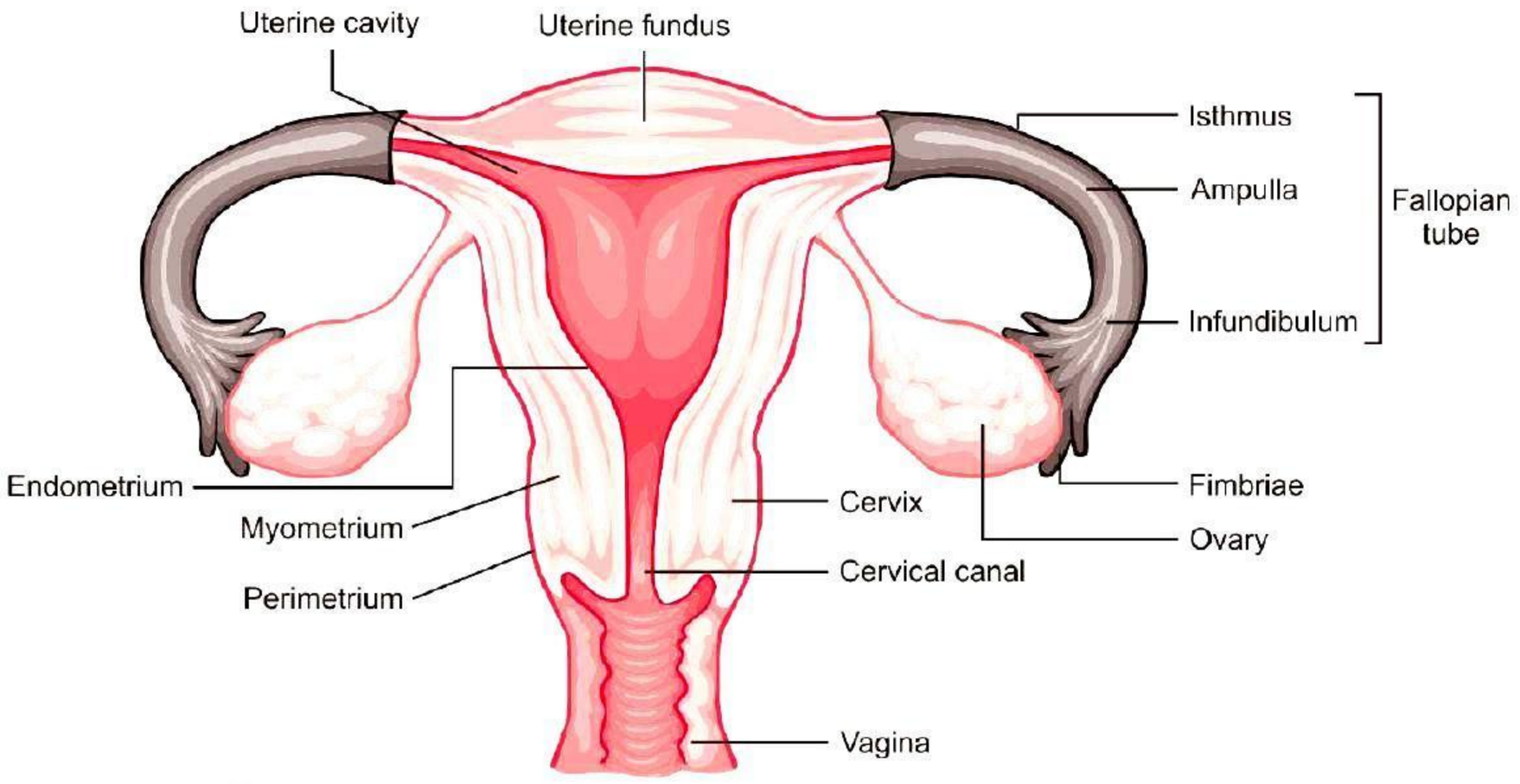
HUMAN REPRODUCTION

BASIC CONCEPTS

1. Sperms are produced in the seminiferous tubules. Each seminiferous tubule is lined on its inside by male germ cells (**spermatogonia**) and **Sertoli cells**. Spermatogonia undergo meiotic cell division to produce sperms. **Sertoli cells** or **nurse cells** provide nutrition to the germ cells.
2. The regions outside the seminiferous tubules contain masses of cells called interstitial cells or **Leydig cells**. Leydig cells synthesise and secrete the male hormones called **androgens (testosterone)** which maintain male sex characteristics.
3. The accessory or secondary glands include a prostate gland, two seminal vesicles and two bulbourethral glands.
   - (*i*) **Prostate gland:** It surrounds the urethra and produces a milky secretion which forms a considerable part of the semen. This secretion contains citric acid, lipids and enzymes. Secretion of the prostate gland nourishes and activates the spermatozoa to swim.
   - (*ii*) **Seminal vesicles:** These secrete mucus and a watery alkaline fluid that contains fructose which provides energy to the sperms.
   - (*iii*) **Bulbourethral glands** or Cowper's glands are attached to the urethra below the prostate gland. They secrete mucus fluid for the lubrication of the penis.
4. Ovaries are the primary female sex organs that produce the female gametes (ovum) and several steroid hormones (ovarian hormones). Each ovary is almond-like flattened body, measuring about 2–4 cm in length. The outer region of the ovary is composed of developing follicles and the middle region forms the stroma which contains connective tissue, blood vessels and mature follicles.

   The stroma is divided into two regions: a peripheral cortex and an inner medulla.

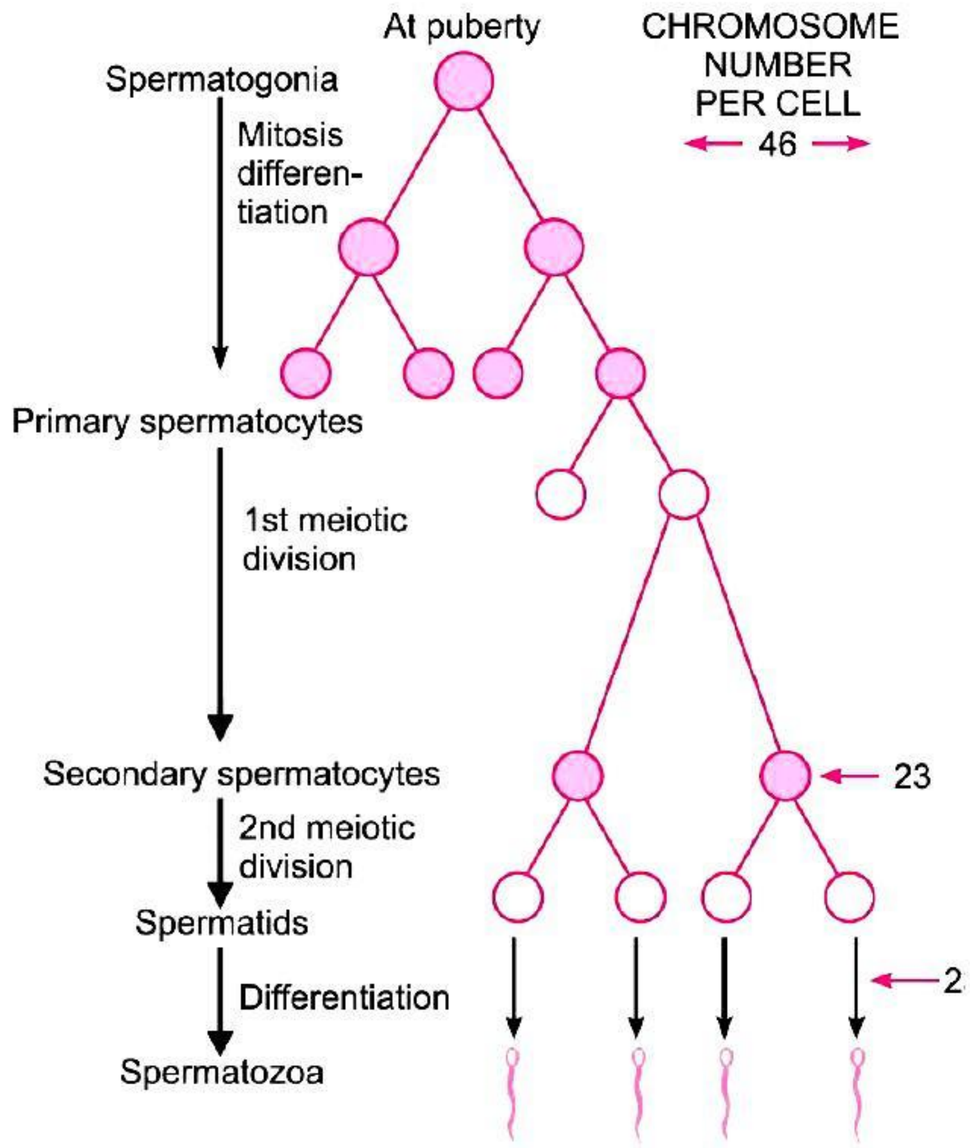


Diagrammatic sectional view of the female reproductive system

5. The wall of the uterus has three layers of tissue:
   (*i*) **Perimetrium:** Outer, thin membranous covering of the uterus wall.
   (*ii*) **Myometrium:** Middle, thick layer of smooth muscle fibres which contracts strongly during delivery of the baby.
   (*iii*) **Endometrium:** Inner layer, that contains glands and many blood vessels. It undergoes cyclical changes during the menstrual cycle.

6. The process of formation of spermatozoa (sperms) from diploid spermatogonia is called spermatogenesis. It occurs in the seminiferous tubules of the testes after attaining puberty.

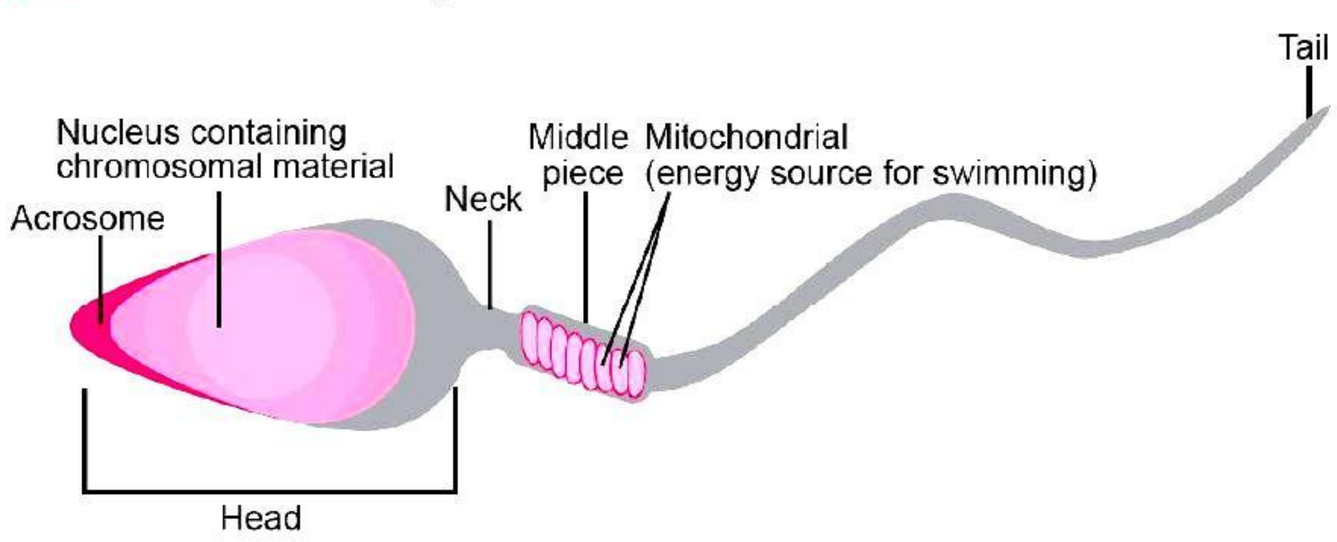
   It includes the following phases:
   (*i*) **Multiplication phase:** Spermatogonia multiply by mitotic division and increase in numbers.
   (*ii*) **Growth phase:** Spermatogonia grow and increase in size and form primary spermatocytes.
   (*iii*) **Maturation phase:** A primary spermatocyte completes the first meiotic division leading to formation of two equal haploid cells called secondary spermatocytes. The secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids.
   (*iv*) **Differentiation phase:** The spermatids are transformed into spermatozoa (sperms) by the process of spermiogenesis.



Schematic representation of spermatogensis

7. Spermatogenesis is initiated at the age of puberty by the gonadotropin releasing hormone (GnRH) secreted by the hypothalamus. The increased levels of GnRH stimulate the anterior pituitary which then secretes the FSH (follicle stimulating hormone) and LH (luteinising hormone). FSH stimulates Sertoli cells to secrete some factors which help in spermiogenesis.

8. **Spermatozoa:** It consists of four parts:



Structure of a sperm

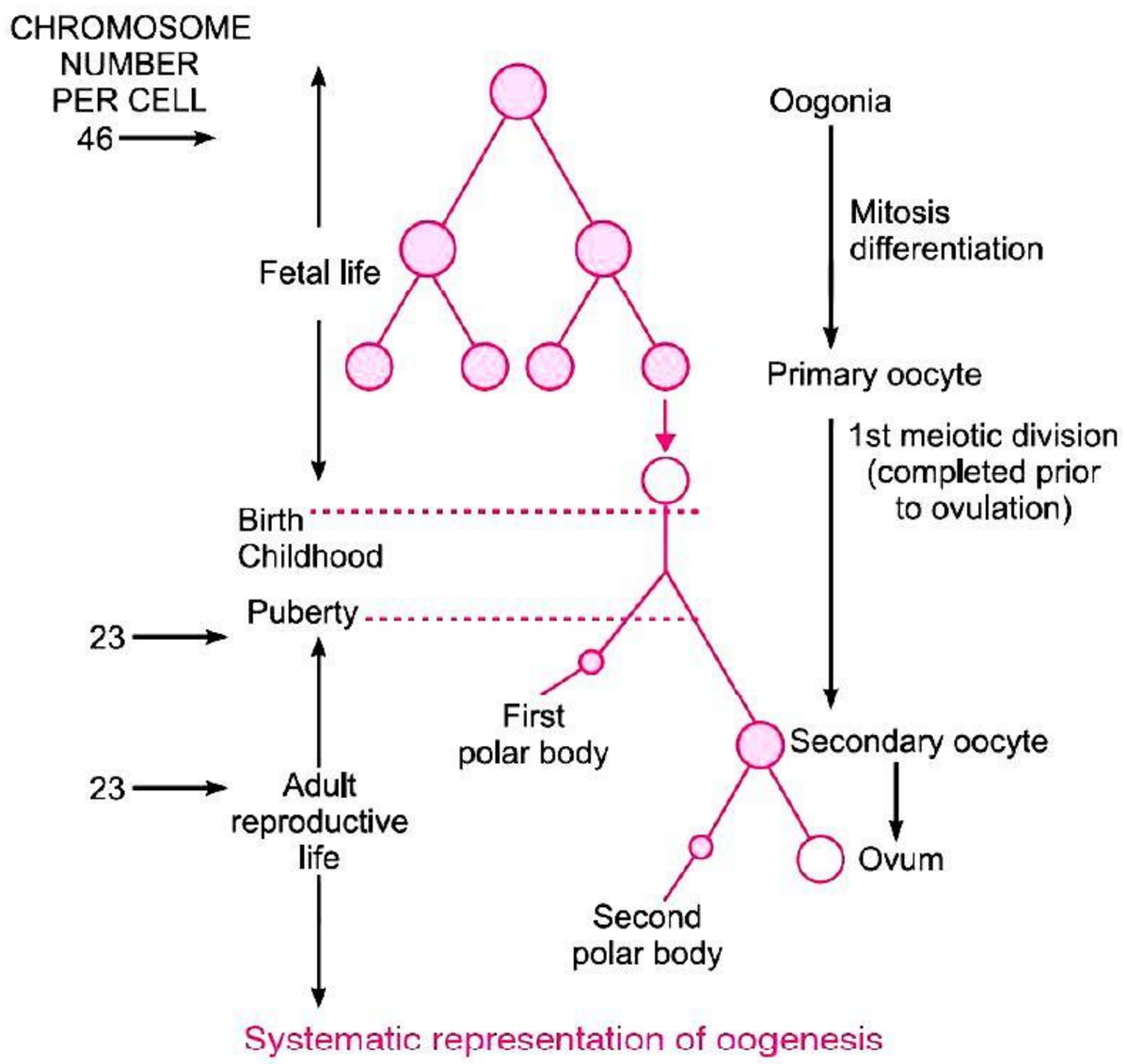
   (*i*) **Head:** It contains the large haploid nucleus and is capped by acrosome. The acrosome contains hydrolytic enzymes that help in dissolving membranes of the ovum for fertilisation.
   (*ii*) **Neck:** It contains proximal centriole which is necessary for the first cleavage division of zygote.

(*iii*) **Middle piece:** It contains a number of mitochondria that provide energy for the movement of the tail.

(*iv*) **Tail:** It helps the sperms to swim in a fluid medium.

9. The process of formation of a mature female gamete is called oogenesis. It occurs in the ovaries. It consists of the following three phases:

(*i*) **Multiplication phase:** Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each foetal ovary. These cells start division and enter into prophase-I of the meiotic division. They get temporarily arrested at this stage and are called primary oocytes.



Systematic representation of oogenesis

(*ii*) **Growth phase:** Each primary oocyte then gets surrounded by a layer of granulosa cells. This structure is called the primary follicle. The primary follicles get surrounded by more layers of granulosa cells and a new theca to form secondary follicles.

(*iii*) **Maturation phase:** In the first maturation phase, the secondary follicle soon transforms into a tertiary follicle. The primary oocyte within the tertiary follicle grows in size and completes its first meiotic division to form a large, haploid, secondary oocyte and a tiny first polar body. The tertiary follicle changes into a mature follicle—the Graafian follicle—which ruptures to release the secondary oocyte (ovum) from the ovary by a process called ovulation. The second maturation phase occurs after fertilisation when the meiotic division of the secondary oocyte is complete. This second meiotic division results in the formation of a second polar body and a haploid ovum (ootid).

10. The menstrual cycle has four phases. These are:

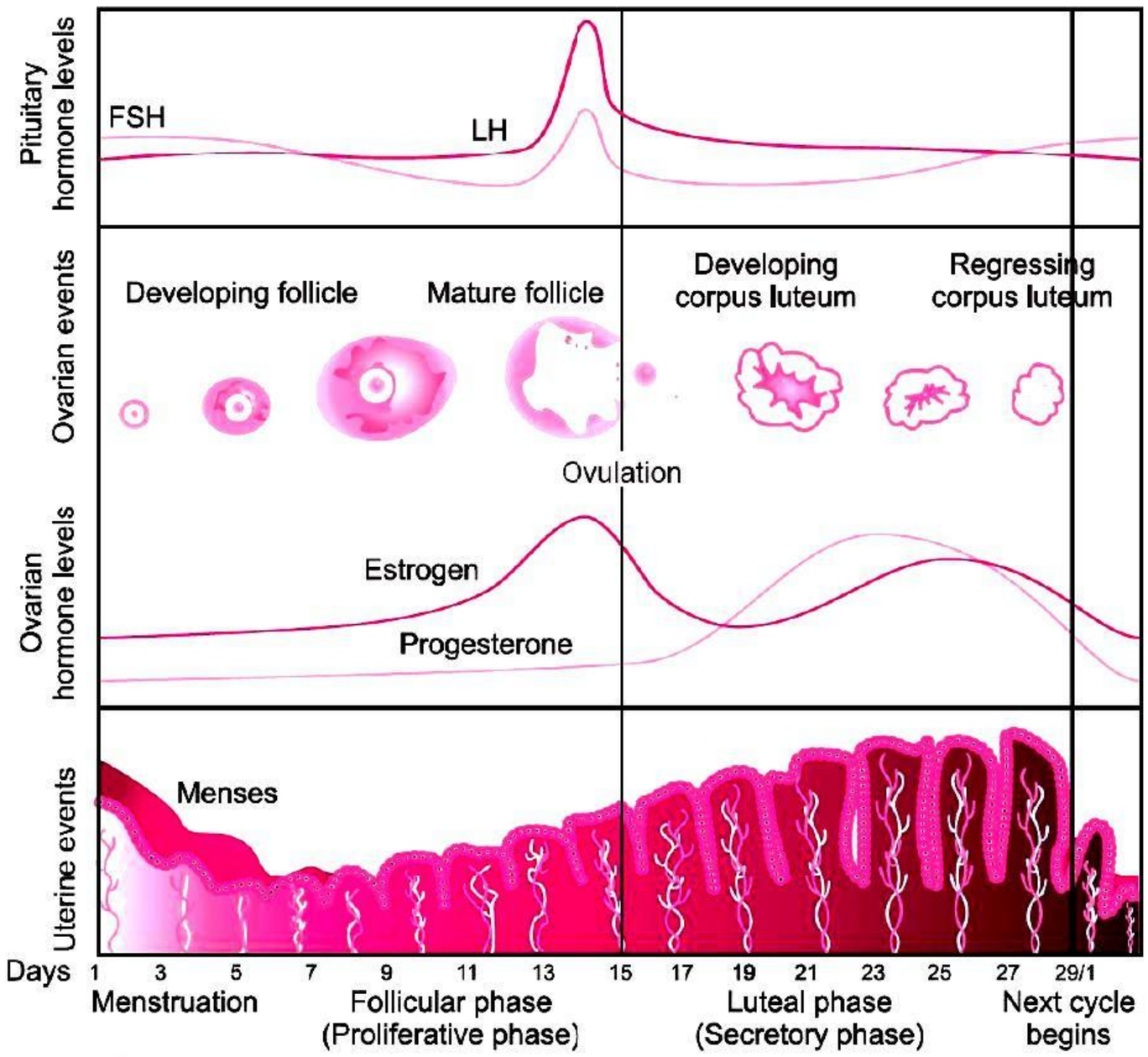
(*i*) **Menstrual phase:** The menstrual flow results due to breakdown of endometrial lining of uterus and its blood vessels, that are discharged through vagina. The unfertilised egg and soft tissues are discharged.

(*ii*) **Follicular phase/Proliferative phase:** The primary follicles in the ovary grow and become a fully mature Graafian follicle. The endometrium of the uterus is regenerated due to the secretion of LH and FSH from anterior pituitary and ovarian hormone, estrogen.

(*iii*) **Ovulatory phase:** Rapid secretion of LH leading to its maximum level during mid cycle called **LH surge**, induces rupture of Graafian follicle, thereby leading to **ovulation** (release of ovum).

(*iv*) **Luteal phase/Secretory phase:** In this phase the ruptured follicle changes into **corpus luteum** in the ovary and it begins to secrete the hormone progesterone which is essential for maintenance of endometrium. The endometrium thickens further and their glands secrete a fluid into the uterus.

If ovum is not fertilised, the corpus luteum undergoes degeneration and this causes disintegration of the endometrium leading to menstruation.



Diagrammatic representation of various events during a menstrual cycle

11. Functions of Placenta:

(*i*) Provides nutrients and oxygen to the developing embryo.

(*ii*) Removes CO_2 and waste materials from the embryo.

(*iii*) Acts as an endocrine tissue and produces several hormones like **human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens, progesterones** that are essential to maintain pregnancy.

In later phase of pregnancy, hormone called **relaxin** is also secreted by ovary. During pregnancy, levels of other hormones like estrogen, progesterone, cortisol, prolactin, thyroxine, etc. are increased several fold and are essential for supporting foetal growth, metabolic changes in mother and maintenance of pregnancy.

12. The act of expelling the full term foetus from the mother's uterus at the end of gestation period by vigorous contraction of uterus is called parturition. Parturition signals originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.

MULTIPLE CHOICE QUESTIONS

Choose and write the correct option in the following questions.

1. Which hormone of pituitary gland regulates Sertoli cells?

(*a*) LH (*b*) FSH

(*c*) GH (*d*) prolactin

2. The correct sequence of stages in spermatogenesis are:

(*a*) spermatogonia → spermatid → spermatocyte → sperm

(*b*) spermatocyte → spermatogonia → spermatid → sperm

(*c*) spermatogonia → spermatocyte → spermatid → sperm

(*d*) spermatid → spermatocyte → spermatogonia → sperm

3. **Seminal plasma in humans is rich in**

(*a*) fructose and calcium
(*b*) glucose and calcium
(*c*) progesterone and testosterone
(*d*) potassium and calcium

4. **The signals of parturition originate from**

(*a*) placenta
(*b*) fully developed foetus
(*c*) oxytocin released from pituitary
(*d*) both placenta and fully developed foetus

5. **The Leydig cells are a source of**

(*a*) fructose
(*b*) androgens
(*c*) progesterone
(*d*) mucus

6. **The function of corpus luteum is to produce**

(*a*) estrogen
(*b*) progesterone
(*c*) HCG
(*d*) relaxin

7. **Choose the incorrect statement from the following.** *[NCERT Exemplar]*

(*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 fertilisation.

8. **Identify the correct statement from the following.** *[NCERT Exemplar]*

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

9. **Spot the odd one out from the following structures with reference to the male reproductive system.** *[NCERT Exemplar]*

(*a*) Rete testis
(*b*) Epididymis
(*c*) Vasa efferentia
(*d*) Isthmus

10. **Seminal plasma, the fluid part of semen, is contributed by** *[NCERT Exemplar]*

(*i*) Seminal vesicle
(*ii*) Prostate gland
(*iii*) Urethra
(*iv*) Bulbourethral gland

(*a*) (*i*) and (*ii*)
(*b*) (*i*), (*ii*) and (*iv*)
(*c*) (*ii*), (*iii*) and (*iv*)
(*d*) (*i*) and (*iv*)

11. **Which of the following statements is incorrect?**

(*a*) GnRH stimulates secretion of FSH and LH.
(*b*) LH stimulates the Leydig cells to secrete androgen.
(*c*) FSH acts on the Sertoli cells and stimulates spermiogenesis.
(*d*) None of these

12. **Spermiation is the process of release of sperms from** *[NCERT Exemplar]*

(*a*) seminiferous tubules
(*b*) vas deferens
(*c*) epididymis
(*d*) prostate gland

13. **Mature Graafian follicle is generally present in the ovary of a healthy human female around** *[NCERT Exemplar]*

(*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

14. Acrosomal reaction of the sperm occurs due to [*NCERT Exemplar*]

(*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

15. Which one of the following is not a male accessory gland? [*NCERT Exemplar*]

(*a*) Seminal vesicle (*b*) Ampulla

(*c*) Prostate (*d*) Bulbourethral gland

16. The immature male germ cells undergo division to produce sperms by the process of spermatogenesis. Choose the correct one with reference to above. [*NCERT Exemplar*]

(*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.

17. Match between the following representing parts of the sperm and their functions and choose the correct option. [*NCERT Exemplar*]

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

(*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*)

18. Number of chromosomes in polar body of human is

(*a*) 23 (*b*) 46

(*c*) 21 (*d*) 1

19. Which among the following has 23 chromosomes? [*NCERT Exemplar*]

(*a*) Spermatogonia (*b*) Zygote

(*c*) Secondary oocyte (*d*) Oogonia

20. Match the following and choose the correct option. [*NCERT Exemplar*]

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**

(*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*)

21. Which of the following hormones is not secreted by human placenta? [*NCERT Exemplar*]

(*a*) hCG (*b*) Estrogens

(*c*) Progesterone (*d*) LH

22. The vas deferens receives duct from the seminal vesicle and opens into urethra as [*NCERT Exemplar*]

(*a*) epididymis (*b*) ejaculatory duct

(*c*) efferent ductule (*d*) ureter

23. Urethral meatus refers to the [*NCERT Exemplar*]

(*a*) urinogenital duct
(*b*) opening of vas deferens into urethra
(*c*) external opening of the urinogenital duct
(*d*) muscles surrounding the urinogenial duct

24. Morula is a developmental stage [*NCERT Exemplar*]

(*a*) between the zygote and blastocyst (*b*) between the blastocyst and gastrula
(*c*) after the implantation (*d*) between implantation and parturition

25. The membranous cover of the ovum at ovulation is [*NCERT Exemplar*]

(*a*) corona radiata (*b*) zona radiata
(*c*) zona pellucida (*d*) chorion

26. Identify the odd one from the following. [*NCERT Exemplar*]

(*a*) Labia minora (*b*) Fimbriae
(*c*) Infundibulum (*d*) Isthmus

27. What is common in sperms and ovum?

(*a*) Diploidy (*b*) Polyploidy
(*c*) Haploidy (*d*) Presence of same type of chromosomes

28. Sucking of milk takes place through

(*a*) mammary alveoli (*b*) mammary tubules
(*c*) mammary ampulla (*d*) mammary duct

29. Human females are

(*a*) heterogametic (*b*) monogametic
(*c*) agametic (*d*) homogametic

30. Choose the correct statement regarding oxytocin.

(*a*) It helps in contraction of uterine muscles. (*b*) It controls the blood pressure.
(*c*) It facilitates parturition. (*d*) It helps to expand the ligaments.

31. Number of testicular lobules found in each testis of human being is

(*a*) 100 (*b*) 200
(*c*) 250 (*d*) 500

32. Process of delivery of the foetus (child birth) is known as

(*a*) gastrulation (*b*) parturition
(*c*) gestation (*d*) implantation

33. Cells which secrete milk in mammary glands are

(*a*) acinar cells (*b*) chondrocytes
(*c*) leucocytes (*d*) cells of mammary alveoli

34. Stem cells are the part of

(*a*) ectoderm (*b*) mesoderm
(*c*) both (*a*) and (*b*) (*d*) inner cell mass

35. The number of mammary lobes in each mammary gland is

(*a*) 30 – 40 (*b*) 50 – 70
(*c*) 15 – 20 (*d*) 80 – 90

36. 'The middle piece of human sperm is considered as the powerhouse of the sperm'. This is because

(*a*) it contains numerous mitochondria which produce energy for movement of sperms
(*b*) it is responsible for the movement of sperms which helps in fertilisation
(*c*) it holds the DNA of the cell to break through the egg membrane
(*d*) both (*b*) and (*c*)

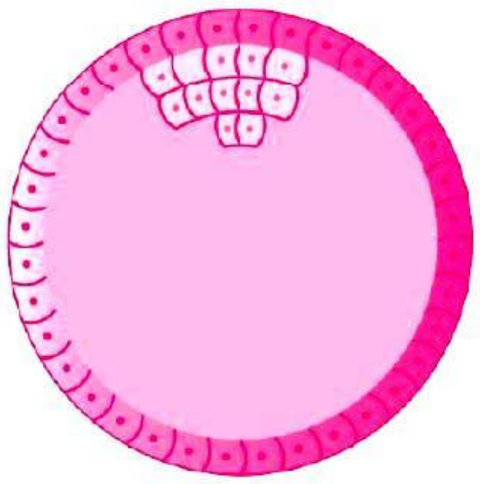
37. **_____ova and _____ functional sperms will be formed by a primary oocyte and primary spermatocyte, respectively.**

(*a*) One, four
(*b*) Four, one
(*c*) Four, four
(*d*) One, one

38. **Follicular phase of menstrual cycle is also called**

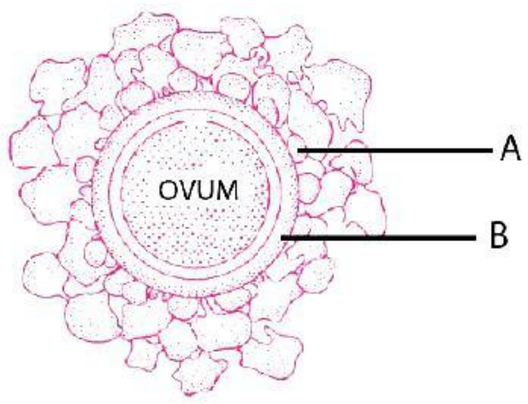
(*a*) menstruation phase
(*b*) proliferative phase
(*c*) luteal phase
(*d*) ovulatory phase

39. **Identify the figure given below.**



(*a*) Morula
(*b*) Embryo
(*c*) Trophoblast
(*d*) Blastocyst

40. **In the following diagram of 'ovum' identify 'A' and 'B'.**



(*a*) A : Zona pellucida, B : Corona radiata
(*b*) A : Corona radiata, B: Zona pellucida
(*c*) A : Yolk sac, B : Zona pellucida
(*d*) A : Corona radiata, B : Yolk sac

41. **The sperms penetrate through the zona pellucida in human ovum with the help of**

(*a*) mitochondria present in the sperm cells
(*b*) tail as it facilitates sperm motility
(*c*) both (*a*) and (*b*)
(*d*) secretions from the acrosome

42. **Which of the following stimulates the pituitary to release the hormone responsible for parturition?**

(*a*) Oxytocin
(*b*) Foetal ejection reflex
(*c*) Relaxin
(*d*) Chorionic villi

43. **Which of the following statement is true about chorionic villi?**

(*a*) Chorionic villi appear on morula after implantation.
(*b*) The chorionic villi and uterine tissue become interlocked and forms the placenta between developing embryo and maternal body.
(*c*) Both (*a*) and (*b*)
(*d*) The blastomeres in blastocyst are arranged into an outer layer. The layer is the chorionic villi.

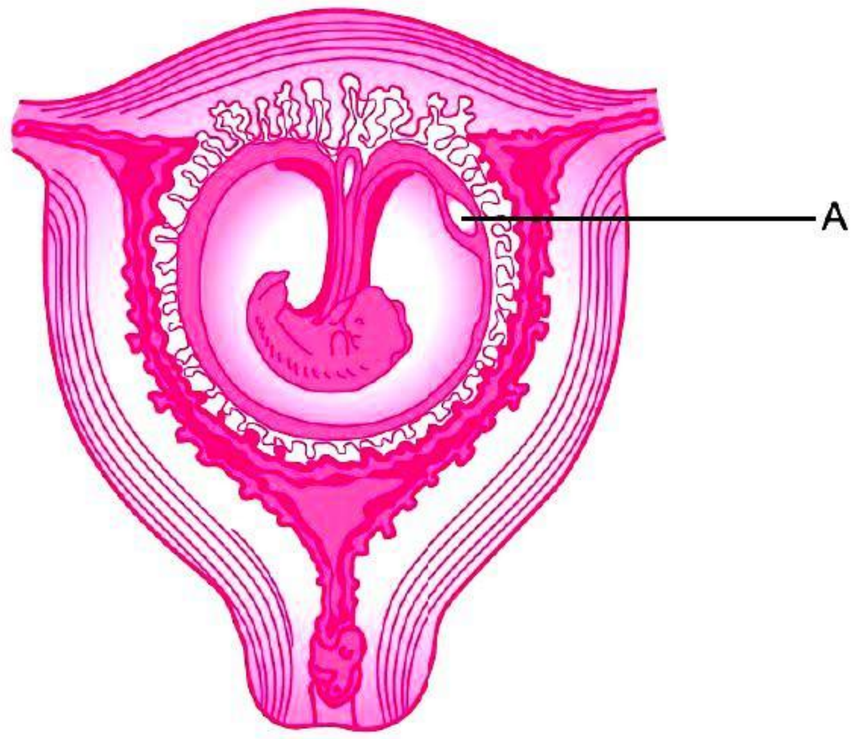
44. **The embryonic stage that gets implanted in the uterine wall of human female is**

(*a*) morula
(*b*) trophoblast
(*c*) blastocyst
(*d*) gastrula

45. Generally, woman cannot conceive a child after fifty years of age. This is because of

(*a*) old age
(*b*) menarche
(*c*) hormones
(*d*) menopause

46. In the following diagram of a human foetus within the uterus, identify 'A'.



(*a*) Yolk sac
(*b*) Umbilical cord
(*c*) Cavity of uterus
(*d*) Placental villi

47. Choose the correct statement(s).

(*i*) Androgens are produced by Sertoli cells.
(*ii*) Oogenesis takes place in corpus luteum.
(*iii*) Menstrual cycle stops during pregnancy.
(*iv*) Presence/absence of hymen is not a reliable indicator of virginity.

(*a*) (*i*)
(*b*) (*iii*), (*iv*)
(*c*) (*iii*), (*ii*)
(*d*) (*i*), (*iii*), (*ii*)

48. When does oogenesis and spermatogenesis initiate in

(A) human males and	**(B) females, respectively?**
(*a*) Foetal stage	Puberty
(*b*) Puberty	Puberty
(*c*) Puberty	Foetal stage
(*d*) Foetal stage	Foetal stage

49. Hormones produced only during pregnancy is/are:

(*a*) human chorionic gonadotropin
(*b*) human placental lactogen
(*c*) relaxin
(*d*) all of these

50. In a female reproductive system, fimbriae are present in

(*a*) edges of infundibulum
(*b*) edges of isthmus
(*c*) edges of perimetrium
(*d*) uterine fundus

51. Match the number of chromosomes in column I with the cells of human female in column II.

Column I	Column II
1. 46	A. Secondary oocyte
2. 23	B. Primary oocyte
3. 46	C. Follicles

(*a*) 1—C, 2—B, 3—A
(*b*) 1—C, 2—A, 3—B
(*c*) 1—A, 2—C, 3—B
(*d*) 1—B, 2—C, 3—A

52. During ovulation, the egg from ovary are released into

(*a*) oviduct (*b*) uterus

(*c*) vagina (*d*) cervix

53. _____ is the outermost layer of a blastocyst.

(*a*) Ectoderm (*b*) Mesoderm

(*c*) Trophoblast (*d*) Endoderm

54. Choose the odd one out.

(*a*) Rete testis (*b*) Vasa efferentia

(*c*) Vas deferens (*d*) Ampulla

55. Choose the incorrect statement.

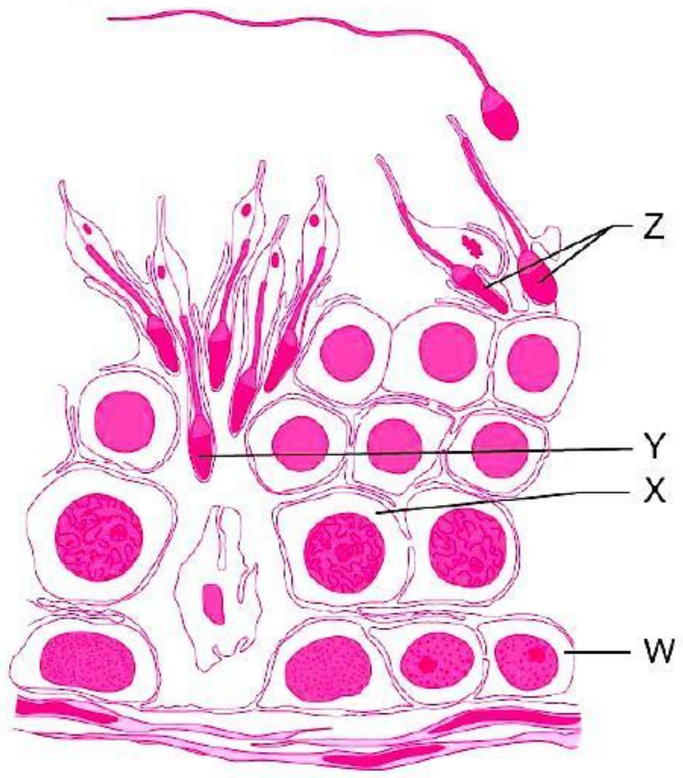
(*a*) Sertoli cells nourish the germ cells in the testes.

(*b*) The finger like projection, fimbriae, help in the collection of ovum into the fallopian tube.

(*c*) Leydig cells are a source of androgen.

(*d*) Morula is the developmental stage between the blastocyst and gastrula.

56. Identify the cells that undergo spermiogenesis from the diagram given below.



(*a*) W (*b*) Y

(*c*) X (*d*) Z

57. Which of the following is/are the primary sex organ(s) of human male?

(*a*) Testes (*b*) Seminal vesicle

(*c*) Prostate gland (*d*) All of these

58. In human male, the testes descend down into scrotal sac for

(*a*) spermatogenesis (*b*) spermiogenesis

(*c*) more space to visceral organs (*d*) independent functioning of kidney

59. Temperature in scrotum necessary for sperm formation should be

(*a*) 4°C lower than body temperature (*b*) 2°C lower than body temperature

(*c*) 4°C above body temperature (*d*) 2°C above body temperature

60. The capsule enclosing testes in human is

(*a*) tunica vasculosa (*b*) theca externa

(*c*) tunica vaginalis (*d*) tunica albuginea

61. Interstitial cells or Leydig cells

(*a*) synthesise androgens (*b*) secrete androgens

(*c*) both (*a*) and (*b*) (*d*) none of these

62. Common duct formed by union of vas deferens and duct from seminal vesicle is

(a) ejaculatory duct (b) epididymis
(c) urethra (d) spermatic duct

63. Which one is unpaired gland in male reproductive system?

(a) Seminal vesicle (b) Prostate gland
(c) Cowper's gland (d) None of these

64. What will happen if the vasa deferentia of a man are surgically cut?

(a) Spermatogenesis will be stopped. (b) Sperms in the semen become non-motile.
(c) Testosterone will disappear from blood. (d) Semen will be without sperms.

65. Seminal plasma of human is rich in

(a) fructose and magnesium (b) glucose and calcium
(c) fructose and calcium (d) glucose and sodium

66. Which of the following doesn't contribute to seminal plasma?

(a) Seminal vesicle (b) Prostate
(c) Bulbovestibular gland (d) Epididymis

67. Match the following representing parts of the sperm and their functions.

Column I	Column II
A. Head	1. Sperm lysins
B. Middle piece	2. Sperm motility
C. Acrosome	3. Powerhouse
D. Tail	4. Genetic material

(a) A—2, B—4, C—1, D—3 (b) A—4, B—3, C—1, D—2
(c) A—4, B—1, C—2, D—3 (d) A—2, B—1, C—3, D—4

68. Spermiation is the process of the release of sperms from

(a) seminiferous tubules (b) penis
(c) epididymis (d) Leydig's cell

69. In adult human male, sperms are produced

(a) continuously (b) periodically
(c) just before intercourse (d) just before ejaculation

70. Which one of the following is not associated with male reproductive system?

(a) Bulbourethral gland (b) Bulbovestibular gland
(c) Prostate gland (d) None of these

71. In which of the following parts of the male reproductive system sperms are stored and nourished ?

(a) Epididymis (b) Testis
(c) Seminiferous tubules (d) Vasa efferentia

72. Introduction of sperms into the female genital tract is called

(a) copulation (b) capacitation
(c) insemination (d) fertilisation

73. If Cowper's glands are removed, they will affect

(a) erection of penis (b) ova
(c) sperm mobility (d) sperm protection

74. Which among the following has 23 chromosomes?

(a) Spermatogonia (b) Primary spermatocyte
(c) Secondary oocyte (d) Oocytes may not show disjunction

75. In human female, secretion of which of the following hormones doesn't decrease during menopause?

(*a*) FSH (*b*) LH
(*c*) Both (*a*) and (*b*) (*d*) Estrogen

76. Endometrium is part of

(*a*) ovary (*b*) uterus
(*c*) vagina (*d*) urethra

77. Which hormone is responsible for inducing both spermatogenesis and oogenesis?

(*a*) FSH (*b*) Progesterone
(*c*) Testosterone (*d*) Estrogen

78. Menstrual cycle is influenced by

(*a*) FSH (*b*) Estrogen
(*c*) LH (*d*) All of these

79. Number of eggs released from both ovaries of a non-pregnant woman in a year is

(*a*) 24 (*b*) 12
(*c*) 6 (*d*) 416

80. Identify the odd one from the following.

(*a*) Vulva (*b*) Fimbriae
(*c*) Infundibulum (*d*) Isthmus

81. Corpus luteum secretes

(*a*) progesterone (*b*) relaxin
(*c*) both (*a*) and (*b*) (*d*) estrogen

82. Onset of menstruation is due to

(*a*) increased progesterone level (*b*) increase in level of FSH
(*c*) fall in progesterone level (*d*) decrease in level of FSH

83. Which of the following statements is correct?

(*a*) Menstrual cycle is present in all mammals. (*b*) Estrous cycle occurs in all primates.
(*c*) Menstrual cycle is present in all primates. (*d*) Estrous cycle occurs in all mammals.

84. Estrogen is more active during

(*a*) ovulatory phase (*b*) secretary phase
(*c*) menstrual phase (*d*) post-menstrual phase

85. Level of which of the following hormones decreases at menopause?

(*a*) FSH (*b*) LH
(*c*) Both (*a*) and (*b*) (*d*) Estrogen and progesterone

86. In human female the antrum first develops in

(*a*) primary follicle (*b*) secondary follicle
(*c*) tertiary follicle (*d*) Graafian follicle

87. Which of the following statements is incorrect?

(*a*) GnRH stimulates secretion of FSH and LH.
(*b*) LH stimulates the Leydig cells to secrete androgen.
(*c*) FSH acts on the Sertoli cells and stimulates spermiogenesis.
(*d*) GnRH stimulates secretion of estrogen.

88. A mature Graafian follicle of human contains

(*a*) an ovum (*b*) a primary oocyte
(*c*) a secondary oocyte (*d*) an oogonium

89. Ovulation occurs

(*a*) alternately from two ovaries
(*b*) simultaneously from both the ovaries
(*c*) from one ovary throughout the life
(*d*) according to temperature condition of female body

90. Identify the odd one from the following.

(*a*) Labia minora
(*b*) Ampulla
(*c*) Infundibulum
(*d*) Isthmus

91. Match the column I with column II.

Column I	Column II
A. LH	1. Ovulation
B. Progesterone	2. Maturation of Graafian follicle
C. Estrogen	3. Female secondary sexual characters
D. FSH	4. Parturition
E. Oxytocin	5. Pregnancy

(*a*) A—2, B—5, C—3, D—1, E—4
(*b*) A—3, B—1, C—2, D—4 E—5
(*c*) A—1, B—2, C—3, D—4, E—5
(*d*) A—1, B—5, C—3, D—2, E—4

92. In 28 days of human menstrual cycle, ovulation occurs on

(*a*) day 1
(*b*) day 7
(*c*) day 14
(*d*) day 21

93. If the ovulated egg is not fertilised, the corpus luteum

(*a*) becomes more active
(*b*) produces more relaxin
(*c*) degenerates after some time
(*d*) is maintained by progesterone

94. After ovulation the remaining follicular cells are transfered into corpus luteum on influence of hormone

(*a*) FSH
(*b*) estrogen
(*c*) progesterone
(*d*) LH

95. Which of the following functions as endocrine gland after ovulation?

(*a*) Stroma of ovary
(*b*) Zona pellucida
(*c*) Germinal epithelium
(*d*) Graafian follicle

96. In an oocyte, second maturation division occurs in

(*a*) fallopian tube
(*b*) ovary
(*c*) uterus
(*d*) abdominal cavity

97. At least how many meiotic divisions are required for formation of 100 zygotes?

(*a*) 150
(*b*) 125
(*c*) 400
(*d*) 200

98. How many sperms and ova will be produced from 50 primary spermatocytes and 50 primary oocytes respectively?

(*a*) 200 sperms and 200 ova
(*b*) 200 sperms and 100 ova
(*c*) 200 sperms and 50 ova
(*d*) 50 sperms and 50 ova

99. Which of the following phases is also called luteal phase?

(*a*) Follicular phase
(*b*) Proliferative phase
(*c*) Menstruation phase
(*d*) Secretory phase

100. Ovary produces

(*a*) estrogen
(*b*) estrogen and progesterone
(*c*) relaxin
(*d*) all of these

101. Match the following and choose the correct option.

Column I	Column II
A. Trophoblast	(*i*) Morphogenetic movement in the endometrium
B. Cleavage	(*ii*) Group of cells which form embryo
C. Inner cell mass	(*iii*) Outer layer of blastocyst
D. Gastrulation	(*iv*) Mitosis but no growth of the embryo

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

102. In human being, the fallopian tube is a part of

(*a*) uterus
(*b*) oviduct
(*c*) cervix
(*d*) vagina

103. Which of the following hormones is not secreted by human testes?

(*a*) Androgen
(*b*) Inhibin
(*c*) Gonadotropin
(*d*) None of these

104. Progesterone is secreted by

(*a*) uterus
(*b*) corpus luteum
(*c*) placenta
(*d*) both (*b*) and (*c*)

105. In human beings fertilisation occurs in

(*a*) uterus
(*b*) coelom
(*c*) fimbriated funnel
(*d*) ampulla

106. Which of the following helps in the penetration of sperm into egg?

(*a*) Fertilizin
(*b*) Anti-fertilizin
(*c*) Sperm lysin
(*d*) Both (*a*) and (*b*)

107. Zona pellucida disintegrates just

(*a*) before fertilisation
(*b*) after fertilisation
(*c*) midway during cleavage
(*d*) before implantation

108. Implantation occurs between

(*a*) 3rd and 5th day after fertilisation
(*b*) 5th and 7th day after fertilisation
(*c*) 9th and 11th day after fertilisation
(*d*) 6th and 10th day after fertilisation

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

(*a*) hCG
(*b*) hPL
(*c*) Estrogen
(*d*) LH

110. Colostrum contains

(*a*) IgE
(*b*) IgG
(*c*) IgM
(*d*) IgA

111. Solid ball-like structure formed by cleavage is called

(*a*) blastula
(*b*) morula
(*c*) gastrula
(*d*) neural tube

112. Which of the following stages of the human embryo is implanted in the uterus?

(*a*) Morula
(*b*) Blastocyst
(*c*) Zygote
(*d*) Gastrula

113. hCG is secreted from

(*a*) ovary (*b*) uterus

(*c*) placenta (*d*) corpus luteum

114. If for some reason the vasa efferentia in the human get blocked, it will obstruct the transport of sperms from

(*a*) penis to vagina (*b*) epididymis to vas deferens

(*c*) testes to epididymis (*d*) vagina to cervix

115. Which layer of the uterus is shed off during menstruation?

(*a*) Endometrium (*b*) Perimetrium

(*c*) Myometrium (*d*) All of these

116. Choose the correct statement.

(*a*) No cell division is involved in spermiogenesis.

(*b*) Ovulation occurs under the influence of follicle stimulating hormone.

(*c*) After the release of secondary oocyte, the Graafian follicle develops into corpus callosum.

(*d*) The outermost thin membranous part of uterine wall is called myometrium.

117. Sertoli cells are regulated by the pituitary hormone known as

(*a*) GH (*b*) prolactin

(*c*) LH (*d*) FSH

118. Match the items in column I with the items in column II.

Column I	Column II
A. Ovaries	1. Birth
B. Oviduct	2. Fertilisation
C. Vagina	3. Ovulation

(*a*) A—1, B—2, C—3 (*b*) A—3, B—2, C -1

(*c*) A—3, B—1, C—2 (*d*) A—2, B—3, C—1

119. During spermiogenesis _____ is transformed to _____.

(*a*) spermatogonium to primary spermatocyte

(*b*) spermatid to sperm

(*c*) secondary spermatocyte to spermatid

(*d*) primary spermatocyte to secondary spermatocyte

120. Correct sequence of hormone secretion from beginning of menstruation is

(*a*) FSH, progesterone, estrogen (*b*) FSH, estrogen, progesterone

(*c*) estrogen, FSH, progesterone (*d*) estrogen, progesterone, FSH

121. GnRH secreted from hypothalamus acts at the anterior pituitary gland and stimulates secretion of

(*a*) FSH (*b*) LH

(*c*) progesterone (*d*) both (*a*) and (*b*)

122. What of the following is the correct sequence of different stages of development?

(*a*) Zygote-blastula-morula-gastrula (*b*) Zygote-morula-gastrula-blastula

(*c*) Zygote-blastula-gastrula-morula (*d*) Zygote-morula-blastula-gastrula

123. In which phase of meiosis, the first polar body is formed?

(*a*) Phase of multiplication (*b*) Phase of growth

(*c*) First maturation division (*d*) Second maturation division

Answers

1. (*b*)	**2.** (*c*)	**3.** (*a*)	**4.** (*d*)	**5.** (*b*)	**6.** (*b*)	**7.** (*c*)	**8.** (*d*)
9. (*d*)	**10.** (*b*)	**11.** (*d*)	**12.** (*a*)	**13.** (*b*)	**14.** (*a*)	**15.** (*b*)	**16.** (*c*)
17. (*b*)	**18.** (*a*)	**19.** (*c*)	**20.** (*b*)	**21.** (*d*)	**22.** (*b*)	**23.** (*c*)	**24.** (*a*)
25. (*a*)	**26.** (*a*)	**27.** (*c*)	**28.** (*c*)	**29.** (*d*)	**30.** (*a*)	**31.** (*c*)	**32.** (*b*)
33. (*d*)	**34.** (*d*)	**35.** (*c*)	**36.** (*a*)	**37.** (*a*)	**38.** (*b*)	**39.** (*d*)	**40.** (*b*)
41. (*d*)	**42.** (*b*)	**43.** (*b*)	**44.** (*c*)	**45.** (*d*)	**46.** (*a*)	**47.** (*b*)	**48.** (*c*)
49. (*d*)	**50.** (*a*)	**51.** (*b*)	**52.** (*a*)	**53.** (*c*)	**54.** (*d*)	**55.** (*d*)	**56.** (*b*)
57. (*a*)	**58.** (*a*)	**59.** (*b*)	**60.** (*d*)	**61.** (*c*)	**62.** (*a*)	**63.** (*b*)	**64.** (*d*)
65. (*c*)	**66.** (*c*)	**67.** (*b*)	**68.** (*a*)	**69.** (*a*)	**70.** (*b*)	**71.** (*a*)	**72.** (*c*)
73. (*d*)	**74.** (*c*)	**75.** (*c*)	**76.** (*b*)	**77.** (*a*)	**78.** (*d*)	**79.** (*b*)	**80.** (*a*)
81. (*c*)	**82.** (*c*)	**83.** (*c*)	**84.** (*b*)	**85.** (*d*)	**86.** (*b*)	**87.** (*d*)	**88.** (*c*)
89. (*a*)	**90.** (*a*)	**91.** (*d*)	**92.** (*c*)	**93.** (*c*)	**94.** (*d*)	**95.** (*d*)	**96.** (*a*)
97. (*b*)	**98.** (*c*)	**99.** (*d*)	**100.** (*d*)	**101.** (*b*)	**102.** (*b*)	**103.** (*c*)	**104.** (*d*)
105. (*c*)	**106.** (*c*)	**107.** (*d*)	**108.** (*d*)	**109.** (*d*)	**110.** (*d*)	**109.** (*b*)	**112.** (*b*)
113. (*c*)	**114.** (*c*)	**115.** (*a*)	**116.** (*a*)	**117.** (*d*)	**118.** (*b*)	**119.** (*b*)	**120.** (*b*)
121. (*d*)	**122.** (*d*)	**123.** (*c*)					

CASE-BASED QUESTIONS

Attempt any 4 sub-parts from each question. Each question carries 1 mark.

1. Read the following and answer the questions given below:

PLACENTA: A VITAL CONNECTING TISSUE

After implantation the foetus develops a connection with uterine wall known as placenta. It facilitates the supply of oxygen and nutrient to the foetus and removal of carbon-dioxide and excretory wastes produced by the foetus. Placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo. Placenta also acts as an endocrine tissue and produces several hormones like human chorionic gondotropin (hCG), human placental lactogen (hPL), estrogens, progesterones, etc. In the later phase of pregnancy, a hormone called relaxin is also secreted by the ovary. In addition, during pregnancy, levels of other hormones like estrogens, progesterones, cortisol, prolactin, thyroxine, etc. are increased several folds in the maternal blood. Increased production of these hormones is essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy.

(*i*) Select the correct number of hormones produced by placenta from the given list [hCG, estrogen, hPL, relaxin, prolactin].

(*a*) One (*b*) Two

(*c*) Three (*d*) Four

(ii) Relaxin is secreted by

(*a*) Placenta (*b*) Pituitary

(*c*) Ovary (*d*) Chorionic villi

(*iii*) Which of the following is not a function of placenta?

(*a*) Production of hCG and hPL

(*b*) Removal of excretory wastes of foetus

(*c*) Facilitates supply of oxygen and nutrient

(*d*) Production of prolactin

(*iv*) Which of the following hormones get produced only during pregnancy?

(*a*) Cortisol (*b*) Relaxin

(*c*) Prolactin (*d*) GH

(v) Placenta is essential for

(a) growth and development of foetus (b) removal of waste of the embryo
(c) supply of oxygen to the embryo (d) all the above

Answers

1. (i) (c) Three
(ii) (c) Ovary
(iii) (d) Production of prolactin
(iv) (b) Relaxin
(v) (d) all the above

2. Read the following and answer the questions given below:

GAMETOGENESIS

The primary sex-organs—the testis in the males and the ovaries in the female—produce gametes, which are sperm and ovum respectively, by the process called gametogenesis. In testes, the immature germ cells or spermatogonia produce sperms by spermatogenesis that begins at puberty. The spermatogonia, present on the inside wall of seminiferous tubules, multiply by mitotic divisions. Each speramtogonium is diploid and contains 46 chromosomes. Some of the speromatogonia enlarge in size and termed as primary spermatocytes. These undergo meiosis periodically. A primary spermatocyte completes the first meiotic division (reduction division) leading to formation of two equal haploid cells called secondary spermatocytes, which have only 23 chromosomes each. The secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids. The spermatids are transformed into spermatozoa or sperms by the process called spermiogenesis. The spermatozoa gets embedded in the Sertoli cells. The Sertoli cells nourishes sperms which get released from the stoloniferous tubules by the process called spermiation.

(i) How many chromosomes are present in spermatids?

(a) 46 (b) 23
(c) 24 (d) 45

(ii) Transformation of spermatid into spermatozoa takes place by

(a) spermiation (b) spermatogenesis
(c) spermiogenesis (d) androgenesis

(iii) Sertoli cells are responsible for

(a) spermiation (b) spermiogenesis
(c) spermatogenesis (d) providing nutrition to spermatozoa

(iv) Spermatogenesis includes

(a) formation of spermatogonia
(b) formation of primary spermatocyte
(c) formation of secondary spermatocyte and spermatid
(d) both (b) and (c)

(v) Spermatogenesis is initiated at the age of puberty by _____ secreted by the hypothalamus.

(a) GnRH (b) FSH
(c) LH (d) all of these

Answers

2. (i) (b) Spermatids contain 23 chromosomes.
(ii) (c) The spermatids are transformed into spermatozoa (sperms) by the process of spermiogenesis.

(*iii*) (*d*) Sertoli cells present inside the seminiferous tubules provides nutrition to the spermatozoa (sperms).

(*iv*) (*d*) Spermatogenesis includes both the formation of primary spermatocyte and secondary spermatocyte and spermatids.

(*v*) (*a*) Spermatogenesis is initiated at the age of puberty by the gonadotropin releasing hormone (GnRH) secreted by the hypothalamus.

3. Read the following and answer the questions given below:

PARTURITION

The average duration of human pregnancy is about 9 months which is called the gestation period. Vigorous contraction of uterus at the end of pregnancy causes expulsion or delivery of the foetus. This process of delivery of the foetus or child birth is called parturition. Parturition is induced by a complex neuroendocrine mechanism. The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex. This triggers release of oxytocin from the maternal pituitary. Oxytocin act on the uterine muscle and causes stronger uterine contraction, which in turn stimulates further secretion of oxytocin. The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of uterus through the birth canal, *i.e.*, parturition. Soon after the infant is delivered, the placenta is also expelled out of the uterus.

(*i*) Parturition is under control of

(*a*) LH (*b*) GnRH

(*c*) oxytocin (*d*) relaxin

(*ii*) To induce parturition doctors inject _____to the pregnant lady.

(*a*) relaxin (*b*) LH

(*c*) FSH (*d*) oxytocin

(*iii*) The signals for parturition originate from

(*a*) fully developed foetus (*b*) placenta

(*c*) uterus (*d*) both (*a*) and (*b*)

(*iv*) Foetal ejection reflex refers to

(*a*) induction of mild uterine contraction

(*b*) release of oxytocin from maternal pituitary

(*c*) induction of stronger uterine contraction

(*d*) none of these

(*v*) Which of the following is the correct sequence of events that occur during parturition?

(1) foetal ejection reflex **(2) release of oxytocin**

(3) relaxation of smooth muscles **(4) vigorous contraction of uterus**

(*a*) 1, 2, 3, 4 (*b*) 4, 1, 2, 3

(*c*) 4, 1, 3, 2 (*d*) 3, 4, 1, 2

Answers

3. (*i*) (*c*) Oxytocin

(*ii*) (*d*) Oxytocin

(*iii*) (*d*) both (*a*) and (*b*)

(*iv*) (*a*) induction of mild uterine contraction

(*v*) (*a*) 1, 2, 3, 4

4. Read the following and answer the questions given below:

FERTILISATION AND IMPLANTATION

The process of fusion of a sperm with an ovum is called fertilisation. During fertilisation, a sperm comes in contact with zona pellucida layer of the ovum and induces changes in the membrane that block the entry of additional sperms. This ensures that only one sperm can fertilise an ovum. The secretions of the acrosome helps the sperm to enter into cytoplasm of the ovum through zona pellucida and the plasma membrane. This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and results in the formation of a second polar body and a haploid ovum. Soon the haploid nucleus of the sperms and that of the ovum fuse together to form a diploid zygote. Immediately embryonic development starts. The zygote undergoes mitosis as it moves through the isthmus of the oviduct towards the uterus. The mitotic division in zygote is termed as cleavage. It results in 2, 4, 8, 16 daughter cells called blastomeres. The embryo with 8 to 16 blastomeres is called a morula. The morula continues to divide and transforms into blastocyst as it moves further into the uterus. The blastomeres in the blastocyst gets arranged into an outer layer called trophoblast and an inner group of cells attached to the trophoblast called the inner cell mass. The trophoblast layer then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo. After attachment, the uterine cells divides rapidly and covers the blastocyst. This is called implantation.

(*i*) Acrosome of human sperms is equivalent to

(*a*) lysosome (*b*) Golgi body

(*c*) Golgian vesicles (*d*) none of these

(*ii*) Implantation takes place at

(*a*) morula stage (*b*) blastula stage

(*c*) blastocyst stage (*d*) none of these

(*iii*) Which of the following statement(s) is true regarding blastocysts?

(*a*) Outer layer of blastocyst is called trophoblast.

(*b*) Blastocyst undergoes implantation.

(*c*) Initial cells resulting from division of zygote are blastomeres.

(*d*) Inner group of cells in tropoblast is inner cell mass.

(*iv*) Morula is a developmental stage

(*a*) after the implantation

(*b*) between implantation and parturition

(*c*) between the zygote and blastocyst

(*d*) between the blastocyst and gastrula

(*v*) Completion of meiosis in secondary oocyte takes place

(*a*) after fertilisation of secondary oocyte

(*b*) when sperm penetrates through zona pellucida and plasma membrane

(*c*) before entry of sperm into uterus

(*d*) both (*a*) and (*b*)

Answers

4. (*i*) (*a*) Acrosome resembles lysosome and contains hydrolytic enzymes that help in dissolving membranes of the ovum for fertilisation.

(*ii*) (*c*) The morula continues to divide and transforms into a large mass of cells called blastocyst, which passes further into the uterus. Thus implantation occurs at blastocyst stage.

(*iii*) (*d*) Blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called inner cell mass.

(*iv*) (*c*) Morula is a developmental stage between the zygote and the blastocyst.

(*v*) (*d*) both (*a*) and (*b*)

ASSERTION-REASON QUESTIONS

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

1. **Assertion** : A decrease in temperature has no effect on spermatogenesis.
   Reason : Spermatogonia cannot survive the high body temperature.
2. **Assertion** : The uterus is shaped like an inverted pear.
   Reason : The inner glandular layer lining the uterine cavity is called as myometrium.
3. **Assertion** : The middle piece of the sperm is called its powerhouse.
   Reason : Numerous mitochondria in the middle piece produce energy for the movement of the tail.
4. **Assertion** : All sperms released at a time do not fertilise the ovum.
   Reason : Fertilisation occurs only when ovum and sperm fuse at the ampullary-isthmic junction.
5. **Assertion** : The embryo with 8 to 16 blastomeres is called a morula.
   Reason : The morula continuously divides to transform into trophoblast.
6. **Assertion** : After implantation, finger-like projections appear on the trophoblast called chorionic villi.
   Reason : Chorionic villi are surrounded by the uterine tissue and the maternal blood.
7. **Assertion** : The regions inside the seminiferous tubules contain Leydig cell.
   Reason : Leydig cells synthesise and secrete androgens.
8. **Assertion** : The endometrium undergoes cyclical changes during the menstrual cycle.
   Reason : Perimetrium contracts strongly during delivery of the baby.
9. **Assertion** : Vigorous contraction of the uterus at the end of pregnancy causes expulsion.
   Reason : The signals for parturition, originating from the foetus, trigger release of oxytocin which stimulates uterine contraction.
10. **Assertion** : In human beings, ovum is released from the ovary in the ootid stage.
    Reason : The secondary oocyte divides into unequal daughter cells, a large ootid and a small polar body.

Answers

1. (*b*) **2.** (*c*) **3.** (*a*) **4.** (*b*) **5.** (*c*) **6.** (*b*) **7.** (*d*) **8.** (*c*)
9. (*a*) **10.** (*d*)

HINTS/EXPLANATIONS OF SELECTED MCQs

27. (*c*) Each of these (gamete) contains 23 chromosomes(n) which further fuse to form the complete set of chromosomes ($2n = 46$).

28. (*c*) The cells of alveoli produce milk which is stored in the cavities or lumens of alveoli. Alveoli open into mammary tubules and then into mammary ducts. Mammary ducts form a mammary ampulla from which a lactiferous duct develops. Each lobe produces a separate lactiferous duct. The various lactiferous ducts open at the nipple by separate pores.

29. (*d*) In humans (and most other mammals), the female is the homogametic sex having two identical homologous chromosomes (XX), whereas males are the heterogametic sex, have two homologous chromosomes of different sizes with different genes (XY).

31. (*c*) Each testis of a human male has 250 compartments called testicular lobules. Each lobule contains one to three highly coiled seminiferous tubules in which sperms are produced.

34. (*d*) The inner cell mass of the blastocyst is composed of two kinds of cells: those that will become the mature organism (the epiblast), and those that will develop into the placenta, the chorion, and the amniotic membranes. The cells that will develop into the complete embryo are called embryonic stem cells (ESCs).

37. (*a*) In spermatogenesis, a primary spermatocyte produces four functional sperms while in oogenesis a primary oocyte forms one large ovum and 2-3 polar bodies.

38. (*b*) The follicular phase is also known as the "proliferative phase" because rising oestradiol (oestrogen) levels cause the endometrial lining of the uterus to proliferate and thicken.

41. (*d*) The acrosome contains degradative enzymes (including hyaluronidase and acrosin).

42. (*b*) Foetal ejection reflex are the mild uterine contractions generated by placenta when the foetus is fully developed. This reflex is seen during the time of parturition. The parturition gives signals and the placenta induces mild uterine contractions. This triggers release of oxytocin from the maternal pituitary gland.

44. (*c*) Implantation is a process in which a developing embryo, moving as a blastocyst through a uterus, makes contact with the uterine wall and remains attached to it until birth. The lining of the uterus (endometrium) prepares for the developing blastocyst to attach to it via many internal changes.

45. (*d*) In human beings, menstrual cycle ceases at 50 years of age (menopause) and there will be no production of egg. Hence, a woman cannot conceive a child after 50 years of age.

48. (*c*) Oogenesis is initiated during the embryonic development only whereas spermatogenesis begins at puberty.

50. (*a*) The ovarian extremity of the uterine tube forms the infundibulum, which is the portion of the uterine tube responsible for capturing the oocyte expelled from the ovary. The infundibulum presents some expansions called fimbriae, which surround the abdominal ostium of the uterine tube.

51. (*d*) The secondary oocyte is the cell that is formed by meiosis I in oogenesis. Thus, it has only one of each pair of homologous chromosomes. In other words, it is haploid.

53. (*c*) Trophoblasts are cells that form the outer layer of a blastocyst and are present for four days post fertilisation in humans.

54. (*d*) The ampulla is the widest and longest part of the fallopian tube in human female reproductive system while the other structures are related to the human male reproductive structures.

55. (*d*) Morula is an early stage in post-fertilisation development when cells have rapidly mitotically divided to produce a solid mass of cells (12-15 cells) with a "mulberry" appearance. This stage is followed by formation of a cavity in this cellular mass of blastocyst stage.

The gastrula develops from the hollow, single-layered ball of cells called a blastula.

56. (*b*) 'Y' represents spermatids. The spermatids are transformed into spermatozoa (sperm) by the process of spermiogenesis.

58. (*a*) Testes descend down into scrotum for the purpose of spermatogenesis. The temperature in scrotal sac is 2°- 2.5°C cooler than in abdominal cavity, thus allowing spermatogenesis to takes place and viable sperm to be produced.

64. (*d*) The vas deferens (or ductus deferens) is a duct in a man's body. Its function is to carry sperm away from the testes, towards the penis.

65. (*c*) 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 help in the lubrication of the penis.

66. (*c*) Bulbovestibular gland or Bartholin's gland in females secrete mucus and are homologous to the bulbourethral glands of the male.

68. (*a*) Spermiation is the process by which mature spermatids are released from Sertoli cells into the seminiferous tubule lumen prior to their passage to the epididymis.

70. (*b*) Bulbovestibular gland or Bartholin's gland in females secrete mucus and are homologous to the bulbourethral glands of the male.

71. (*a*) Epididymis is a long and a coiled tube that receives sperms from the vasa efferentia. It leads to the vas deferens. It is responsible for storing and nourishing the sperms until they are moved further to the vas deferens.

72. (*c*) Insemination is the introduction of sperm into a female animal's reproductive system for the purpose of impregnating or fertilising the female for sexual reproduction.

73. (*d*) Cowper's glands secrete an alkaline fluid which helps to neutralize the acidic environment of the male urethra and female reproductive tract. Removal of Cowper's glands thus would inactivate and kill sperms in male urethra and female reproductive tract.

74. (*c*) The secondary oocyte is the cell that is formed by meiosis I in oogenesis. Thus, it has only one of each pair of homologous chromosomes. In other words, it is haploid.

75. (*c*) Gonadotropin secretion increases dramatically after menopause. Follicle-stimulating hormone (FSH) levels are higher than luteinizing hormone (LH) levels, and both rise to even higher values than those seen in the surge during the menstrual cycle. The FSH rise precedes the LH rise.

76. (*b*) The endometrium is the inner lining of the uterus.

77. (*a*) In women, FSH helps control the menstrual cycle and stimulates the growth of eggs in the ovaries. FSH levels in women change throughout the menstrual cycle, with the highest levels happening just before an egg is released by the ovary. This is known as ovulation. In men, FSH helps control the production of sperm.

78. (*d*) The menstrual cycle is regulated by the complex interaction of hormones: luteinizing hormone, follicle-stimulating hormone, and the female sex hormones, estrogen and progesterone.

79. (*b*) In the middle of every cycle, one of the ovaries produce an ovum. So, 6 ova are produced by each ovary in a year.

80. (*a*) The vulva is the outer part of the female genitals while the other terms represent the parts of the uterus.

82. (*c*) During menstrual phase, the production of LH from the anterior lobe of the pituitary gland is considerably reduced. The withdrawal of this hormone causes degeneration of the corpus luteum and, therefore, progesterone production is reduced.

84. (*b*) Estrogen levels rise and fall twice during the menstrual cycle. Estrogen levels rise during the mid-follicular phase and then drop precipitously after ovulation. This is followed by a secondary rise in estrogen levels during the mid-luteal phase with a decrease at the end of the menstrual cycle.

86. (*b*) The characteristic feature that distinguishes secondary follicle from primary follicles is the appearance of a follicular antrum within the granulosa layer. The antrum contains fluid which is rich in hyaluronan and proteoglycans.

88. (*c*) The Graafian follicle is the mature follicles present in the female ovary. It has a fluid-filled cavity which is known as the antrum. This follicle contains the secondary oocyte hat completed its first meiotic division and released a polar body.

90. (*a*) The labia minora lie just inside the labia majora and surround the openings to the vagina and urethra while other structures denotes the parts of uterus.

92. (*c*) In a 28 days menstrual cycle, the ovulation occurs in the middle of cycle (about 14th day).

94. (*d*) LH causes ovulation and the remaining cells of the ovarian follicles are stimulated by the LH to develop corpus luteum.

95. (*d*) A gland which produces hormones for the regulation of the body is called as an endocrine gland. After ovulation, the graafian follicle matures into corpus luteum and works as an endocrine gland. It releases luteinizing hormone, follicle stimulating hormone, oestrogen and progesterone.

96. (*a*) The secondary oocyte proceeds with meiosis II (second maturation division) but the division gets arrested at metaphase stage. It is in this stage of oocyte that the ovum is shed during ovulation. It passes into oviduct, where the cell cycle resumes only after the entry of sperm.

97. (*b*) For the formation of 1 zygote in human, there must be a fusion of a haploid male and female gamete. In males, 1 meiotic division forms 4 male gametes. Hence, total 25 meiotic divisions are essential to form 100 male gametes. Similarly, in females, 1 meiotic division forms 1 female gamete. Hence, total 100 meiotic divisions are essential to form 100 female gametes. Hence, total 125 meiotic divisions are essential for the formation of 100 zygotes in human.

98. (*c*) one spermatocyte produces 4 sperms. So, 200 sperms are produce by 50 primary spermatocytes. Similarly, in females, 1 primary oocyte forms 1 female gamete. Hence, 50 ova will form from 50 primary oocyte.

103. (*c*) Gonadotropins are glycoprotein polypeptide hormones secreted by gonadotropin cells of the anterior pituitary of vertebrates.

106. (*c*) Fertilizin is a proteoglycan secreted from the cortical region of the egg cytoplasm, that interacts with the antifertilizin of the sperm of the same species. This makes the sperm stick to the surface of the egg. An antifertilizin is a protein present in the plasma membrane of the sperm.

109. (*d*) Lutcinizing hormonc (LH) is a glycoprotcin hormonc that is co-sccrctcd along with follicle-stimulating hormone by the gonadotrophin cells in the adenohypophysis (anterior pituitary).

113. (*c*) Human chorionic gonadotropin is a hormone produced primarily by syncytiotrophoblastic cells of the placenta during pregnancy. The hormone stimulates the corpus luteum to produce progesterone to maintain the pregnancy.

114. (*c*) Vasa efferentia are fine ciliated ductules that arise from the seminiferous tubules of testis (where sperms are formed) and open into epididymis.

116. (*a*) The differentiation of the spermatids into sperm cells is called spermiogenesis. It corresponds to the final part of spermatogenesis.

117. (*d*) Sertoli cells are the cells that line the seminiferous tubules in the testis. These cells protect the spermatids and convey nutrients to both the developing and mature spermatozoa. Sertoli cells are regulated by FSH (Follicle Stimulating Hormone) as the FSH receptors are confined to the sertoli cells.

121. (*d*) Gonadotropin-releasing hormone (GnRH) is a releasing hormone responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the anterior pituitary.

123. (*c*) During the maturation phase of oogenesis, primary oocyte undergoes first meiotic division and forms two haploid daughter cells - large secondary oocyte and a small first polar body. This small first polar body dies after that.