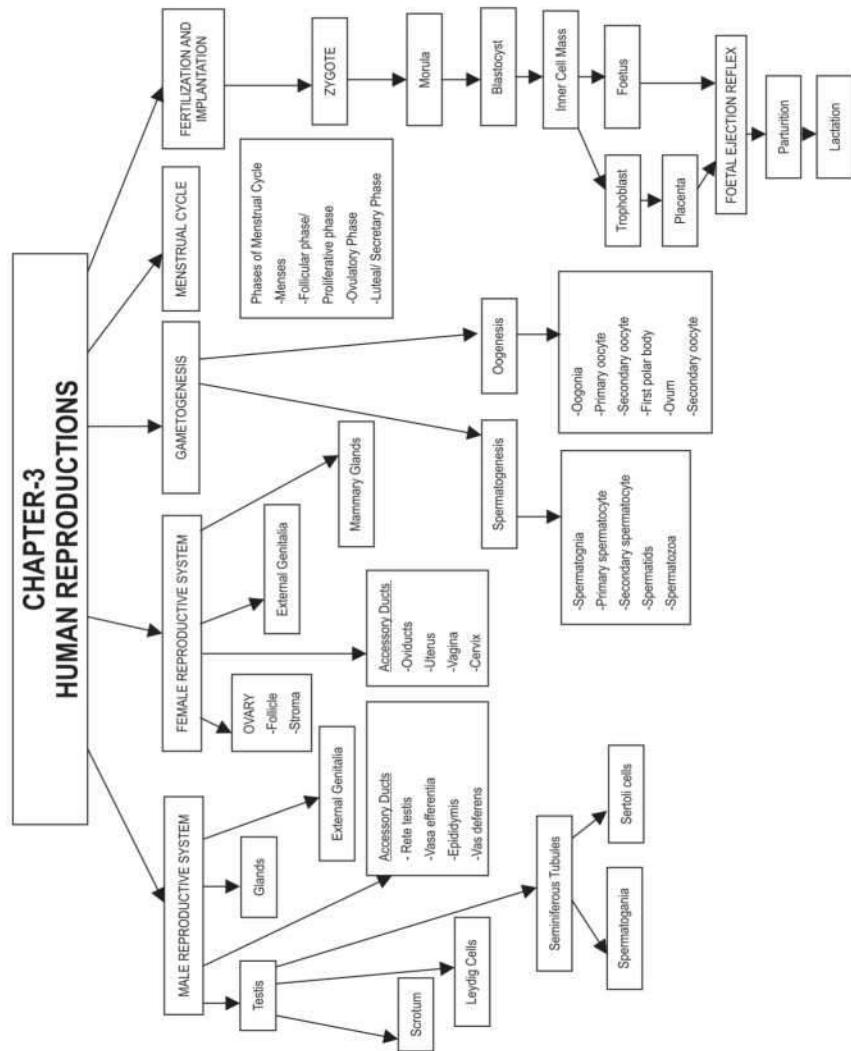


Chapter - 2

Human Reproduction



Blastula : A stage of embryogenesis which comes after morula and has a hollow fluid filled space called blastocoel.

Gestation Period : A period between fertilisation of ovum and the birth of a baby.

Implantation : Fixing of embryo/fertilised egg in uterus. It leads to pregnancy.

Menarche : The beginning of first menstruation in female on attaining puberty.

Menopause : Permanent cessation of menstrual cycle in female. It occurs between the age 45 to 50 years in human female.

Ovulation : Process of release of mature ovum (Secondary oocyte) from the ovary.

Parturition : Process of delivery of the foetus (Child birth), through birth canal.

Puberty : A stage at which immature reproductive system of boy or girl becomes mature. Period of puberty is 10-14 years in girls and 13-16 years in boys.

Spermiogenesis : Transformation of spermatids into sperms.

Spermiation : A process by which spermatozoa are released from the seminiferous tubules.

Spermatogenesis : Process of formation of sperm from male germ cell in the testes.

Colostrum : The fluid secreted by mammary glands soon after birth is called colostrum. It contains proteins, lactose and antibodies (e.g.IgA). This provides nutrition and help the new born baby to develop resistance for healthy development.

Ootid (Ovum) : A haploid cell formed by meiotic division of a secondary oocyte, especially the ovum, as distinct from the polar bodies.

Cleavage : The mitotic division in which the zygote undergoes to form morula and then blastocyst.

Insemination : The process in which the male transfers the sperms into the genital tract of the female.

Leydig Cells : (Interstitial Cells)—Present in connective tissue outside the seminiferous tubules. They are endocrine in nature and produce androgens e.g. testosterone.

Sertoli Cells : (nurse cells) : Present in the lumen of the seminiferous tubules. They provide nutrition and help in differentiation of cells undergoing spermatogenesis. They also secrete ABP (Androgen Binding Proteins) and inhibin.

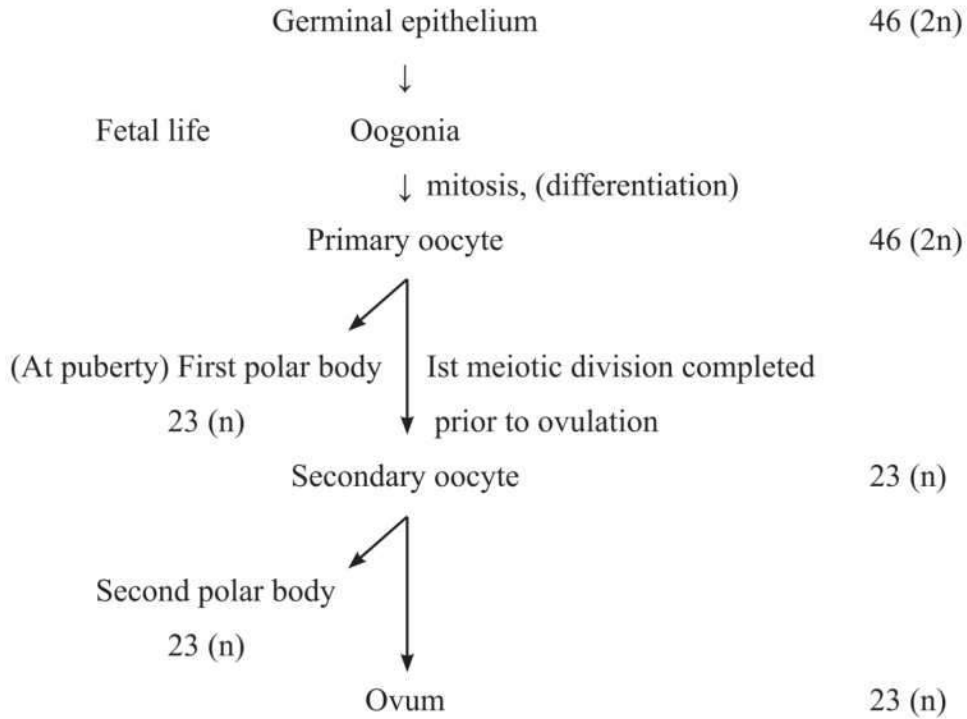
Accessory Male Genital Glands :

- Seminal Vesicles—Produce seminal fluid which forms 60-70% of semen. The fluid activates the sperms and have fructose, citrate, inositol and proteins for nutrition of sperms.
- Prostate Gland : The gland secretes thin, milky and alkaline secretion which neutralises the acidic secretion in female vagina.
- Cowper's Gland : (Bulbourethral gland)—helps in secretion of mucus which provides lubrication of urinogenital tract.

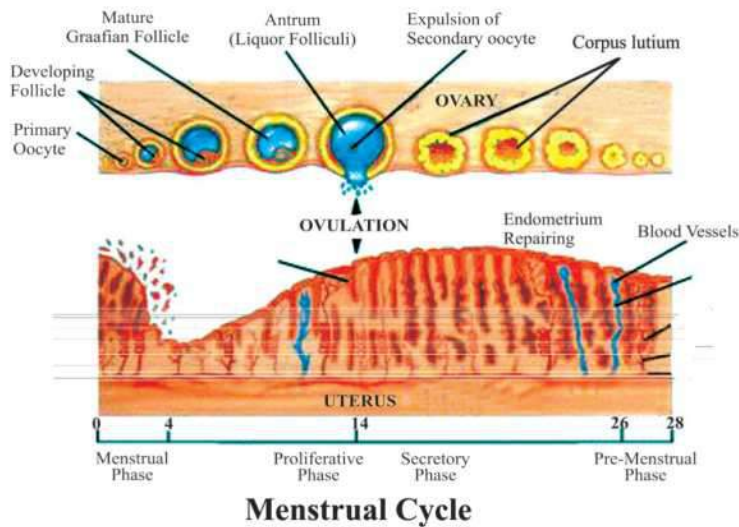
Spermatogenesis : Process of formation of sperms in testis.

Germinal epithelium	46 (2n)
differentiation ↓ Mitosis	
Spermatogonia	46 (2n)
↓ Mitosis	
Primary spermatocyte	46 (2n)
Ist Meiotic division ↓	
Secondary spermatocyte	23 (n)
2nd meiotic division ↓	
Spermatid	23 (n)
Spermiogenesis ↓	
Spermatozoa/sperm	23 (n)

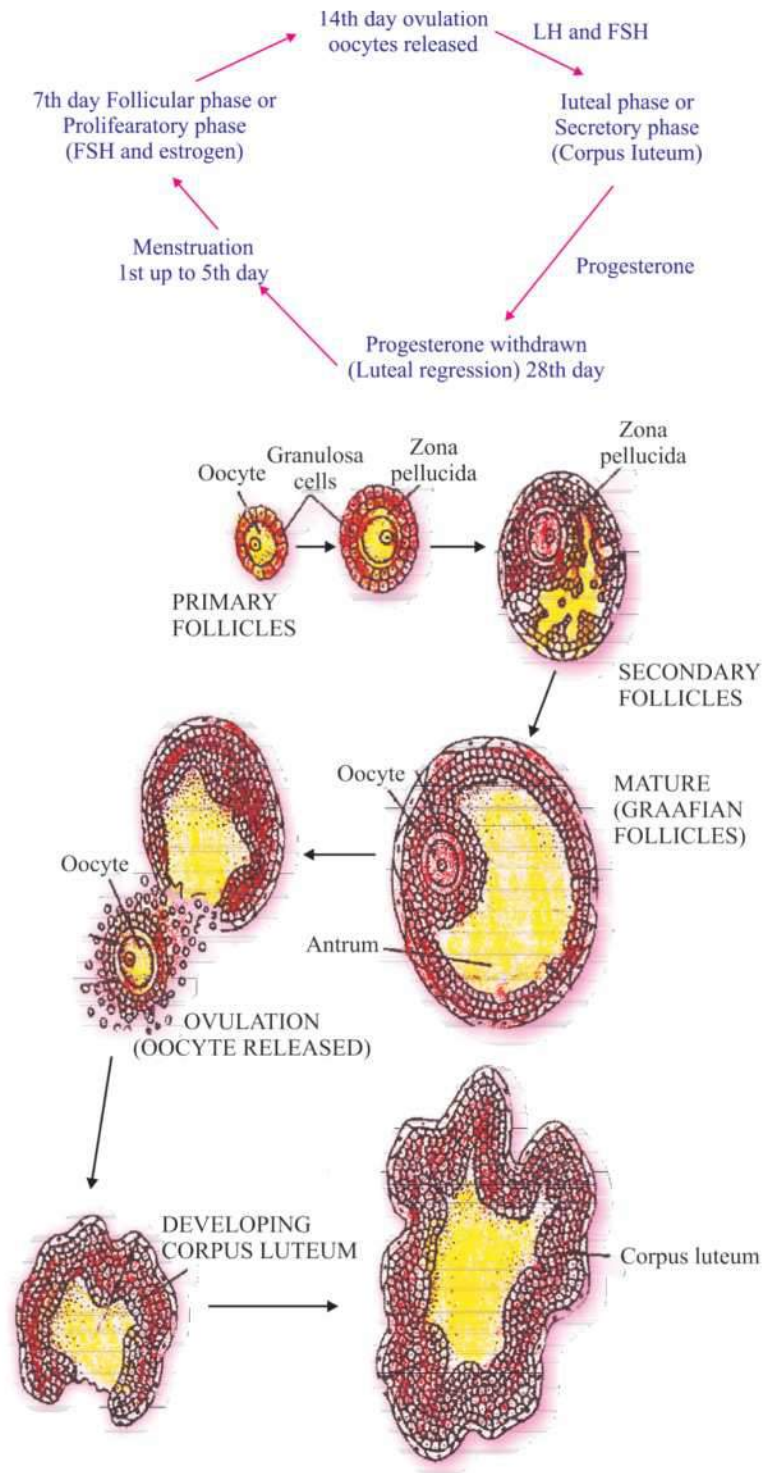
Oogenesis : Process of formation of ova in ovary.



Phases of Menstrual Cycle : Menstrual phase, Follicular (Proliferative) Phase, ovulatory phase and Luteal (secretory) phase



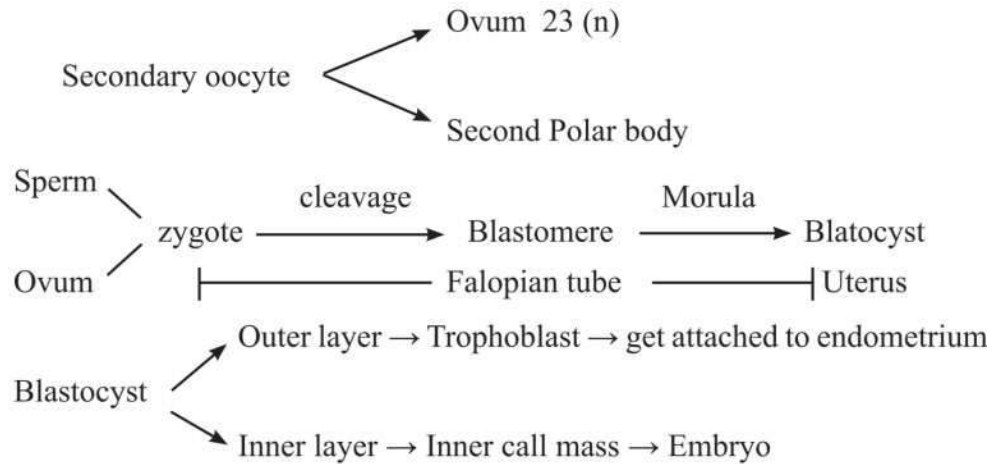
diag.- Menstrual Cycle



Fertilisation : Process of fusion of sperm with ovum

Site of fertilisation in human female : Ampullary region.

Secretion of acrosome helps the sperm entry into cytoplasm of ovum through zona pellucida and plasma membrane. Sperm entry induce the completion of the 2nd meiotic division of secondary oocyte.



Placenta : An intimate connection between foetus and uterine wall of the mother to exchange materials.

Function : Nutrition, Respiration, Excretion, as barrier, Endocrine function, shock absorber.

Placenta as Endocrine tissue : Placenta Produces several hormones such as Estrogen, hCG, hPL, Progesterone.

In late phase of pregnancy—relaxin hormone is released by ovary.

Progesterone is called ‘Pregnancy hormone’.

Embryonic Development : (at various month of pregnancy) After 1 month = Heart, 2 months = Limbs and digits, 3 months = External genital organ, 5 months = First movement, 6 months = body covered with fine hairs, eye lid, eye lashes, 9 months = Fully developed and ready for delivery.

Questions

VSA

(1 Mark)

1. Failure of testes to descend into Scrotal sacs leads to sterility. Why ?
2. How many sperms will be produced from 10 primary spermatocytes and how many eggs will be produced from 10 primary oocytes ?

3. In ovary which structure transforms as corpus luteum and name the hormone secreted by corpus luteum?

Chapter-3: Human Reproduction

Multiple-Choice Questions

4. Name the hormone that has no role in menstruation.
- LH
 - FSH
 - GH
 - TSH
5. $2n=16$ in a primary spermatocyte which is in metaphase of first meiotic division. What shall be the total number of chromatids in each of the secondary spermatocyte?
- 8
 - 16
 - 24
 - 32
6. Some important events in the human female reproductive cycle are given below. Arrange the events in a proper sequence.
- A - Secretion of FSH-I, B - Growth of corpus luteum, C - Growth of the follicle and oogenesis, D - Ovulation, E - Sudden increase in the levels of LH
- A, C, E, D, B
 - A, D, C, E, B
 - B, A, C, D, E
 - C, A, D, B, E
7. In the absence of acrosome, the sperm
- cannot get energy
 - cannot penetrate the egg
 - cannot swim
 - cannot get food

8. In oocyte, secondary maturation division occurs in
- (a) Ovary
 - (b) Abdominal cavity
 - (c) Fallopian tube
 - (d) Uterus

Assertion-Reason Questions

9. **Assertion:** Colostrum provides nutrition and helps the new born baby to develop resistance for healthy growth.

Reason: Colostrum contains proteins, lactose and antibodies such as IgA.

- a) Both assertion and reason are true, and reason is the correct explanation of assertion.
 - b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
 - c) Assertion is true but reason is false.
 - d) Both assertion and reason are false.
10. **Assertion:** Sertoli cells provide nutrition and help in differentiation of cells undergoing spermatogenesis.

Reason: Leydig cells are present in connective tissue outside the seminiferous tubule.

- a) Both assertion and reason are true, and reason is the correct explanation of assertion.
- b) Both assertion and reason are true, but reason is not the correct explanation of assertion.
- c) Assertion is true but reason is false.
- d) Both assertion and reason are false.

Case-based Questions

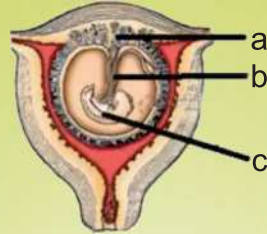
11. Read the following and answer any four questions from (i) to (v) given below:
- The reproductive cycle in female primates is called the menstrual cycle. One ovum is released during the middle of each menstrual cycle. The cycle starts with the menstrual phase when menstrual flow occurs and it lasts for 3-5 days. The menstrual flow results due to the breakdown of the endometrial lining of the uterus and its blood vessels which form a liquid that comes out through the

vagina. The menstrual phase is followed by the follicular phase, the primary follicles in the ovary grow to become a fully mature Graafian follicle. Both LH and FSH attain a peak level in the middle of the cycle. The ovulatory phase is followed by the luteal phase during which the remaining parts of the Graafian follicle transform. During pregnancy, all events of the menstrual cycle stop and there is no menstruation.

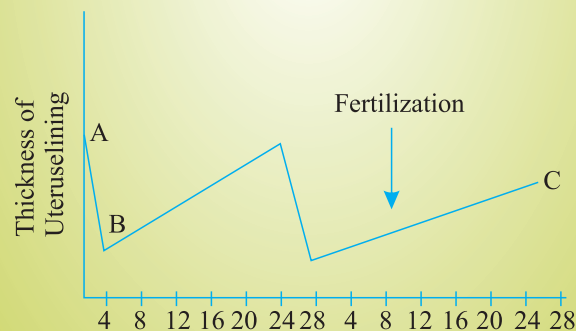
- (i) At what stage of life is oogenesis initiated in a human female?
- a) At puberty
 - b) During menarche
 - c) During menopause
 - d) During embryonic development
- (ii) Ovulation in the human female normally takes place during the menstrual cycle
- a) at the middle of secretory phase
 - b) just before the end of the secretory phase
 - c) at the beginning of the proliferative phase
 - d) at the end of the proliferative phase
- (iii) Immediately after ovulation, the mammalian egg is covered with a membrane known as
- a) chorion
 - b) zona pellucida
 - c) corona radiata
 - d) vitelline membrane
- (iv) Which one of the following events are correctly matched with the time period in a normal menstrual cycle?
- a) Release of egg: 5th day
 - b) Endometrium regenerates: 5-10 days
 - c) Endometrium secretes nutrients for implantation: 11-18 days
 - d) Rise in progesterone level: 1-15 days
- (v) Identify the correct sequence
- a) Primary follicle, ovum, corpus luteum, Graafian follicle
 - b) Corpus luteum, Graafian follicle, Primary follicle, ovum

- c) Primary follicle, Graafian follicle, ovum, corpus luteum
- d) Corpus luteum, Primary follicle, Graafian follicle, ovum

12. The following figure shows a foetus within the uterus. On the basis of the given figure, answer the questions that follow:

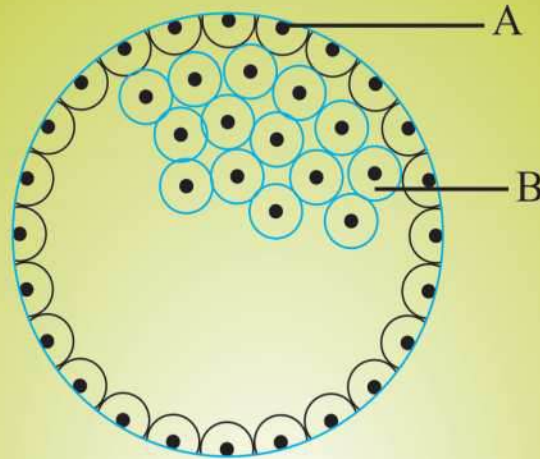


- (a) In the above figure, label the parts a, b and c.
 - (b) In the above figure, choose and name the correct part (a, b or c) that act as a temporary endocrine gland and substantiate your answer.
 - (c) Mention the role of the 'b' in the development of the embryo.
 - (d) Name the fluid surrounding the developing embryo. How is it misused for sex determination?
13. The graph given below shows how the lining of the uterus in a female who has achieved puberty varies with time. Examine the graph and answer the following questions.

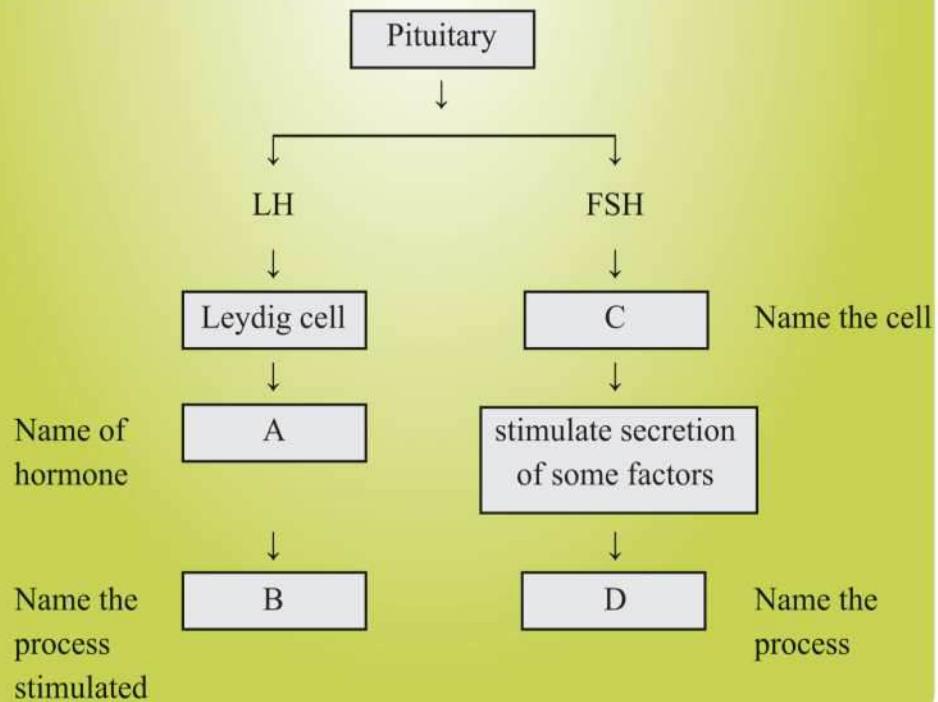


- (a) What is happening between A and B?
- (b) When the ovulation will take place? Surge of which pituitary hormone is required for ovulation?
- (c) Fertilisation occurs on the 16th day of the second menstrual cycle. How do you expect the graph to behave after points C? Will the pattern of the first and second months be followed?
- (d) Write the role of yolk sac.

14. In the given figure, give the name and functions of parts labelled A and B.



15. Given below is an incomplete flow chart showing influence of hormone on gametogenesis in male, observe the flow chart carefully and fill in the blank A, B, C and D.



16. Give reason for the following :

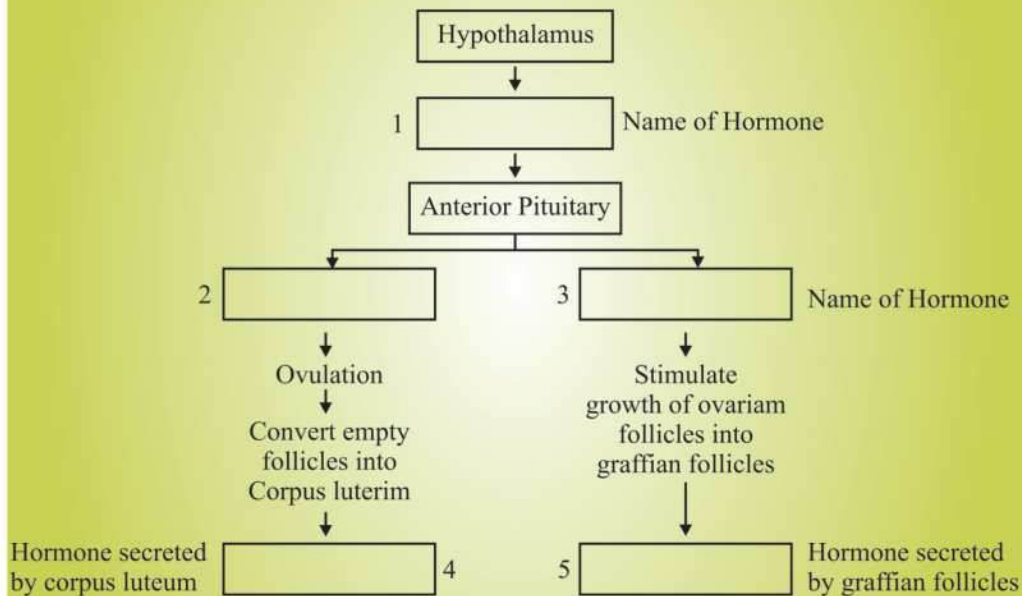
- (a) The first half of the menstrual cycle is called follicular phase as well as proliferative phase.
- (b) The second half of the menstrual cycle is called luteal phase as well as secretory phase.

17. What is meant by L.H. Surge ? Write the role of L.H.

SA-II

(3 Marks)

18. Study the flow chart given below. Name the hormones involved at each stage and in human female.

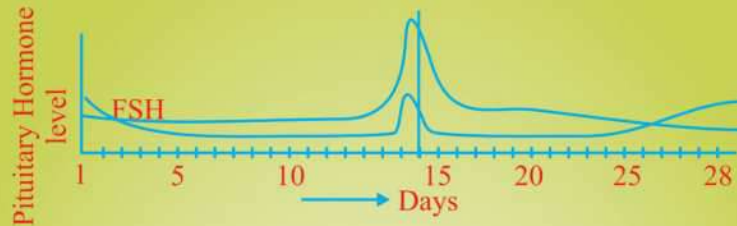


19. Three of the steps of neuro-endocrine mechanism in respect of parturition are mentioned below.

Write the missing steps in proper sequence.

- (a) Signals originate from fully developed foetus and placenta.
- (b)
- (c)
- (d) Oxytocin causes strong uterine contraction
- (e) Uterine contraction stimulates further secretion of oxytocin.
- (f)

20.(a) Read the graph given below. Correlate the ovarian events that take place in the human female according to the level of the pituitary hormone during the following day.



(i) 10th – 14th days (ii) 14th – 15th days

(iii) 16th – 23th days (iv) 25th – 29th days

(If the ovum is not fertilised)

(b) What are the uterine events that follow beyond 29th day if the ovum is not fertilised.

21. T.S. of mammalian testis revealing seminiferous tubules show different types of cell.

(i) Name the two types of cells of germinal epithelium.

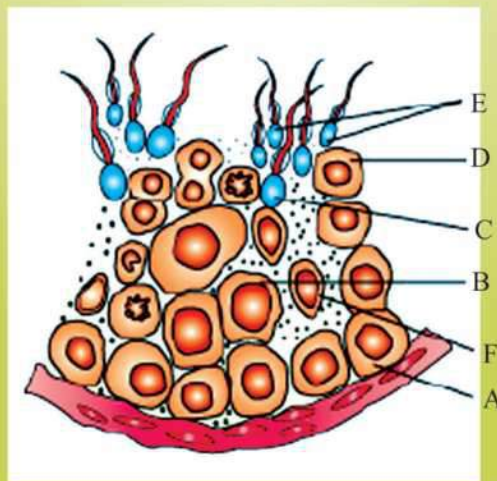
(ii) Name of cells scattered in connective tissue and lying between seminiferous tubules.

Differentiate between them on the basis of their functions.

LA

(5 Marks)

22.



Study the figure given :

- (i) Pick out the name of cells that undergo spermiogenesis.
- (ii) Name A, B, C and F.
- (iii) Give ploidy of B and E.
- (iv) Mention the function of 'F' cell.

Answers

VSA

(1 Mark)

1. High temperature of abdomen kills the spermatogenic tissue of the testes, so no sperm are formed.
2. 40 sperms, 10 eggs.
3.
 - Follicular cells of empty Graafian follicle.
 - Progesterone.

Answer of Multiple-Choice Question :

4. (c) 5. (b) 6. (a) 7. (b) 8. (c)

Answer of Assertion-Reason Question :

9. (a) 10. (b) 11. (i) (d), (ii) (d), (iii) (d), (iv) b, (v) (c)

SA-I

(2 Marks)

12. (a) a-Placental villi, b- umbilical cord, c - embryo
(b) Part 'a' is placenta which act as temporary endocrine tissue and producers several hormones like human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens and progestogens.
(c) 'b' is the umbilical cord. It connects placenta to embryo and help in transportation of substances to and from the embryo.
(d) Amniotic fluid. Used to determine sex based on chromosomal pattern of cells of amniotic fluid and misused for female foeticide.
13. (a) It represents menstrual flow. During this phase the uterus lining is said along with the blood and moves out of the body in the form of bleeding.
(b) 14th day or in the mid of the cycle. LH surge (Luteinising Hormone increases)

- (c) since fertilisation occurs on the day 16, the graph after point C will be straight lined. y if the ovum is It is because once fertilization occurs, the uterus lining is retained and no bleeding /menstrual flow occurs during that period.
- (d) It provides nutrition and gas exchange between mother and developing embryo before the placenta forms.

14. A = Trophoblast – Gets attached to endometrium and draws nutritive material material secreted by uterine endometrium gland.

B = Inner cell mass – Differentiates as Embryo.

15. A = Testosterone; B = Spermatogenesis

C = Sertoli cells; D = Spermiogenesis

16. (a) During this phase, primary follicles transform into Graafian follicle under FSH stimulation. Graafian follicles secrete Estrogens with stimulate enlargement of Endometrium of uterus.

(b) During this phase, Corpus luteum is fully formed and secretes large quantity of Progesterone.

17. LH surge refers to maximum level of luteinising hormone middle of menstrual cycle. LH causes ovulation.

SA-II

(3 Marks)

18. Hypothalamus → 1. GnRH → Anterior pituitary ———— $\left\{ \begin{array}{l} 2. LH \\ 3. FSH \end{array} \right.$

4. Progesterone 5. Estrogen

19. (b) Foetal ejection reflex
- (c) The reflex triggers release of oxytocin
 - (f) Expulsion of the baby out through birth canal.
20. (a) (i) Gonadotropins and FSH increase
- (ii) LH attains peak level but FSH decrease
 - (iii) LH and FSH level decrease
 - (iv) LH remains low and FSH increases.
- (b) After 29th day there is a menstrual flow involving discharge of blood and cast off endometrium lining.
21. (i) Germinal epithelium have two types of cells. 1. Spermatogonium.
2. Sertoli cells
- (ii) Leydig's cell or Interstitial cells.

Functions

Spermatogonium undergoes meiotic division leading to sperm formation.

Sertoli cell : Nourishes germ cells

Leydig cell : Synthesise and Secrete hormone androgen.

LA

(5 Marks)

22. (i) D—Spermatids
- (ii) A—Spermatogonium; B—Primary spermatocyte
C—Secondary spermatocyte F—Sertoli cells
- (iii) B—Diploid E—Haploid
- (iv) Provide nourishment to germ cells.

