following are the remaining functions of placenta:

(a) Facilitates supply of oxygen and nutrients to the foetus.

(b) Facilitates removal of carbon dioxide and other waste products from the foetus.

6. Why doctors recommend breast feeding during initial period of infant growth?

Ans. The milk producing during the initial few days of lactation is called colostrums. It contains several antibodies which are important for developing diseases resistance in the baby. Due to this, doctors recommend breast feeding during initial period of infant growth.

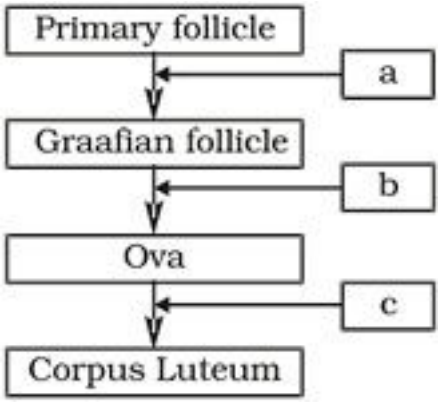
7. What are the events that take place in the ovary and uterus during follicular phase of the menstrual cycle.

Ans. Following events takes place in the ovary and uterus during follicular phase of the menstrual cycle:

(a) Primary follicle in the ovary grow to become fully mature Graafian follicle.

(b) Endometrium in the uterus regenerates through proliferation.

(c) Estrogen is secreted by growing follicle.



8. Given below is a flow chart showing ovarian changes during menstrual cycle. Fill in the spaces giving the name of the hormones responsible for the events shown.

Ans. Following hormones are responsible for various changes during the menstrual cycle:

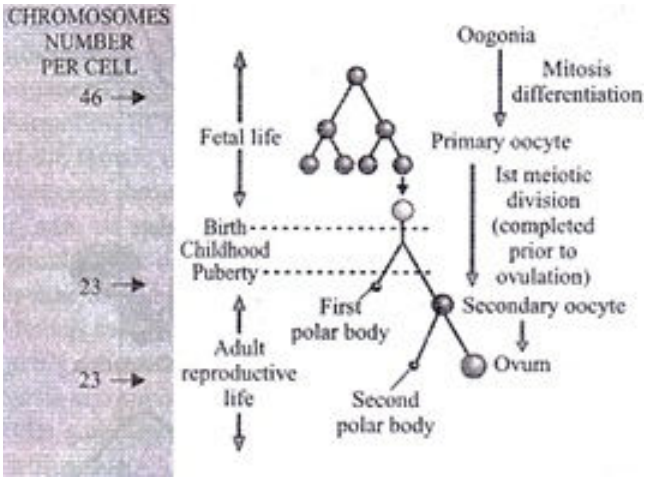
(a) **FSH (Follicle Stimulating Hormone):** It is responsible for transformation of primary follicle into Graafian follicle.

(b) FSH is responsible for ovulation as well, i.e. release of ovum. It is important to note that both FSH and LH work in coordination and complement each other's functions.

(c) **LH (Luteinizing Hormone):** It is responsible for development of corpus luteum from Graafian follicle.

9. Give a schematic labelled diagram to represent oögenesis (without descriptions).

Ans.



10. What are the changes in the oogonia during the transition of a primary follicle to Graafian follicle?

Ans. Following changes happen in the oogonia during the transition of a primary follicle to Graafian follicle:

(a) Each primary oocyte gets surrounded by a layer of granulosa cells; called primary follicle.

(b) Primary follicle gets surrounded by another layer of granulosa cells and a new theca. This called secondary follicle.

(c) The secondary follicle soon transforms into tertiary follicle. The tertiary follicle is characterized by a fluid filled cavity called antrum. At this stage, the primary oocyte undergoes second meiotic division and forms secondary oocyte and a tiny polar body.

(d) The tertiary follicle then changes into mature Graafian follicle. During this stage, a new layer; called zona pellucida; develops around the secondary oocyte.

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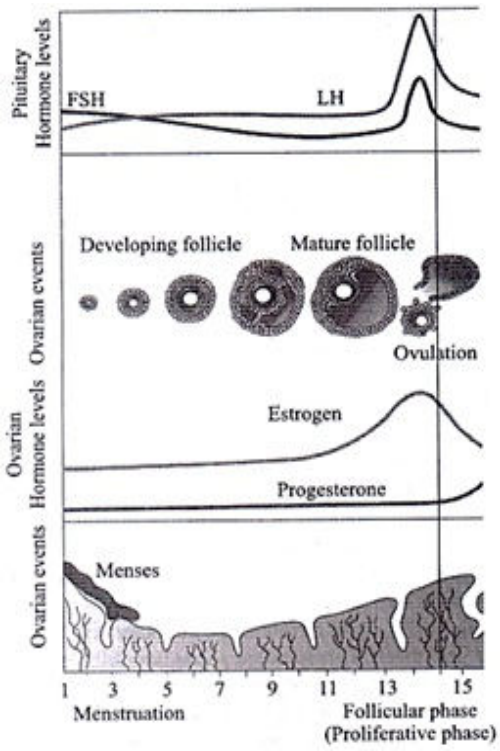
Long Answer Type Questions

1. What role does pituitary gonadotropins play during follicular and ovulatory phases of menstrual cycle? Explain the shifts in steroidal secretions.

Ans. FSH and LH are the two pituitary gonadotropins which play important role during follicular and ovulatory phases of menstrual cycle.



- FSH stimulates the release of ovum from the Graafian follicle. It also stimulates the development and subsequent rupture of Graafian follicle. Thus, FSH plays major role during follicular and ovulatory phases.
- The given figure shows varying levels of LH, FSH and steroid hormones during follicular and ovulation phases of menstrual cycle.
- At this stage, level of estradiol (a steroid hormone) increases. This suppresses the level of Luteinizing hormone (LH). Once the level of estradiol reaches a threshold level; its

effect is reversed.

- After that, level of estrogen (another steroid hormone) increases. This stimulates a surge in levels of LH. High level of LH stimulates development of corpus luteum and proliferation of endometrium. This marks the beginning of the luteal phases.

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2. Meiotic division during oogenesis is different from that in spermatogenesis. Explain how and why?

Ans. It is true that meiotic division during oogenesis is different from that in spermatogenesis. Following are the details about significant differences between them:

- In case of spermatogenesis, meiotic division begins at the time of puberty. This is the time when spermatogenesis begins in a male. On the other hand, oogenesis begins in female when the female is still in the womb. Thus, it can be said that meiotic division during oogenesis begins when the girl child is still in the womb.
- Formation of primary oocytes stop by the 20^{th} week of gestation of the female child. On the contrary, production of spermatocytes continues throughout the reproductive phase of a male.
- In case of spermatogenesis, all the stages of meiosis take place quickly after one another and there is no time lag between them. In case of oogenesis, meiosis is suspended at the Prophase I state.
- Meiosis resumes only once the puberty begins.

Following are some possible reasons for this difference in patterns of oogenesis and spermatogenesis:

- Male gametes need to be formed in very large number to ensure fertilization.
- Female gametes are not exposed to external hazards and hence a less number of them would be enough. Limiting the production of female gametes helps in conservation of resources from the female body. The resources can then be properly utilized during development of foetus.

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3. The zygote passes through several developmental stages till implantation. Describe each stage briefly with suitable diagrams.

Ans. Following figure shows various stages of zygote development till implantation:

(a) The zygote divides into two-cell stage called cleavage. This development takes place when the zygote is still in the isthmus.

(b) The cleavage undergoes further rounds of mitosis to form 2, 4, 8 and finally 16-celled stage.

These daughter cells are called blastomere.

(c) The 16-celled stage is called morula.

(d) The morula changes into blastocyst; with more rounds of meiosis. At this stage, the blastomeres are arranged in an outer layer of cells; called trophoblast and an inner mass of cells.

(e) Implantation to uterine wall happens at the blastocyst stage.

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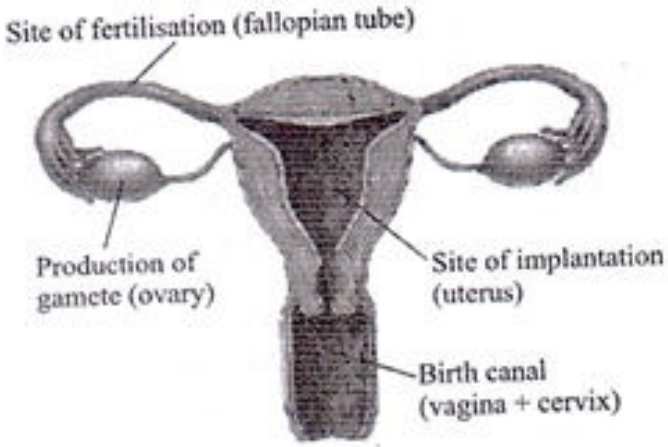
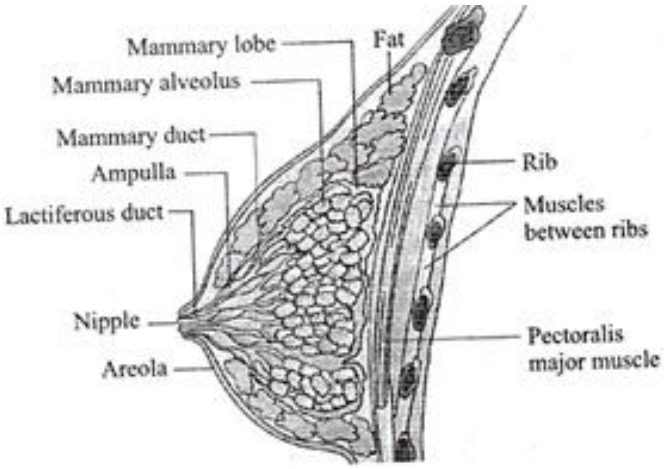
4. Draw a neat diagram of the female reproductive system and label the parts associated with the following (a) production of gamete, (b) site of fertilisation (c) site of implantation and, (d) birth canal.

Ans.



5. With a suitable diagram, describe the organisation of mammary gland.

Ans. Mammary glands are paired structures which contain glandular tissue and variable amount of fat.



- In each breast, glandular tissue is divided into 15 – 20 mammary lobes. These lobes have clusters of cells called alveoli.
- The cells of alveoli secrete milk, which is stored in the cavities (lumens) of alveoli. The alveoli open in mammary tubules.
- Tubules from each lobe join to form a mammary duct.
- Many mammary ducts join to form a wider mammary ampulla.
- A mammary ampulla is connected to the lactiferous duct. Milk is sucked out through the lactiferous duct.