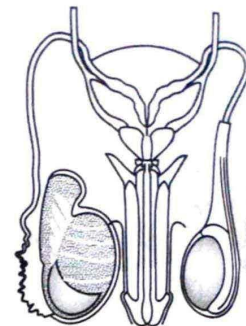


2 Human Reproduction



2.1. The Male Reproductive System

1. Given below are two statements:

Statement I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.

Statement II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Statement I is correct but Statement II is false.
- (B) Statement I is incorrect but Statement II is true.
- (C) Both Statement I and Statement II are true.
- (D) Both Statement I and Statement II are false.

[NEET 2023]

2. The shared terminal duct of the reproductive and urinary system in the human male is:

- (A) urethra
- (B) ureter
- (C) vas deferens
- (D) vasa efferentia

[AIPMT 2014]

3. The Leydig cells found in the human body are the secretory source of:

- (A) progesterone
- (B) intestinal mucus
- (C) glucagon
- (D) androgens.

[AIPMT Screening 2012]

4. If for some reason, the vasa efferentia in the human reproductive system gets blocked, the gametes will not be transported from: @THE_RDX_07

- (A) epididymis to vas deferens
- (B) ovary to uterus
- (C) vagina to uterus
- (D) testes to epididymis

[AIPMT Screening 2011]

5. The testes in humans are situated outside the abdominal cavity inside a pouch called scrotum. The purpose served is for:

- (A) escaping any possible compression by the visceral organs.

(B) providing more space for the growth of epididymis.

(C) providing a secondary sexual feature for exhibiting the male sex.

(D) maintaining the scrotal temperature lower than the internal body temperature.

[AIPMT Screening 2011]

6. Sertoli cells are found in:

- (A) ovaries and secrete progesterone.
- (B) adrenal cortex and secrete adrenaline.
- (C) seminiferous tubules and provide nutrition to germ cells.
- (D) pancreas and secrete cholecystokinin.

[AIPMT Screening 2010]

7. Vasa efferentia are the ductules leading from:

- (A) testicular lobules to rete testis
- (B) rete testis to vas deferens
- (C) vas deferens to epididymis
- (D) epididymis to urethra

[AIPMT Screening 2010]

8. Seminal plasma in human males is rich in:

- (A) fructose and calcium
- (B) glucose and calcium
- (C) DNA and testosterone
- (D) ribose and potassium

[AIPMT Screening 2010]

9. Secretions from which one of the following are rich in fructose, calcium and some enzymes?

- (A) Male accessory glands
- (B) Liver
- (C) Pancreas
- (D) Salivary glands

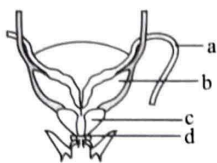
[AIPMT Mains 2010]

10. Seminal plasma in human is rich in:

- (A) fructose, calcium and certain enzymes
- (B) fructose and calcium but has no enzymes
- (C) glucose and certain enzymes but has no calcium
- (D) fructose and certain enzymes but poor in calcium

[AIPMT Screening 2009]

11. Given below is a diagrammatic sketch of a portion of human male reproductive system. Select the correct set of the names of the parts labelled a, b, c, d.



	a	b	c	d
(A)	Ureter	Prostate	Seminal vesicle	Bulbourethral gland
(B)	Vas deferens	Seminal vesicle	Prostate	Bulbourethral gland
(C)	Vas deferens	Seminal vesicle	Bulbourethral gland	Prostate
(D)	Ureter	Seminal vesicle	Prostate	Bulbourethral gland

[AIPMT Screening 2009]

12. Male hormone is produced in the testis by cells of:

- (A) Sertoli
- (B) Epithelial
- (C) Spermatocytes
- (D) Leydig

[AIPMT 1993]

2.2. The Female Reproductive System

13. Arrange the following parts in human Mammary gland, traversing the route of milk ejection.

- (I) Mammary duct
- (II) Lactiferous duct
- (III) Mammary alveolus
- (IV) Ampulla
- (V) Mammary tubule

Choose the correct answer from the options given below:

- (A) (IV) → (III) → (V) → (I) → (II)
- (B) (III) → (V) → (II) → (I) → (IV)
- (C) (III) → (V) → (I) → (IV) → (II)
- (D) (I) → (III) → (V) → (IV) → (II) [Re-NEET 2024]

14. Match List-I with List-II relating to human female external genitalia:

List-I (Structures)	List-II (Features)
(a) Mons Pubis	(i) A fleshy fold of tissue surrounding the vaginal opening
(b) Clitoris	(ii) Fatty cushion of cells covered by skin and hair

(c) Hymen	(iii) Tiny finger-like structure above labia minora
(d) Labia majora	(iv) A thin membrane like structure covering vaginal opening

Choose the correct answer from the options given below:

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

[Re-NEET 2024]

15. Given below are two statements:

Statement I: The presence or absence of hymen is not a reliable indicator of virginity.

Statement II: The hymen is torn during the first coitus only.

In the light of the above statements, choose the correct answer from the options given below:

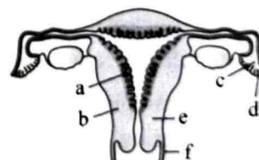
- (A) Both Statement I and Statement II are false.
- (B) Statement I is true but Statement II is false.
- (C) Statement I is false but Statement II is true.
- (D) Both Statement I and Statement II are true.

[NEET 2024]

16. Which of the following is not a component of fallopian tube?

- (A) Isthmus
- (B) Infundibulum
- (C) Ampulla
- (D) Uterine fundus [NEET 2024]

17. The figure given below depicts a diagrammatic sectional view of the female reproductive system of humans. Which one set of three parts out of a-f have been correctly identified?



- (A) c-Infundibulum, d-Fimbriae, e-Cervix
- (B) d-Oviducal funnel, e-Uterus, f-Cervix
- (C) a-Perimetrium, b-Myometrium, c-Fallopian tube
- (D) b-Endometrium, c-Infundibulum, d-Fimbriae

[AIPMT Screening 2011]

18. Bartholin's glands are situated:

- (A) on the sides of the head of some amphibians
- (B) at the reduced end of birds
- (C) on either side of vagina in humans
- (D) on either side of vas deferens in humans.

[AIPMT 2003]

2.3. Gametogenesis

19. Given are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R):

Assertion (A): FSH acts upon ovarian follicles in female and Leydig cells in male.

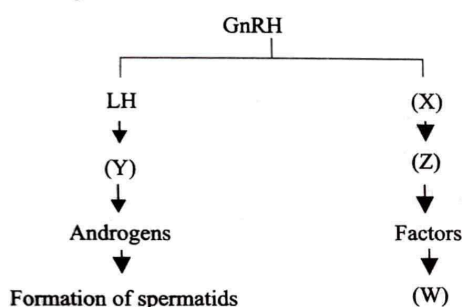
Reason (R): Growing ovarian follicles secrete estrogen in female while interstitial cells secrete androgen in male human being.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Both A and R are true but R is NOT the correct explanation of A.
- (B) A is true but R is false.
- (C) A is false but R is true.
- (D) Both A and R are true and R is the correct explanation of A.

[NEET 2024]

20. Identify the correct option (X), (Y), (Z), (W) with respect to spermatogenesis.



- (A) ICSH, Interstitial cells, Leydig cells, spermiogenesis.
- (B) FSH, Sertoli cells, Leydig cells, spermatogenesis.
- (C) ICSH, Leydig cells, Sertoli cells, spermatogenesis.
- (D) FSH, Leydig cells, Sertoli cells, spermiogenesis

[NEET 2024]

21. Given below are two statements:

Statement I: The release of sperms into the seminiferous tubules is called spermiation.

Statement II: Spermiogenesis is the process of formation of sperms from spermatogonia.

In the light of the above statements. Choose the most appropriate answer from the options given below:

- (A) Both Statement I and Statement II are incorrect.
- (B) Statement I is correct but Statement II is incorrect.
- (C) Statement I is incorrect but Statement II is correct.
- (D) Both Statement I and Statement II are correct.

[NEET 2022]

22. Which of the following statements are true for spermatogenesis but do not hold true for Oogenesis?

- (I) It results in the formation of haploid gametes.
- (II) Differentiation of gamete occurs after the completion of meiosis.
- (III) Meiosis occurs continuously in a mitotically dividing stem cell population.

(IV) It is controlled by the Luteinising hormone (LH) and Follicle stimulating Hormone (FSH) secreted by the anterior pituitary.

(V) It is initiated at puberty.

Choose the most appropriate answer from the options given below:

- (A) (II) and (III) only
- (B) (II), (IV) and (V) only
- (C) (II), (III) and (V) only
- (D) (III) and (V) only

[NEET 2022]

23. At which stage of life the oogenesis process is initiated?

- (A) Embryonic development stage
- (B) Birth
- (C) Adult
- (D) Puberty

[NEET 2022]

24. The difference between spermiogenesis and spermiation is:

- (A) In spermiogenesis, spermatozoa from Sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.
- (B) In spermiogenesis, spermatozoa are formed, while in spermiation spermatids are formed.
- (C) In spermiogenesis, spermatids are formed, while in spermiation spermatozoa are formed.
- (D) In spermiogenesis, spermatozoa are formed, while in spermiation spermatozoa are released from Sertoli cells into the cavity of seminiferous tubules.

[NEET 2018]

25. Which of the following cells during gametogenesis is normally diploid?

- (A) Primary polar body
- (B) Spermatid
- (C) Spermatogonia
- (D) Secondary polar body

[AIPMT Cancelled 2015]

26. Which of the following layers in an antral follicle is acellular?

- (A) Granulosa
- (B) Theca interna
- (C) Stroma
- (D) Zona pellucida

[AIPMT Latest July 2015]

27. What is the correct sequence of sperm formation?

- (A) Spermatid, Spermatocyte, Spermatogonia, Spermatozoa
- (B) Spermatogonia, Spermatocyte, Spermatozoa, Spermatid
- (C) Spermatogonia, Spermatozoa, Spermatocyte, Spermatid
- (D) Spermatogonia, Spermatocyte, Spermatid, Spermatozoa

[NEET 2013, AIPMT Screening 2012]

28. Which one of the following statements is false in respect of viability of mammalian sperm?

- (A) Sperm is viable (for only up to 24 hr).
- (B) Survival of sperm depends on the pH of the medium and is more active in alkaline medium.
- (C) Viability of sperm is determined by its motility.
- (D) Sperms must be concentrated in a thick suspension.

[AIPMT Screening 2012]

29. Which one of the following statements about human sperm is correct?

- (A) Acrosome has a conical pointed structure used for piercing and penetrating the egg, resulting in fertilisation.
- (B) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilisation.
- (C) Acrosome serves as a sensory structure leading the sperm towards the ovum.
- (D) Acrosome serves no particular function.

[AIPMT Screening 2010]

30. Sertoli cells are regulated by the pituitary hormone known as:

- (A) LH
- (B) FSH
- (C) GH
- (D) Prolactin [AIPMT 2006]

31. Middle piece of mammalian sperm possesses:

- (A) mitochondria and centriole
- (B) mitochondria only
- (C) centriole only
- (D) nucleus and mitochondria [AIPMT 1999, 91]

32. Human eggs are:

- (A) alecithal
- (B) microlecithal
- (C) mesolecithal
- (D) macrolecithal

[AIPMT 1997, 89]

33. At the end of first meiotic division, male germ cell differentiates into:

- (A) Secondary spermatocyte
- (B) Primary spermatocyte
- (C) Spermatogonium
- (D) Spermatid [AIPMT 1994]

34. How many sperms are formed from a secondary spermatocyte?

- (A) 4
- (B) 8
- (C) 2
- (D) 1 [AIPMT 1990]

35. Egg is liberated from ovary in:

- (A) secondary oocyte stage
- (B) primary oocyte stage
- (C) oogonial stage
- (D) mature ovum stage. [AIPMT 1989]

2.4. Menstrual Cycle

36. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): During menstrual cycle, the ovulation takes place approximately on 14th day.

Reason (R): Rapid secretion of LH in the middle of menstrual cycle induces rupture of Graafian follicle and thereby the release of ovum.

In the light of the above statements, choose the most appropriate answer from the options given below.

- (A) A is correct but R is not correct.
- (B) A is not correct but R is correct.
- (C) Both A and R are correct and R is the correct explanation of A.
- (D) Both A and R are correct but R is NOT the correct explanation of A. [Re-NEET 2024]

37. Which of the following statements are correct regarding female reproductive cycle?

- (I) In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
- (II) First menstrual cycle begins at puberty and is called menopause.
- (III) Lack of menstruation may be indicative of pregnancy.
- (IV) Cyclic menstruation extends between menarche and menopause.

Choose the most appropriate answer from the options given below.

- (A) (I), (II) and (III) only
- (B) (I), (III) and (IV) only
- (C) (I) and (IV) only
- (D) (I) and (II) only [NEET 2023]

38. No new follicles develop in the luteal phase of the menstrual cycle because:

- (A) follicles do not remain in the ovary after ovulation
- (B) FSH levels are high in the luteal phase
- (C) LH levels are high in the luteal phase
- (D) Both FSH and LH levels are low in the luteal phase.

[NEET Odisha 2019]

39. Match the items given in Column I with those in Column II and select the correct option given below.

Column I	Column II
(a) Proliferative phase	(i) Breakdown of endometrial lining
(b) Secretory phase	(ii) Follicular phase
(c) Menstruation	(iii) Nutrient enrichment

Select the correct option from the following.

(a) (b) (c)

(A) (ii) (iii) (i)

(B) (i) (iii) (ii)

(C) (iii) (ii) (i)

(D) (iii) (i) (ii)

[NEET 2018]

40. Changes in GnRH pulse frequency in females is controlled by circulating levels of:

(A) estrogen and inhibin.

(B) progesterone only.

(C) progesterone and inhibin.

(D) estrogen and progesterone. [NEET Phase-I 2016]

41. Identify the correct statement on 'inhibin':

(A) It is produced by granulosa cells in ovary and inhibits the secretion of FSH

(B) It is produced by granulosa cells in ovary and inhibits the secretion of LH

(C) It is produced by nurse cells in testes and inhibits the secretion of LH

(D) It inhibits the secretion of LH, FSH and prolactin

[NEET Phase-I 2016]

42. Select the incorrect statement.

(A) LH and FSH triggers ovulation in ovary.

(B) LH and FSH decrease gradually during the follicular phase.

(C) LH triggers secretion of androgens from the Leydig cells.

(D) FSH stimulates the Sertoli cells which help in spermiogenesis. [NEET Phase-I 2016]

43. Which of the following events is not associated with ovulation in human female?

(A) Decrease in Estradiol

(B) Full development of Graafian follicle

(C) Release of secondary oocyte

(D) LH surge [AIPMT Latest July 2015]

44. Menstrual flow occurs due to lack of:

(A) progesterone (B) FSH

(C) oxytocin (D) vasopressin [NEET 2013]

45. The secretory phase in the human menstrual cycle is also called:

(A) luteal phase and lasts for about 6 days

(B) follicular phase lasting for about 6 days

(C) luteal phase and lasts for about 13 days

(D) follicular phase and lasts for about 13 days

[AIPMT Mains 2012]

46. About which day in a normal human menstrual cycle does rapid secretion of LH (popularly called LH surge) normally occurs?

(A) 14th day

(B) 20th day

(C) 5th day

(D) 11th day

[AIPMT Mains 2011 AIPMT 1997]

47. Which one of the following is the most likely reason of not occurring regular menstruation cycle in females?

(A) Fertilisation of the ovum

(B) Maintenance of the hypertrophic endometrial lining

(C) Maintenance of high concentration of sex-hormones in the blood stream

(D) Retention of well-developed corpus luteum

[AIPMT Screening 2009]

48. Which one of the following is the correct matching of the events occurring during menstrual cycle?

(A) Ovulation — LH and FSH attain peak level and sharp fall in the secretion of progesterone

(B) Proliferative phase — Rapid regeneration of myometrium and maturation of Graafian follicle

(C) Secretory phase — Development of corpus luteum and increased secretion of progesterone

(D) Menstruation — Breakdown of myometrium and ovum not fertilized

[AIPMT Screening 2009]

49. Which one of the following statement is incorrect about menstruation?

(A) During normal menstruation about 40 mL blood is lost.

(B) The menstrual fluid can easily clot.

(C) At menopause in the female, there is especially abrupt increase in gonadotropic hormones.

(D) The beginning of the cycle of menstruation is called menarche. [AIPMT Screening 2008]

50. Which part of ovary in mammals acts as an endocrine gland after ovulation?

(A) Stroma

(B) Germinal epithelium

(C) Vitelline membrane

(D) Graafian follicle. [AIPMT 2007]

51. In the human female, menstruation can be deferred by the administration of:

(A) combination of FSH and LH

(B) combination of estrogen and progesterone

(C) FSH only

(D) LH only [AIPMT 2007]

52. Withdrawal of which of the following hormone is the immediate cause of menstruation?

- (A) Progesterone (B) Estrogen
(C) FSH (D) FSH-RH [AIPMT 2006]

53. If mammalian ovum fails to get fertilized, which one of the following is unlikely?

- (A) Corpus luteum will disintegrate.
(B) Progesterone secretion rapidly declines.
(C) Estrogen secretion further decreases.
(D) Primary follicle starts developing. [AIPMT 2005]

54. Ovulation in the human female normally takes place during the menstrual cycle:

- (A) at the mid 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 [AIPMT 2004]

55. Mainly which hormones control menstrual cycle in human beings?

- (A) FSH (B) LH
(C) FSH, LH, estrogen (D) Progesterone
[AIPMT 2002]

56. Which set is similar?

- (A) Corpus luteum – Graafian follicle
(B) Sebum – Sweat
(C) Bundle of His – Pacemaker
(D) Vit-B₇ – Niacin [AIPMT 2001]

57. After ovulation, Graafian follicle regresses into:

- (A) corpus luteum (B) corpus callosum
(C) corpus albicans (D) corpus artesia
[AIPMT 1999]

58. The mammalian corpus luteum produces:

- (A) luteotrophic hormone
(B) luteinizing hormone
(C) estrogen
(D) progesterone [AIPMT 1995]

59. In the 28 day human ovarian cycle, the ovulation takes place typically on:

- (A) day 14 of the cycle (B) day 28 of the cycle
(C) day 1 of the cycle (D) day 5 of the cycle
[AIPMT 1994]

Reason (R): In the absence of fertilisation, the corpus luteum degenerates that causes disintegration of endometrium.

In the light of the above statements, choose the correct answer from the options given below:

- (A) (A) is true but (R) is false.
(B) (A) is false but (R) is true.
(C) Both (A) and (R) are true and (R) is the correct explanation of (A).
(D) Both (A) and (R) are true but (R) is NOT the correct explanation of (A). [NEET 2023]

61. Receptors for sperm binding in mammals are present on:

- (A) corona radiata (B) vitelline membrane
(C) perivitelline space (D) zona pellucida
[NEET 2021]

62. Extrusion of second polar body from egg nucleus occurs:

- (A) after fertilisation
(B) before the entry of sperm into ovum
(C) simultaneously with first cleavage
(D) after the entry of sperm but before fertilisation.
[NEET National 2019]

63. Select the correct sequence of events.

- (A) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
(B) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Organogenesis → Cell differentiation
(C) Gametogenesis → Syngamy → Gamete transfer → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
(D) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell differentiation → Cell division (Cleavage) → Organogenesis [NEET Odisha 2019]

64. Capacitation occurs in:

- (A) rete testis (B) epididymis
(C) vas deferens (D) female reproductive tract
[NEET 2017]

65. Fertilisation in humans is practically feasible only if:

- (A) the ovum and sperms are transported simultaneously to ampullary-isthmic junction of the fallopian tube.
(B) the ovum and sperms are transported simultaneously to ampullary-isthmic junction of the cervix.
(C) the sperms are transported into cervix within 48 hrs of release of ovum in uterus.
(D) the sperms are transported into vagina just after the release of ovum in fallopian tube.

[NEET Phase-I 2016]

2.5. Fertilisation and Implantation

60. Given below are two statements. one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): Endometrium is necessary for implantation of blastocyst.

66. In human females, meiosis-II is not completed until:

- (A) puberty (B) fertilisation
- (C) uterine implantation (D) birth.

[AIPMT Latest July 2015]

67. What happens during fertilisation in humans after many sperms reach close to the ovum?

- (A) Secretions of acrosome helps one sperm enter cytoplasm of ovum through zona pellucida.
- (B) All sperms except the one nearest to the ovum lose their tails.
- (C) Cells of corona radiata trap all the sperms except one.
- (D) Only two sperms nearest the ovum penetrate zona pellucida.

[AIPMT Mains 2011]

68. The second maturation division of the mammalian ovum occurs:

- (A) shortly after ovulation before the ovum makes entry into the Fallopian tube
- (B) until after the ovum has been penetrated by a sperm
- (C) until the nucleus of the sperm has fused with that of the ovum
- (D) in the Graafian follicle following the first maturation division.

[AIPMT Screening 2010]

69. Which one of the following statements about morula in humans is correct?

- (A) It has almost equal quantity of cytoplasm as an uncleaved zygote but much more DNA.
- (B) It has far less cytoplasm as well as less DNA than in an uncleaved zygote.
- (C) It has more or less equal quantity of cytoplasm and DNA as in uncleaved zygote.
- (D) It has more cytoplasm and more DNA than an uncleaved zygote.

[AIPMT Screening 2010]

70. In human female, the blastocyst:

- (A) forms placenta even before implantation
- (B) gets implanted into uterus three days after ovulation
- (C) gets nutrition for uterine endometrial secretion only after implantation
- (D) gets implanted in endometrium by the trophoblast cells.

[AIPMT Mains 2010]

71. A change in the amount of yolk and its distribution in the egg will affect:

- (A) formation of zygote
- (B) pattern of cleavage
- (C) number of blastomeres produced
- (D) fertilisation

[AIPMT Screening 2009]

72. Grey crescent is the area:

- (A) at the point of entry of sperm into ovum
- (B) just opposite to the site of entry of sperm into ovum
- (C) at the animal pole
- (D) at the vegetal pole

[AIPMT 2005]

73. What is true for cleavage?

- (A) Size of embryo increases.
- (B) Size of cells decreases.
- (C) Size of cells increases.
- (D) Size of embryo decreases.

[AIPMT 2002]

74. Fertilizin are emitted by:

- (A) immature eggs (B) mature eggs
- (C) sperms (D) polar bodies.

[AIPMT 1997, 91]

75. In an egg, the type of cleavage is determined by:

- (A) the amount and distribution of yolk
- (B) the number of egg membranes
- (C) the shape and size of the sperm
- (D) the size and location of the nucleus

[AIPMT 1995]

76. What is true about cleavage in fertilised egg of human?

- (A) Meroblastic
- (B) Starts when egg reaches uterus
- (C) Starts in fallopian tube
- (D) It is identical to normal mitosis

[AIPMT 1994]

77. Meroblastic cleavage is a type of division:

- (A) horizontal (B) partial/parietal
- (C) total (D) spiral

[AIPMT 1992]

78. During cleavage, what is true about cells?

- (A) Nucleo-cytoplasmic ratio remains unchanged
- (B) Size does not increases
- (C) There is less consumption of oxygen
- (D) The division is like meiosis

[AIPMT 1991]

79. Freshly released human egg has:

- (A) one Y-chromosome
- (B) one X-chromosome
- (C) two X-chromosome
- (D) Both (a) and (b)

[AIPMT 1991]

80. Cells become variable in morphology and function in different regions of the embryo. The process is:

- (A) differentiation (B) metamorphosis
- (C) organisation (D) rearrangement

[AIPMT 1989]

2.6. Pregnancy and Embryonic Development

81. Which of the following secretes the hormone relaxin during the later phase of pregnancy?

- (A) Graafian follicle (B) Corpus luteum
- (C) Foetus (D) Uterus

[NEET 2021]

82. In human beings, at the end of 12 weeks (first trimester) of pregnancy, which one of the following is observed?

- (A) Eyelids and eyelashes are formed.
(B) Most of the major organ systems are formed.
(C) The head is covered with fine hairs.
(D) Movement of the foetus [NEET Oct. 2020]

83. Match the following columns and select the correct option from the following codes:

Column I	Column II
(a) Ovary	(i) Human chorionic gonadotropin
(b) Placenta	(ii) Oestrogen and progesterone
(c) Corpus luteum	(iii) Androgens
(d) Leydig cells	(iv) Progesterone only

Select the correct option.

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

[NEET Oct. 2020]

84. Match the following columns and select the correct option.

Column I	Column II
(a) Placenta	(i) Androgens
(b) Zona pellucida	(ii) Human Chorionic Gonadotropin (hCG)
(c) Bulbourethral glands	(iii) Layer of the ovum
(d) Leydig cells	(iv) Lubrication of the penis

Select the correct option.

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

[NEET Sept. 2020]

85. The amnion of mammalian embryo is derived from:

- (A) mesoderm and trophoblast
(B) endoderm and mesoderm
(C) ectoderm and mesoderm
(D) ectoderm and endoderm.

[NEET 2018]

86. Match column I with column II and select the correct option using the codes given below.

Column I	Column II
(a) Mons pubis	(i) Embryo formation
(b) Antrum	(ii) Sperm

(c) Trophoctoderm	(iii) Female external genitalia
(d) Nebenkern	(iv) Graafian follicle

Select the correct option.

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

[NEET Phase-II 2016]

87. Ectopic pregnancies are referred to as:

- (A) pregnancies with genetic abnormality
(B) implantation of embryo at site other than uterus
(C) implantation of defective embryo in the uterus
(D) pregnancies terminated due to the hormonal imbalance.

[AIPMT Latest July 2015]

88. Select the correct option describing gonadotropin activity in a normal pregnant female:

- (A) High level of FSH and LH stimulates the thickening of endometrium.
(B) High level of FSH and LH facilitate implantation of the embryo.
(C) High level of hCG stimulates the synthesis of estrogen and progesterone.
(D) High level of hCG stimulates the thickening of endometrium.

[AIPMT 2014]

89. Which one of the following is not the function of placenta? It:

- (A) facilitates supply of oxygen and nutrients to embryo.
(B) secretes oestrogen.
(C) facilitates removal of carbon dioxide and waste material from embryo.
(D) secretes oxytocin during parturition.

[NEET 2013]

90. In a normal pregnant woman, the amount of total gonadotropin activity was assessed. The result expected was:

- (A) High level of circulating FSH and LH in the uterus to stimulate implantation of the embryo.
(B) High level of circulating hCG to stimulate endometrial thickening.
(C) High levels of FSH and LH in uterus to stimulate endometrial thickening.
(D) High level of circulating hCG to stimulate oestrogen and progesterone synthesis.

[AIPMT Screening 2012]

91. The first movements of the foetus and appearance of hair on its head are usually observed during which month of pregnancy?

- (A) Fourth month (B) Fifth month
(C) Sixth month (D) Third month

[AIPMT Screening 2010]

92. Which of the following hormones is not a secretion product of human placenta?

- (A) Human chorionic gonadotropin
- (B) Prolactin
- (C) Estrogen
- (D) Progesterone

[AIPMT 2004]

93. During embryonic development, the establishment of polarity along anterior/posterior, dorsal/ventral or medial/ lateral axis is called:

- (A) organizer phenomena
- (B) axis formation
- (C) anamorphosis
- (D) pattern formation.

[AIPMT 2003]

94. Extra-embryonic membranes of the mammalian embryo are derived from:

- (A) inner cell mass
- (B) trophoblast
- (C) formative cells
- (D) follicle cells

[AIPMT 1994]

95. Eye lens is formed from:

- (A) Ectoderm
- (B) Mesoderm
- (C) Endoderm
- (D) Ectoderm and mesoderm

[AIPMT 1992]

96. Gonads develop from embryonic:

- (A) ectoderm
- (B) endoderm
- (C) mesoderm
- (D) both (B) and (C).

[AIPMT 1990]

2.7. Parturition and Lactation

97. Match List-I with List-II:

List-I	List-II
(a) Parturition	(i) Several antibodies for new - born babies
(b) Placenta	(ii) Collection of ovum after ovulation
(c) Colostrum	(iii) Foetal ejection reflex
(d) Fimbriae	(iv) Secretion of the hormone hCG

Choose the correct answer from the options given below:

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

[Re-NEET 2024]

98. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

Assertion (A): Breast-feeding during initial period of infant growth is recommended by doctors for bringing a healthy baby.

Reason (R): Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Both A and R are correct but R is NOT the correct explanation of A.
- (B) A is correct but R is not correct.
- (C) A is not correct but R is correct.
- (D) Both A and R are correct and R is the correct explanation of A.

[NEET 2024]

99. Which of these is not an important component of initiation of parturition in humans?

- (A) Increase in estrogen and progesterone ratio
- (B) Synthesis of prostaglandins
- (C) Release of oxytocin
- (D) Release of prolactin

[NEET 2021]

100. The foetal ejection reflex in humans triggers the release of:

- (A) oxytocin from foetal pituitary
- (B) human chorionic gonadotropin (hCG) from placenta
- (C) human placental lactogen (hPL) from placenta
- (D) oxytocin from maternal pituitary

[NEET Karnataka 2013]

101. Signals from fully developed foetus and placenta ultimately lead to parturition which requires the release of:

- (A) oestrogen from placenta
- (B) oxytocin from maternal pituitary
- (C) oxytocin from foetal pituitary
- (D) relaxin from placenta

[AIPMT Mains 2010]

102. Foetal ejection reflex in human female is induced by:

- (A) pressure exerted by amniotic fluid
- (B) release of oxytocin from pituitary
- (C) fully developed foetus and placenta
- (D) differentiation of mammary glands.

[AIPMT Screening 2009]

103. In human adult females, oxytocin:

- (A) stimulates pituitary to secrete vasopressin
- (B) causes strong uterine contractions during parturition
- (C) is secreted by anterior pituitary
- (D) stimulates growth of mammary glands

[AIPMT 2008]

SOLUTIONS

- (C) Vas deferens is a muscular tube that carries sperm from the epididymis to the urethra during ejaculation. It receives a duct from the seminal vesicle, which produces and secretes a significant portion of the fluid that makes up semen. The vas deferens and seminal vesicle duct join to form the ejaculatory duct, which passes through the prostate gland and opens into the urethra.

Cervix is the lower narrow part of the uterus that opens into the vagina. The cervical canal is the cavity within the cervix, which connects the uterus to the vagina. During childbirth, the cervical canal dilates to allow the baby to pass through, along with the vagina, which forms the birth canal.

- (A) In human male, urethra is the common terminal duct of the reproductive and urinary systems. It measures around 8 inches long and opens at the end of the penis. During ejaculation, the urethra serves as an outlet for both the urine (urinary system) and the sperm (reproductive system). Ureter connects kidney to urinary bladder. Vas deferens connects testis to seminal vesicle. Vasa efferentia lead from the rete testis to the vas deferens.



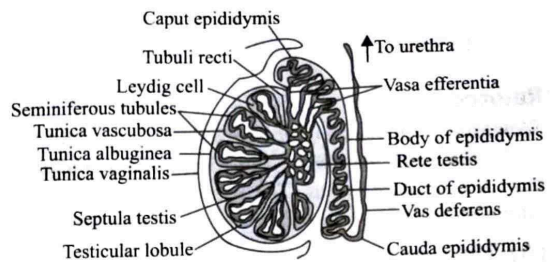
Related Theory

- Male incontinence during copulation: When penis is erect, the sphincter that is at the base of bladder closes. This disables urination during copulation.
- (D) Leydig cells are present adjacent to the seminiferous tubules in the testes. They produce testosterone (androgens) in the presence of luteinizing hormone.



Related Theory

- Sertoli cells are the somatic cells in the testis that are essential for testis formation and spermatogenesis. They facilitate the progression of germ cells to spermatozoa via direct contact and by controlling the environment within the seminiferous tubules.
- (D) Sperms are produced in seminiferous tubules in testis, which are connected to rete testis then moves to vasa efferentia. The sperms reach epididymis through vasa efferentia, where they are stored temporarily for maturation and then transferred to vas deferens. Therefore, if vasa efferentia is blocked, then gametes will not be transported from testis to epididymis. On the other hand, ovary, uterus and vagina are the parts of human female reproductive system.



Structure of testis

- (D) The function of the scrotum is to protect the testes and to keep them at a temperature 2-2.5 degrees below the normal body temperature. This lowers temperature which helps to maintain sperm production. The scrotum protrudes from the body wall. It contracts from cold, exercise, or sexual stimulation and expands and relaxes when warm. Secondary sexual characters are influenced by testosterone and produced by testes.
- (C) The specialised sertoli cells are found in between the germinal epithelium of seminiferous tubules in men. These provide nutrition to the developing male germ cells.



Related Theory

- Spermiogenesis is the final stage of spermatogenesis, which includes the maturation of spermatids into mature and motile spermatozoa. The transformation of spermatid into sperms takes place in sertoli cells.
- (B) Sperms are produced in seminiferous tubules, which are connected to rete testis and then to vasa efferentia. The sperms reach epididymis through vasa efferentia, where they are stored temporarily for maturation and then transferred to vas deferens.
 - (A) Seminal plasma in humans is secretion of accessory glands, rich in fructose, calcium and some enzymes.



Related Theory

- The seminal vesicles in male reproductive system create fructose, which is released into the sperm during ejaculation. Fructose is the source of energy for sperm motility. Calcium (Ca) is an important element required for numerous physiological processes in spermatozoa such as spermatogenesis, sperm motility, capacitation, acrosome response, and fertilisation.
- (A) Male accessory glands include a pair of seminal vesicles, a prostate gland, and pair of bulbourethral glands. Their secretions are called as seminal plasma, which is rich in fructose, has calcium and some enzymes. Liver is the largest gland of the

human body, which secretes Angiotensinogen which is involved in blood pressure control. Pancreas secrete insulin and glucagon. Salivary glands secrete salivary amylase, involved in the digestion of starch.

Related Theory

Secretions from the seminal vesicles make up about 60 percent of the volume of the semen, with most of the remainder coming from the prostate gland. The sperm and secretions from the bulbourethral gland contribute only a small volume.

10. (A) The seminal plasma is rich in fructose, calcium, ascorbic acid, and certain enzymes. It provides nourishment and protection to sperms.

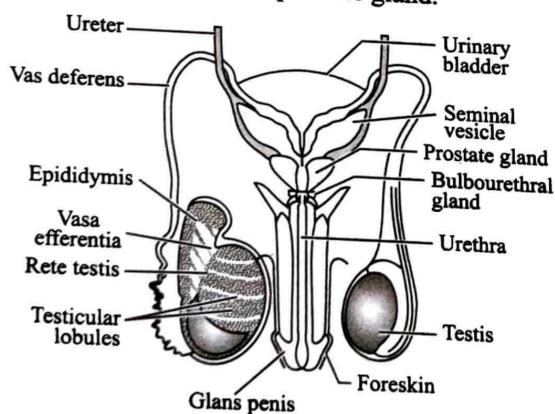
Related Theory

Seminal plasma is a complex fluid comprised of secretions from all organs or tubules of the seminal tract (bulbourethral glands, seminal vesicles, prostate, vasa deferentia and epididymis) and from the seminiferous tubules in the testicles.

11. (B) The vas deferens is the muscular tube that travels from epididymis into the pelvic cavity to just behind the bladder. The seminal vesicle is a pair of exocrine glands that are located posterior to the urinary bladder and anterior to the rectum.

The prostate gland is an exocrine gland that borders the urinary bladder and surrounds the urethra.

The bulbourethral glands are located on the sides of urethra just below the prostate gland.



Male Reproductive System

12. (D) Sex hormones are hormones or chemical compounds produced by specific cells in an organism's reproductive system. These hormones influence the growth, maturation, and development of gametes and other reproductive organs. The principal male sex hormone, i.e., testosterone, influences the major male physical characteristics. It is essential for the development of reproductive organs such as the testes and prostate. It is produced in the testis' interstitial cells. The interstitial cells are referred to as Leydig's cells. These cells are found in the interstitial spaces, which are regions outside the seminiferous tubules. These cells produce

testosterone by stimulating the pituitary gland's production of LH hormone.

Related Theory

The main androgenic hormone secreted by the testes is testosterone. The testes also produce inhibin B and anti-Mullerian hormone from Sertoli cells, and insulin-like peptide 3 (INSL3) and oestradiol from the Leydig cells.

Testosterone is essential in the early stages of a foetus' development of male reproductive organs. It also triggers the development of male features such as facial hair growth, voice deepening, and the growth spurt that occurs during puberty.

Mnemonics

Finding it hard to remember the examples of hormones secreted by testis? Here's a simple trick to memorize it. Check it out!

TIM

T - Testosterone

I - Inhibin

M - Mullerian Inhibiting Factor

13. (C) To arrange the parts in the human mammary gland in the correct order for the route of milk ejection:

Milk production starts in the mammary alveoli.

Milk from the alveoli drains into the mammary tubules.

The tubules converge to form mammary ducts.

The ducts lead to the ampulla, where milk is stored.

From the ampulla, milk travels through the lactiferous ducts to the nipples.

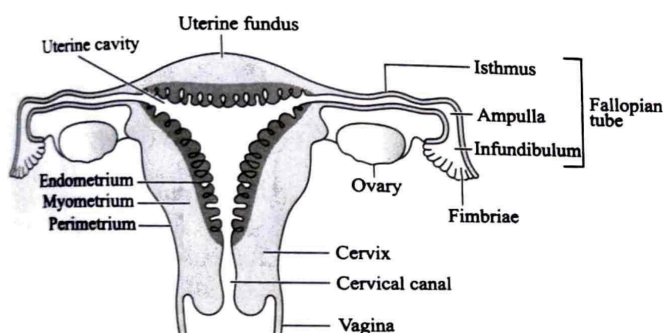
14. (A) The mons pubis is a fatty cushion of tissue located over the pubic bone and covered by skin and hair. The clitoris is a small, sensitive finger-like structure located above the labia minora. The hymen is a delicate membrane that partially covers the vaginal opening. The labia majora are the larger, fleshy outer folds of skin surrounding the vaginal opening.

15. (B) Hymen is a membrane that partially covers the opening of the vagina. It is often torn during the first coitus (intercourse). However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, etc.

16. (D) The fallopian tube is composed of three parts: infundibulum, ampulla and isthmus. The first segment, closest to the uterus, is called the isthmus. The second segment is the ampulla, which is the most common site for fertilisation. The final segment, located farthest from the uterus, is the infundibulum.

The fundus of uterus is the superior part of the body of uterus that lies above the opening of the uterine tubes.

17. (A) The given diagram shows female reproductive system that consists of ovaries, uterine tubes, uterus, vagina and external genitalia. In the diagram, (a) represents inner glandular layer called endometrium that lines the uterine cavity. The endometrium undergoes cyclical changes during menstrual cycle. The part (b) represents myometrium that exhibits strong contraction during delivery of the baby. The part (c) is infundibulum which is the funnel shaped lateral end of fallopian tube. The part (d) is finger like processes known as fimbriae which serve to collect the ovum after ovulation. The part (e) represents cervix which helps the uterus to open into the vagina. The part (f) shows cervical canal (cavity of the cervix). This canal along with vagina forms the birth canal.



Female Reproductive System

18. (C) The Bartholin's glands are located on each side of the vaginal opening. They secrete fluid that helps lubricate the vagina.

Related Theory

A Bartholin's cyst develops when the duct exiting the Bartholin's gland becomes blocked. The fluid produced by the gland then accumulates, causing the gland to swell and form a cyst.

Caution

Students must remember that Bartholin's (bulbourethral) glands of females are homologues to the bulbourethral glands of males.

19. (C) FSH is a gonadotropin and it affects ovarian follicles in females and causes their growth, but in males. LH affects Leydig cells leading to secretion of androgens. Growing ovarian follicles secrete estrogen in females while interstitial cells secrete androgen in male human being.
20. (D) In the given flowchart related to spermatogenesis:
- (1) GnRH stimulates the release of LH and FSH (X) from the anterior pituitary.
 - (2) LH targets Leydig cells (Y), which stimulates the synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis

- (3) FSH (X) acts on Sertoli cells (Z) and stimulates the secretion of some factors, which help in the process of spermiogenesis (W).

21. (B) Spermiogenesis is the process in which spermatids are transformed into spermatozoa (Sperms). After spermiogenesis, sperm heads become embedded in the Sertoli cells, and are finally released from the seminiferous tubules by the process called spermiation.

22. (C) The process of formation of the male gametes (sperm) and female gametes (ovum) is called spermatogenesis and oogenesis, respectively.

Some similarities and differences between spermatogenesis and oogenesis:

- (1) Both spermatogenesis and oogenesis results in the formation of haploid gametes.
 - (2) In spermatogenesis, differentiation of gamete occurs after the completion of meiosis. In oogenesis, the Graafian follicle ruptures to release the secondary oocyte called the ovum. There is nothing like the differentiation of secondary oocytes.
 - (3) In spermatogenesis, meiosis occurs continuously in a mitotically dividing stem cell population. In oogenesis, mitosis occurs only during the embryonic development stage.
 - (4) Both spermatogenesis and oogenesis is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary.
 - (5) Spermatogenesis is initiated at puberty. The male germ cells undergo mitosis to form primary spermatocytes which divide into secondary spermatocytes by meiosis. Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary; no more oogonia are formed and added after birth.
23. (A) Oogenesis is the process of forming an ova/egg/ female gamete. It is the process through which the female gamete ovum is formed. The process of oogenesis begins during a female child's embryonic development. After birth, no additional oogonia are made or added to a human female. Only 60,000 to 80,000 primary follicles remain in each ovary at puberty, with the remainder degenerating during the birth-to-puberty period. During embryonic development, primary oocytes are generated. The meiotic division is then temporarily arrested at the prophase-I stage. Primary oocytes continue to be in meiosis I until the female child reaches puberty. Every month, under the influence of various

female hormones, these primary follicles grow into secondary follicles, resulting in ovulation. The release of the ovum from the ovary is known as ovulation. This marks the onset of the menstrual cycle.

24. (D) Spermiogenesis is the process of transformation of spermatids into spermatozoa. Spermiogenesis involves the release of sperms from seminiferous tubules through Sertoli cells.

Related Theory

In spermatogenesis, secondary spermatocytes undergo meiosis to form four haploid spermatids. These spermatids are non-motile and are sent to Sertoli cells with the aid of peristaltic contraction where they gain motility and become capable of fertilization and transform to spermatozoa. This process is known as spermiogenesis. During this each spermatid begins to grow a tail and develop a thickened midpiece where the mitochondria gather and form an axoneme. Spermatid DNA also undergoes packaging, becoming highly condensed. The Golgi apparatus forms the acrosome. One of the centrioles of the cell elongates to become the tail of the sperm. The mature spermatozoa are released from the protective Sertoli cells into the lumen of the seminiferous tubule by the process called spermiogenesis.

Mnemonics

The process of spermatogenesis can be learned by memorizing this super easy trick.

Government Starts Primary & Secondary School in South

Government – Germ cells

Starts – Spermatogonia

Primary – Primary Spermatocyte

Secondary – Secondary Spermatocyte

School in – Spermatid

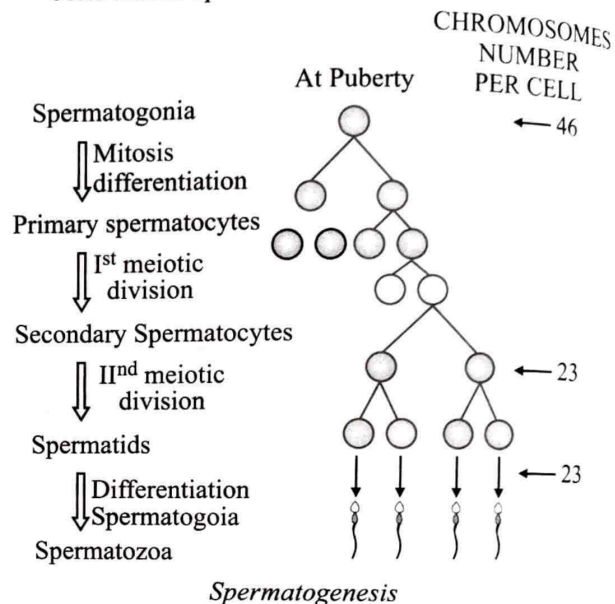
South – Spermatozoa

25. (C) During spermatogenesis, the primary germ cells undergo repeated mitotic divisions producing spermatogonia. All these cells have diploid ($2n$) number of chromosomes. Spermatogonia grows in size by accumulation of nourishing material and attain maturity and are known as primary spermatocytes. Each primary spermatocyte undergoes meiotic division. The first meiotic division produces secondary spermatocytes each containing haploid (n) number of chromosomes. Each secondary spermatocyte undergoes second meiotic division and produces spermatids (haploid). Polar bodies are formed during oogenesis and are haploid.

26. (D) The tertiary follicle and Graafian follicle are also known as antral follicles due to the presence of antrum, i.e., the fluid-filled cavity. The acellular layer in the antral follicle is zona pellucida, which surrounds the oocyte. It is made up of a glycoprotein matrix. Zona pellucida layer is secreted by both

oocytes and follicles. It is surrounded by corona radiata.

27. (D) Spermatogonia present in the seminiferous tubules divide mitotically to increase in number to form spermatocytes. Each spermatocyte undergoes meiosis to form haploid spermatids, which further undergoes changes (spermiogenesis) to form sperm cells called spermatozoa.



Related Theory

Since, each primary spermatocyte divides meiotically to form 4 sperms thus 400 sperms or spermatozoa will be formed from 100 primary spermatocytes. The sperm consists of head, neck, middle piece and tail. When sperm production starts, this age is called sexual maturity. It is generally 14 to 16 years. The spermatogenesis is controlled by hormone (FSH) of anterior lobe of pituitary gland.

28. (A) Sperm is viable for 24 to 48 hrs, whereas human ovum is viable for 24 hrs only. Sperms are ejaculated along with the seminal fluid, which is slightly alkaline (pH 7.2-7.4). Sperm motility measures how well sperm can swim to fertilise an egg and how fast the sperm travel.

Related Theory

The male reproductive system includes three glands: seminal vesicles, prostate gland, and Cowper's glands. The secretions from the three glands together form seminal fluid or semen, which nourishes the sperm, increases the volume and helps in lubrication.

Mnemonics

There are three major male accessory glands which help in the formation of seminal plasma. These glands can be remembered with the help of following mnemonic:

Sangeet Pyar Bhara

Sangeet – Seminal vesicles

Pyar – Prostate gland

Bhara – Bulbourethral gland

29. (B) Human sperm has a head, neck, middle piece, and tail. The acrosome is a cap-like structure found in the head region of sperm. This acrosome contains digestive enzymes such as hyaluronidase and lysins, which help in the breakdown of the ovum's outer membrane, known as the zona pellucida, allowing the haploid nucleus in the sperm cell to join the haploid nucleus in the ovum and thus facilitating fertilization.
30. (B) Sertoli cells line the seminiferous tubules in the testes in males. These cells protect the spermatids and convey nutrients to both developing and mature spermatozoa. Sertoli cells are regulated by Follicle-Stimulating Hormone (secreted by anterior pituitary), and release testosterone. Luteinising hormone is also secreted by anterior pituitary and regulate corpus luteum and placenta, growth hormone regulates all the cells of the body and prolactin is secreted by anterior pituitary and regulates the milk production in mammary glands.



Related Theory

- Spermiogenesis is the final stage of spermatogenesis, which includes the maturation of spermatids into mature, motile spermatozoa. The transformation of spermatid into sperms takes place in Sertoli cells.



Caution

- In females, FSH stimulates the release of oestrogen and progesterone.

31. (B) Middle piece of a mammalian sperm contains mitochondria coiled around the axial filament. It is called mitochondrial spiral. These provide energy for the movement of the sperm.
32. (A) Eggs are grouped into four types based on the idea of the quantity of yolk present in them.
- (1) **Alecithal Egg:** When the egg contains no yolk. *E.g.*, The eggs of eutherian mammals (humans).
 - (2) **Microlecithal Egg:** When the egg contains small or negligible amount of yolk. *E.g.*, Amphioxus, *Tunicates*.
 - (3) **Mesolecithal Egg:** When the quantity of yolk present is moderate. *E.g.*, in amphibian, *Dipnoi* and *Petromyzon*.
 - (4) **Macrolecithal or Megalecithal or Polylecithal Egg:** When the egg contains an outsized amount of yolk. *E.g.*, Reptiles, Birds, Prototheria (*Monotremata*) laying mammals.
33. (A) The primordial germ cells of the germinal epithelium undergo mitotic division and give rise to undifferentiated germ cells called spermatogonia ($2n$). These spermatogonia multiply by mitotic division and increase in numbers. Some of the

spermatogonia called primary spermatocytes. During meiosis-I, primary spermatocyte is the main germ cell. It is diploid, ($2n$). It completes the first meiotic division (reduction division) leading to the formation of two equal, haploid cells called secondary spermatocytes, which have only 23 chromosomes each. So, at the end of first meiotic division, male germ cell differentiates into secondary spermatocyte. Then, these secondary spermatocytes undergo second meiotic division to form four daughter cells known as spermatids (n).

34. (C) Sperms are formed through the process of spermatogenesis from the male germ cells. Each primary spermatocyte divides by meiosis I to produce two secondary spermatocytes. Each secondary spermatocyte undergoes meiosis II to produce 4 spermatids.

So, the correct process is as follows:

Spermatogonia ($2n$) → Primary Spermatocyte ($2n$) → 2 Secondary Spermatocyte (n) → 4 Spermatids (n) → 4 Sperms (n)

35. (A) Egg is liberated from the ovary of humans in the secondary oocyte stage. The release of egg from the ovaries is ovulation. In women, this occurs when the ovarian follicles rupture to release the secondary oocyte ovarian cells.
36. (C) Approximately during the 14th day of menstrual cycle, ovulation typically occurs. This process is triggered by the rapid secretion of luteinizing hormone (LH) in the middle of the menstrual cycle, which induces the rupture of the Graafian follicle and the release of the ovum.
37. (B) Menopause refers to the cessation of menstruation at the end of a woman's reproductive life.
38. (D) Luteal phase occurs after ovulatory phase. During this phase, Corpus luteum is formed and the level of progesterone is highest while the levels of FSH and LH are low and for the development of new follicles, FSH is required. Also progesterone retards follicular development.



Related Theory

- Menstruation is the monthly cycle of orderly sloughing of the uterine lining, in response to the interactions of hormones produced by the hypothalamus, pituitary, and ovaries. The menstrual cycle may be divided into two phases: (1) follicular or proliferative phase, and (2) the luteal or secretory phase. The duration of a menstrual cycle is 28 days with most cycle lengths between 25 to 30 days. The typical volume of blood lost during menstruation is approximately 30 mL. Any amount greater than 80 mL is considered abnormal.

39. (A) In proliferative phase, the follicles start growing in size under the influence of FSH, and hence known as follicular phase. The secretory phase is characterised by the enrichment of the endometrium with nutrient in preparation for embryo implantation. Menstruation is the breakdown of the endometrial lining of the uterus which forms liquid that comes out through vagina.

Related Theory

- The reproductive cycle of female primates (monkeys, apes, and humans) is known as the menstrual cycle.
 - Menarche is the first menstruation that begins. Menopause is the phase which occurs when menstrual cycles cease at the age of 50. Cyclic menstruation that occurs between menarche and menopause is an evidence of a normal reproductive phase.
40. (D) GnRH initiates pituitary secretion of luteinizing hormone (LH) and follicle-stimulating hormone, thus activate the secretion of progesterone and estrogen respectively. These Steroids gives negative feedback regulates GnRH release thus, suppresses GnRH release.

Related Theory

- In males, testosterone exerts negative feedback on gonadotropin secretion.
41. (A) Inhibin is secreted by the granulosa cells of ovarian follicles in the ovary. They give negative feedback to the secretion of FSH in pituitary gland.

Related Theory

- The inhibin A test is done to measure the amount of inhibin A hormone in a pregnant woman's blood to see if the baby may have Down's syndrome. Inhibin A is made by the placenta during pregnancy. The level of inhibin A in the blood is used in a maternal serum quadruple screening test. However, Inhibin B is a hormone associated with reproduction and the development of eggs in women and sperm in men. The test to measure the inhibin B level in the blood is used in infertility evaluation. Inhibin B is made mostly by the ovaries in females, and by the testicles in males.

Caution

- Students should remember that small amounts of inhibin are produced by the Sertoli cells in the testes of men and inhibit the multiplication of spermatogonia in male gonads.
42. (B) The LH and FSH rise steadily during the follicular phase. They promote follicular growth and the release of estrogen by follicular cells.
- Both LH and FSH reach their highest levels in the middle of the cycle (about 14th day). Rapid LH production, which reaches its peak during the mid-cycle, causes Graafian follicle rupture and, as a

result, ovum discharges (ovulation). LH increases androgen production and secretion by acting on the Leydig cells. Androgens, in turn, stimulate the spermatogenesis process (production of sperms from immature male germ cells, i.e., spermatogonia in testis). FSH acts on the Sertoli cells, stimulating the production of certain factors that aid in the process of spermiogenesis (transformation of spermatids into spermatozoa).

43. (A) Estradiol is required for maturation and maintenance of the reproductive system. During the menstrual cycle, the drop in estradiol levels during the follicular phase causes the endometrium layer of the uterus to shed, beginning menstruation. It plays no role in ovulation.

Related Theory

- Ovulation refers to rupture of mature Graafian follicle and release of the ovum in body cavity on 14th day of 28 days menstrual cycle. FSH is secreted by anterior pituitary gland. It stimulates growth, development and hormonal secretion of Graafian follicle and ovum maturation. LH is also secreted by the anterior pituitary, which inhibits secretion of FSH; stimulate maturation and rupture of Graafian follicle and release of the ovum.

44. (A) Menstruation occurs when the egg released from ovary is not fertilised and corpus luteum degenerates. Corpus luteum is necessary to maintain pregnancy as it releases progesterone, which is known as pregnancy hormone. It support pregnancy initially by maintaining the uterus for the developing embryo. FSH functions in sexual development and functioning. In women, it helps to regulate the menstrual cycle and stimulates the growth of eggs in the ovaries. Oxytocin functions during parturition. Vasopressin or ADH control blood pressure by reabsorbing water in kidneys.

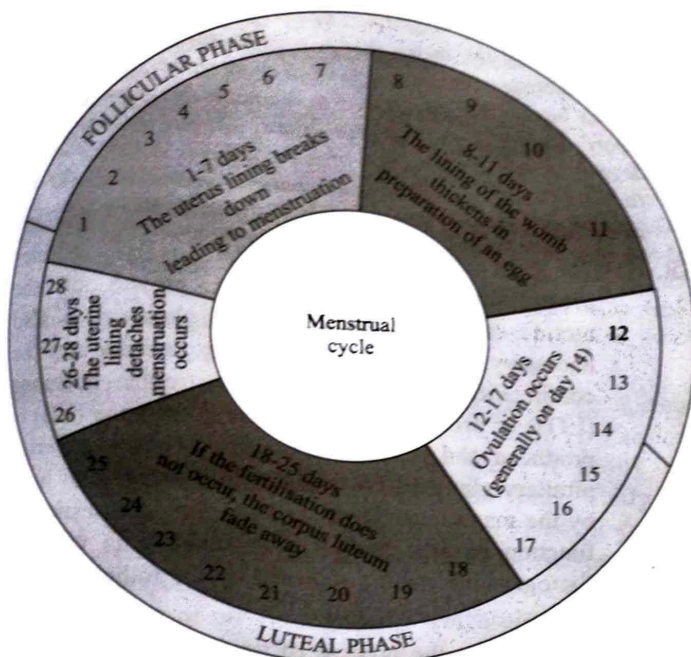
Related Theory

- The corpus luteum secretes large amounts of progesterone which is essential for maintenance of the endometrium. Such an endometrium is necessary for implantation of the fertilised ovum and other events of pregnancy. During pregnancy all events of the menstrual cycle stop and there is no menstruation. In the absence of fertilisation, the corpus luteum degenerates. This causes disintegration of the endometrium leading to menstruation, marking a new cycle.

45. (C) The menstrual cycle of human is generally divided into three phases namely proliferative (follicular), ovulatory and secretory (luteal) phase. The secretory phase occurs between ovulation and onset of menses, and this phase lasts about 14 days.



Related Theory



Menstrual cycle

46. (A) During preovulatory phase of menstrual cycle, theca cells in the ovary respond to LH stimulation by secretion of testosterone, which is converted into oestrogen by adjacent granulosa cells. In women, ovulation of mature follicles in the ovary is induced normally in the middle of the menstrual cycle (about 14th day) by a large burst of LH secretion called as LH surge.
47. (A) There is no menstrual cycle during pregnancy due to the secretion of progesterone hormone by the corpus luteum. The progesterone hormone inhibits the production of the gonadotropic hormones from the pituitary and prevents the uterine lining from sloughing and supports pregnancy.
48. (C) During secretory phase, Graafian follicle degenerates and develops into corpus luteum, which secretes progesterone. During ovulation (at 14th day), sharp rise in LH occurs, called as LH surge. Proliferative phase includes rapid regeneration of endometrium and maturation of Graafian follicles. Menstruation occurs when egg is not fertilised, which is followed by breakdown of endometrium and blood flow.



Related Theory

During the secretory phase, progesterone hormone is produced by the ovaries. Progesterone and oestrogen are secreted by the corpus luteum that develops from the Graafian follicle. Uterine movement or contraction decreases. Progesterone stimulates the further build-up of the cells in the endometrium of the uterus and stimulates the glands in the uterus to secrete

substances that maintain the endometrium and prevents it from breaking down.

49. (B) Generally menstrual fluid does not clot easily due to the presence of anticoagulants. This helps in the easy removal of blood and tissues. During normal menstruation, approximately 40 mL of blood and an additional 35 mL of serous fluid are lost. Menopause is the permanent stoppage of menstrual cycle in female at the age of 45 to 50 years. During this period, the oestrogen production fall below a critical value and the gonadotropic hormones (FSH and LH) are produced regularly from the pituitary so, there level increase in body. Menarche is the onset of menstrual cycle in a young female at about the age of 13 years.



Related Theory

- Menstrual phase lasts for 3-5 days, and extends from 1st and 4th day of the menstrual cycle. When ovum remains unfertilised, corpus luteum starts degeneration, decreasing the level of progesterone. The uterine tissue fail to be maintained. The unfertilised ovum along with ruptural uterine epithelium, 50-100 ml of blood and some mucus is discharged through the vaginal orifice.
50. (D) The release of eggs (at secondary oocyte stage) after rupturing of graafian follicle is called ovulation. After the ovulation, the granulosa cell as well as the stroma cells form theca interna rapidly multiply to fill the cavity of graafian follicle which becomes corpus luteum. If fertilisation occurs, corpus luteum grows further and secrete hormone progesterone. If fertilisation does not take place, corpus luteum regresses and forms a white body called corpus albicans.
51. (B) The progesterone and oestradiol continue the hypertrophy of endometrial lining in the uterus and fallopian tubes and maintain it throughout pregnancy. Progesterone is also necessary for the proper implantation of the foetus in the uterine wall. It stimulates the endometrial glands to secrete a nutrient fluid for the foetus, hence the term secretory phase. The progesterone inhibits the release of FSH so that it may not develop additional follicles and eggs.
52. (A) There is no menstrual cycle during pregnancy due to the secretion of progesterone hormone by the corpus luteum. The progesterone hormone inhibits the production of the gonadotropic hormones from the pituitary and prevents the uterine lining from sloughing and supports pregnancy. Thus, withdrawal of progesterone from the body is the immediate cause of menstruation.
53. (A) If fertilisation does not occur, the high concentration of progesterone and inhibin inhibits GnRH production from hypothalamus. In the absence

of GnRH, levels of LH and FSH falls, making the uterine endometrium start detaching. Due to decreasing progesterone level, corpus luteum converts to corpus albicans and prepares to start the next menstrual phase.

54. (D) Follicular or proliferative phase follows the menstrual phase and lasts for about 10-12 days (from 5th to 14th day of the menstrual cycle). Ovulatory phase involves the ovulation from the Graafian follicle of ovary. It occurs midway between two menstrual cycles (on 14th day of onset of menstruation). Luteal/secretory/post ovulatory phase lasts for about 12-14 days (from 15th - 28th day of menstrual cycle). Corpus luteum is formed from empty Graafian follicle which increases in size. The follicular cells are converted to Lutein cells by deposition of yellowish lipid inclusions, giving it a yellow colour. This phase is the Luteal phase.

Related Theory

Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induce rupture of Graafian follicle and thereby release of ovum (ovulation).

55. (C) The menstrual cycle is regulated by hormones. Luteinizing hormone and follicle-stimulating hormone, which are produced by the pituitary gland, promote ovulation and stimulate the ovaries to produce estrogen and progesterone.
56. (A) A Graafian follicle is the follicle that ruptures and releases the ovum. The Graafian follicle develops into the corpus luteum after ovulation. The corpus luteum secretes progesterone, which is essential for pregnancy maintenance. After ovulation, several follicular cells remain in the collapsed Graafian follicle on the ovary's surface. The antrum (cavity) of a collapsed follicle is partially filled with clotted fluid. The follicular cells enlarge and fill with the yellow pigment lutein. The corpus luteum is thus a sort of follicle. On the other hand, the sebaceous gland secretes an oily, waxy substance known as sebum, and sweat is released by sweat glands. The SA node is recognized as the heart's natural pacemaker. Niacin is vitamin-B₃, and biotin is vitamin-B₇.
57. (A) The process through which a mature egg is released from the ovary is known as ovulation. After the egg is released, it travels down the fallopian tube, and stays there for 12 to 24 hours, where it can be fertilised. The empty Graafian follicle converts into the corpus luteum after ovulation. The corpus luteum produces a hormone called progesterone, which is required to keep the endometrium intact during embryo implantation and to maintain the pregnancy.

Related Theory

Corpus callosum is a nerve fiber tract situated inside the cerebral cortex of the brain. The corpus albicans is a scar on the surface of the ovary that is a remnant of ovulation. The corpus albicans was once a thriving endocrine organ called the corpus luteum that functioned to maintain the growing foetus before degeneration into scar tissue. Corpus Arteria is the degeneration and resorption of many follicles and their ova (a type of apoptosis) prior to the maturation and release of one ovule from a healthy follicle.

58. (D) The corpus luteum of the ovary secretes progesterone. It promotes the growth of the uterine epithelium and mammary glands. It is also necessary for the creation of the placenta and the continuation of pregnancy. Luteotrophic hormone (LTH) or prolactin and luteinizing hormone (LH) is produced and released primarily from the anterior pituitary gland. LTH initiates the secretion of milk by the mammary glands and LH regulates testicular function in men and ovarian function in women. Estrogens are mainly released by the follicles in the ovaries.
59. (A) Ovulation is the process of the release of an ovum from Graafian follicle during menstruation cycle. In a typical 28 days human ovarian cycle ovulation occurs on day 14.
60. (D) Endometrium is the inner lining of the uterus that undergoes cyclic changes under the influence of hormones during the menstrual cycle. The endometrium becomes thick and richly supplied with blood vessels, glandular structures and immune cells to prepare for the implantation of a fertilised egg (blastocyst).
- While it is true that the disintegration of endometrium occurs in the absence of fertilisation and the corpus luteum plays a role in maintaining the endometrium, it does not directly explain why the endometrium is necessary for implantation of the blastocyst. The endometrium provides a receptive environment for the blastocyst to attach and receive nourishment from maternal blood vessels, which is necessary for the further development of the embryo.
61. (D) During mammalian fertilisation, sperm are believed to undergo the acrosome exocytosis when coming into contact with the extracellular matrix surrounding the egg, the zona pellucida of egg cells. Following exocytosis, the acrosome's posterior region, known as the equatorial segment, forms a membrane fusion with the oocyte. IZUMO1, which is found on the acrosomal membrane, is a crucial protein for sperm-egg fusion. As a result of acrosomal exocytosis, this protein relocates to the equatorial region's surface, and sperm become fusion-competent.



Related Theory

The zona pellucida is an extracellular matrix composed of three glycoproteins: ZP1, ZP2, and ZP3. Receptors on the sperm plasma membrane attach to ZP3. Binding to ZP3 allows the sperm to adhere to the zona pellucida and is a critical step in fertilisation.



Caution

Students often get confused between the options, corona radiata and zona pellucida. Remember that, zona pellucida is a thick layer present around the plasma membranes of oocytes which initiates acrosomal reaction of the sperms, and also prevents polyspermy while, corona radiata is a thick outlet membrane that is present outside the zona pellucida which protects and supplies vital proteins to the ovum.

62. (D) Extrusion of second polar body from egg nucleus occurs after entry of sperm but before fertilisation. Once the sperm enters the ovum it allows the secondary oocyte to 'meiotic split'. Entry of sperm causes breakdown of metaphase promoting factor (MPF) and turns on anaphase promoting complex (APC). Second polar body extrusion is a result of oocyte activation which is affected by the fertilisation process.



Related Theory

Polar bodies serve to eliminate one half of the diploid chromosome set produced by meiotic division in the egg, leaving behind a haploid cell. To produce the polar bodies, the cell must divide asymmetrically, by the formation of a furrow/trench near a particular point on the cell membrane. The purpose of polar body formation is to conserve cytoplasm for the oocyte. If fertilised, the oocyte will develop into an egg cell, which will depend on components in the cytoplasm for its development.

63. (A) Gametogenesis (Production of gametes) → Gamete transfer (movement of gametes at the site of fertilisation) → Syngamy (fusion of gametes) → Zygote (First cell formed after fertilisation) → Cell division (multiple synchronised division of cells called cleavage) → Cell differentiation (cell changes to a more specialized type for particular function) → Organogenesis (process of formation of three germ layers)
64. (D) Capacitation is the process of acquiring the capacity to fertilise the egg by the sperm. Freshly ejaculated sperms are unable to fertilise the ovum. Thus, they undergo a series of changes collectively known as capacitation. Capacitation occurs while sperm resides in the female reproductive tract for a period of time.



Related Theory

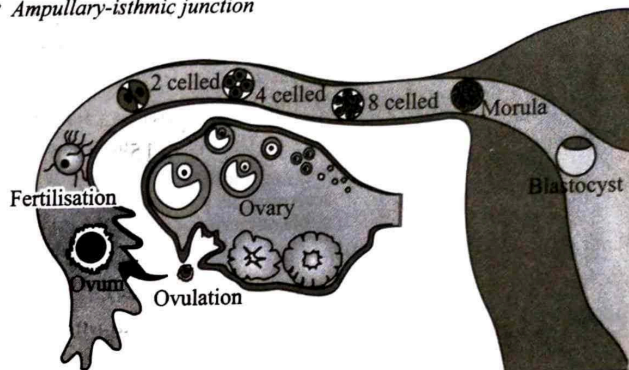
Capacitation in sperm includes removal of adherent seminal plasma proteins, reorganisation of plasma membrane lipids and proteins. It also seems to involve an influx of extracellular calcium, increase in cyclic AMP and decrease in intracellular pH.

65. (A) The sperms swim actively in the female genital tract and enter into the uterus and reach the fallopian tubes at the junction of isthmus and ampulla. The ovum which is released after ovulation also reaches the ampullary-isthmic junction where fertilisation occurs between the sperm and the ovum.



Related Theory

Ampullary-isthmic junction



66. (B) In human females, meiosis-II is not completed until fertilisation. Secondary oocyte is arrested in metaphase-II until sperm contacts the plasma membrane of the oocyte and complete meiosis-II.
67. (A) At first, the sperm passes through corona radiata to reach zona pellucida. There, it releases the enzyme hyaluronidase or sperm lysin from its acrosome. This enzyme dissolves zona pellucida as a result of which the sperm reaches the plasma membrane of the egg. The above changes on the sperm head are called acrosome reaction. Only one sperm reaches the egg, through corona radiata, zona pellucida and the vitelline membranes and lose its tail.



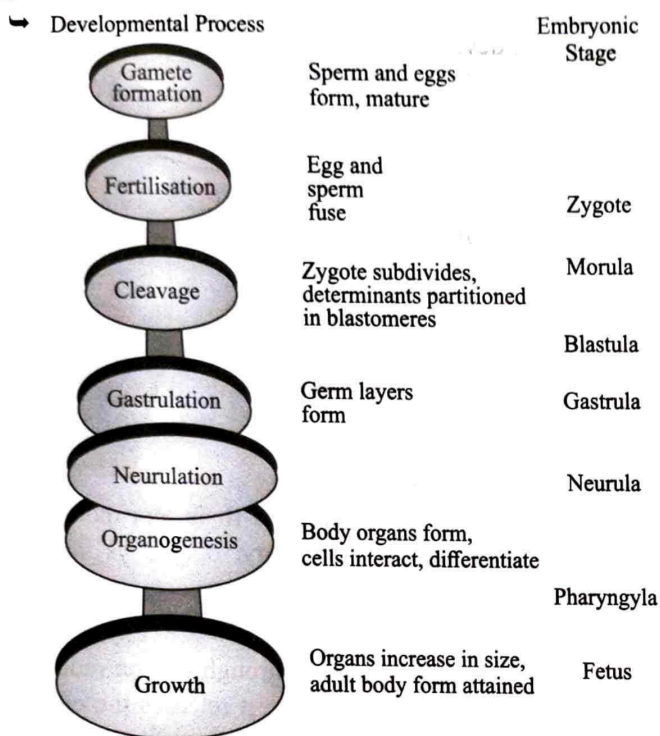
Related Theory

Once one sperm has entered the egg (ovum) the vitelline membrane thickens and is converted into fertilisation membrane. This membrane is rigid and never allows other sperms to pass through this membrane. The egg cytoplasm extends around the head of sperm to form a fertilisation cone that engulfs the sperm so that the head and the mid piece enter the ovum. The formation of fertilisation membrane around the egg blocks polyspermy and allows only single sperm to enter. This is called as zonal reaction.

68. (B) Prior to fertilisation, the egg is in a quiescent state, arrested in metaphase of the second meiotic division. Upon binding of a sperm, the egg rapidly undergoes a number of metabolic and physical changes that collectively are called egg activation. Prominent effects include a rise in the intracellular concentration of calcium, completion of the second meiotic division and the so-called cortical reaction.
69. (A) Cleavage divisions are mitotic divisions, in which the single-celled zygote is converted into a multicellular morula. But during cleavage divisions

there is no growth of resultant daughter cells/blastomeres. So, the DNA content will increase, but there is no increase or insignificant increase in amount of protoplasm.

Related Theory



70. (D) Blastocyst (Blastodermic vesicle) formed as a result of cleavage of zygote, gets implanted in the uterus. The placenta starts to develop when the fertilised egg called blastocyst implants in the maternal endometrium. The outer layer of blastocyst trophoblast, get embedded in the endometrium and later forms the placenta.

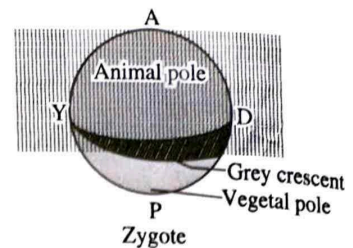
71. (B) The pattern of embryonic cleavage is determined by the amount and distribution of yolk protein within the cytoplasm.

Related Theory

→ **Types of cleavage:**

- (1) **Holoblastic:** The cleavage, in which the segmentation lines pass through the entire egg, dividing it completely, e.g., frog, human egg, etc.
- (2) **Meroblastic:** The lines of segmentation do not completely pass through the egg and remain confined to a part of the egg, e.g., insects, birds, reptiles.

72. (B) Grey crescent marks the future dorsal side of the embryo. Subsequently, it was determined that the Grey Crescent is formed by the 30° rotation of the fertilised egg to form a dorsal/ventral axis. The crescent thus serves as a determinant of dorsal/ventral polarity, cells without it have no means of orientation.



Related Theory

→ In the zygote of the frog, there are two poles present. The vegetal pole and the animal pole. These are separated by an area which is rich in melanin and is known as the grey crescent. The egg enters opposite to the region of sperm entry. The broadest part of the grey crescent forms the dorsal end. The grey crescent helps in establishing polarity.

73. (B) During cleavage, the zygote divides repeatedly to convert the large cytoplasmic mass into a large number of small blastomeres. It involves cell division without growth in size because cells continue to be retained within the zona pellucida. However, cell size decreases during cleavage.

Related Theory

→ **Holoblastic cleavage** is a complete cleavage meaning it completely penetrates the egg. **Meroblastic cleavage** is incomplete or partial cleavage meaning it does not penetrate the egg completely.

74. (B) A mature egg (ovum) of human secretes a chemical substance fertilizin. Sperm has on its surface a protein substance called antifertilizin. The fertilizin of an egg interacts with the antifertilizin of a sperm of the same species. This interaction makes the sperms stick to the egg surface.

75. (A) Cleavage is the division of cells in the embryo's early stages after fertilisation in embryology. The amount and distribution of yolk in an egg determine the type of cleavage. The creation of the blastula marks the end of cleavage.

Related Theory

→ On this basis, the cleavage can be of two types: **Holoblastic**, in which the segmentation line passes through the entire egg. It occurs in alecithal (without yolk), microlecithal (with very little amount of yolk) and mesolecithal (little amount of yolk) egg. **Meroblastic**, in which the segmentation line does not pass through the egg and remained confined to a part of the egg. It occurs in megalecithal (large amount of yolk) egg.

76. (C) The fertilised egg is cleaved in the fallopian tube. Mitotic divisions (called cleavage) occur in the zygote. It begins in the fallopian tube's isthmus region and progresses to the uterus for implantation. The egg cleavage in humans is holoblastic. Blastomeres are embryos at the cleavage stage. Before implantation, cells divide into two, four, eight, sixteen, and blastocyst stages. The fallopian tube is the female reproductive organ via which these cells are transported to the uterus.

77. (B) In the presence of a high quantity of yolk in the fertilised egg cell, partial, or meroblastic cleavage can occur. There are two types of meroblastic cleavage: discoidal and superficial. The cleavage furrows do not enter the yolk in discoidal cleavage. On top of the yolk, the embryo forms a disc of cells known as a blastodisc. Mitosis occurs but not cytokinesis in superficial cleavage, resulting in a polynuclear cell. With the yolk in the middle, the nuclei move to the egg's periphery, and the plasma membrane develops inward, partitioning the nuclei into individual cells.

78. (B) Nucleo-cytoplasmic ratio remains unchanged. In cleavage there is an increase in number of cells and nuclear mass without increase in the cytoplasmic mass.

79. (B) The released egg is haploid because it is formed by meiotic division of a diploid primary oocyte with the XX chromosome. As a result, the egg always has one X chromosome.

Related Theory

The female human chromosome pattern is XX, while the male chromosome pattern is XY. As a result, all haploid gametes (ova) generated by females have the sex chromosome X, however in male gametes (sperms), the sex chromosome can be either X or Y, so 50% of sperms carry the X chromosome and the other 50% have the Y. After the male and female gametes fused, the zygote would carry either XX or XY, depending on whether the sperm carrying X or Y fertilised the ovum. The zygote bearing XX would develop into a female child, while XY would develop into a male.

80. (A) After the formation of three major germ layers (i.e., ectoderm, mesoderm, and endoderm), cells of these three layers become variable in morphology, shape, size, and more specified to form organs so as to meet the foetus's future functional needs; this process is known as differentiation.

Related Theory

Differentiation refers to the transformation of developing tissues and organs from simple to more complex forms, allowing them to become specialised for certain functions. During embryonic development and regeneration, differentiation occurs.

81. (B) Relaxin is produced primarily by the corpus luteum, in both pregnant and non-pregnant females. It attains the highest plasma levels during pregnancy. In this condition, relaxin is also produced by the decidua and placenta. In males, relaxin is synthesized in the prostate and released in the seminal fluid.

Related Theory

In preparation for childbirth, relaxin relaxes the ligaments in the pelvis and softens and widens the cervix.

82. (B) In humans, by the end of 1st-trimester or 3rd month of pregnancy, all the major organ systems

develop e.g., the limbs and genital organs are well-developed. By the end of 2nd trimester (6 months), eyelashes are formed, eyelids separate and the body gets covered with fine hair. During 5th month, the embryo starts moving and hairs start appearing on the head. After the 1st month of pregnancy, the heart develops. Limbs and digits develop in the 2nd month. By the end of the 9th month, the foetus fully develops and is ready for birth.

Caution

Students usually get confused with timeline of embryo development in humans. One should prepare a chart or mnemonics for better retention of memory.

83. (D) Ovary produce oestrogen and progesterone. Placenta produces Human Chorionic Gonadotropin (hCG). Corpus luteum, formed after fertilisation produce progesterone only. Leydig cells, in testis produce androgens.

84. (C) Placenta secretes human Chorionic Gonadotropin hormone (hCG), Human Placental lactogen (hPL), Estrogen and Progesterone. The hormones hCG and hPL are produced in women only during pregnancy. Zona pellucida is a primary egg membrane secreted by secondary oocyte. It supports communication between oocytes and follicle cells during oogenesis; protects oocytes, eggs, and embryos during development, and regulates interactions between ovulated eggs and free-swimming sperm during fertilisation process. The secretion of an exocrine Bulbourethral glands or Cowper's gland located posterolateral to the membranous urethra, help in lubrication of the penis. Leydig cells are found adjacent to the seminiferous tubules in the testicle. They produce testosterone (androgens) in the presence of luteinizing hormone (LH).

85. (C) In mammalian embryo, amnion is derived from ectoderm and mesoderm. It is the extraembryonic membrane, formed by the amniogenic cells of ectodermal origin on inner side, and somato-pleuric mesodermal cells on outer side.

Related Theory

The chorion membrane is tropho-ectodermal and mesodermal in origin. Allantois and yolk sac is mesodermal in outer side, and endodermal on inner side of the tissue.

86. (B) The mons pubis is a pad of fatty tissue that covers the pubic bone. While both sexes have a mons pubis, it's more prominent in females. It forms the female external genitalia. The antrum is the cavity around the ova which develops later in the development of the Graafian follicle. Trophoectoderm is the outermost layer of cells in the mammalian blastodermic vesicle, which provide nutrition to the embryo. It is the cell layer from which the

trophoblast differentiates. The mitochondria in the middle piece of sperm fuse together to form a structure called the Nebenkern.

87. (B) An ectopic pregnancy occurs when a fertilised egg attaches somewhere outside the uterus. An untreated ectopic pregnancy can be a medical emergency.

Related Theory

→ A tubal pregnancy occurs when the egg has implanted in the fallopian tube. This is the most common type of ectopic pregnancy and the majority of ectopic pregnancies are tubal pregnancies. Nearly two percent of all ectopic pregnancies become established in other areas including the ovary, the cervix or the intra-abdominal region.

88. (C) Human Chorionic Gonadotropin (hCG) is a hormone produced by the placenta after implantation. The main function of HCG is to maintain corpus luteum so as to allow the secretion of the hormone progesterone and oestrogen. Progesterone enriches the uterus with a thick lining of blood vessels and capillaries so that it can sustain the growing foetus. During ovulation, oestrogen thickens the endometrium, while progesterone prepares the uterus for pregnancy. An elevated FSH indicates diminished ovarian reserve, while high level of LH causes ovulation.

Related Theory

→ Placenta also acts as an endocrine tissue and produces several hormones like human chorionic gonadotropin (hCG), human placental lactogen (hPL), oestrogens, progesterone, etc. A hormone called relaxin is secreted by the ovary in the later phase of pregnancy. hCG, hPL and relaxin are produced in women only during pregnancy.

→ A human chorionic gonadotropin (hCG) urine test is a pregnancy test. The presence of hCG in urine is considered a positive sign of pregnancy.

89. (D) Posterior pituitary secretes oxytocin during parturition. It induces uterine contractions which in turn cause increased oxytocin secretion, required for child birth. The functions of placenta are:

- (1) **Nutrition:** Supply of nutrient material to foetus.
- (2) **Respiration:** Supply of O_2 to foetus and receives CO_2 back from it.
- (3) **Excretion:** Fluid nitrogenous waste products escape through the placenta.
- (4) **Barrier:** The placenta is a barrier like semi-permeable membrane.
- (5) **Storage:** The placenta stores fat, glycogen and iron for the embryo before the formation of liver.
- (6) **Hormonal function:** The placenta secretes extra ovarian hormones-oestrogen and progesterone in female during pregnancy that serves to maintain foetus.



Mnemonics

→ Check this mnemonic for the substances that crosses the placenta.

We Always Need To Make Healthy Decisions.

We – Waste Products
Always – Antibodies
Need – Nutrients
To – Teratogens
Make – Microorganisms
Healthy – Hormones/HIV
Decisions – Drugs

90. (D) In pregnant female, high levels of hCG will maintain corpus luteum and stimulate it to secrete oestrogen and progesterone.

Estrogen levels rise consistently during pregnancy, peaking in the third trimester. It is important in the development of milk ducts, which enlarges the breasts, during the second trimester. High amounts of progesterone aid in the maintenance of the uterine endometrium, which is critical for the growing foetus. It also aids in the growth of internal structures such as the ureters. It is also necessary for converting the uterus from the size of a tiny pear when not pregnant to a uterus capable of accommodating a full-term baby.

91. (B) The first movement of the foetus and appearance of hair on the head are observed during fifth month of pregnancy.

92. (B) Prolactin is secreted by anterior pituitary gland and cause production of milk in mammary glands. Placenta produce estrogen, progesterone, relaxin. Human chorionic gonadotropin (hCG) hormone and Human placental lactogen (hPL).



Related Theory

→ Progesterone acts to maintain pregnancy by supporting the lining of the uterus (womb), which provides the environment for the foetus and the placenta to grow. Estrogen is also produced by the placenta during pregnancy to help maintain a healthy pregnancy.



Caution

→ Students should note that circulating relaxin is secreted by the corpus luteum. The placenta, decidua, or both also produce relaxin, which does not enter the circulation but may act in an autocrine or paracrine fashion. hCG is a stimulus to luteal relaxin secretion.

93. (A) During embryonic development, the establishment of polarity along anterior/posterior, dorsal/ventral or medial/lateral axis is called organizer phenomena.

Axis formation is the process of formation of an axis. The axis can be ventral/dorsal, medial/lateral. Anamorphosis is the post embryonic development and moulting in the arthropods. Pattern Formation is a developmental process by which the cells attain spatial arrangement within an embryo.

94. (B) The extra-embryonic membranes of the mammalian embryo are developed from trophoblast, and the blastocyst is formed once the zygote is cleaved. The trophoblast, the epithelial layer that surrounds the blastocyst, is then formed. This trophoblast cells is responsible for the formation of the majority of extra-embryonic membranes in mammals. Extra embryonic membranes protect and nourish the foetus. These are classified into four types: chorion, amnion, allantois, and yolk sac. The outermost extra-embryonic membrane is the chorion, whereas the interior extra-embryonic membrane is the amnion.

95. (A) After implantation, the blastocyst's inner cell mass develops into an outer ectoderm, a middle mesoderm, and an inner endoderm. These layers then develop into embryonic tissues and organs. Endoderm is responsible for the development of organs such as the colon, stomach, intestine, liver, lungs, and pancreas. Mesoderm is responsible for the formation of the heart, kidneys, gonads, genital ducts, cartilage, muscles, blood cells, and other structures. Ectoderm develops the outer linings of the brain, spinal cord, nerves, ears, eye lens, and retina of the eye, nails, and hair.

96. (C) The three germ layers that give rise to specific tissues, organs, and organ systems are ectoderm, mesoderm, and endoderm. Mesoderm gives rise to gonads, muscles, dermis, kidneys, septa (crosswise partitions), and mesenteries (lengthwise partitions). The ectoderm gives rise to epithelial and neural tissues. Endoderm gives rise to the pancreas, the lining of the urinary bladder, etc.

97. (A) Parturition is the process of giving birth, which is initiated by the foetal ejection reflex. The placenta secretes the hormone hCG (human chorionic gonadotropin), an indicator of pregnancy. Colostrum is the first form of milk produced after childbirth, is rich in antibodies, such as IgA. Fimbriae are finger-like projections that help in the collection of the ovum after ovulation.

98. (D) Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby as a yellowish fluid or milk is produced during the initial few days of lactation called colostrum, which contains several antibodies (IgA) absolutely essential to develop resistance for the new-born babies.

99. (D) Prolactin is the hormone which induces lactation and has no role in parturition (process of giving birth to the child). On the other hand, increase in estrogen

and progesterone ratio indicates the initiation of the parturition process. Prostaglandins are produced in response to oxytocin and Corticotropin-releasing hormone (CRH) production. They are effective in causing uterine contractions. Oxytocin releases from the posterior pituitary and it stimulates the uterine contractions. This hormone provides the force to expel the baby from the uterus, causing birth.

100. (D) Signals of parturition originate in the form of mild uterine contraction. The foetus signals that is ready (mature) by secreting certain hormones which diffuse through placenta into mother's blood and cause secretion of oxytocin which initiate uterine contractions. These are called foetal ejection reflexes. It is accompanied by rise in oestrogen to progesterone ratio, increase in oxytocin receptors in uterine muscles, increase in level of oxytocin secretion by mother's pituitary gland.



Related Theory

As onset of labour cause complete dilation of cervix, uterine contractions begin from top. They force the baby towards cervix. Contractions are accompanied by pain caused by compression of blood. These contractions are under positive feedback. Oxytocin induce uterine contractions which in turn caused increased oxytocin secretion. Relaxin hormone produced by the placenta increases flexibility of pubic symphysis and dilates uterine cavity which helps in pushing the baby down into the cervix. This results in rupturing of amniotic membrane and flowing out of amniotic fluid.

101. (B) Signals of parturition originate in the form of mild uterine contraction which is accompanied by rise in oestrogen to progesterone ratio, increase in oxytocin receptors in uterine muscles, increase in level of oxytocin secretion by mother pituitary gland.

102. (B) Oxytocin is secreted by posterior pituitary gland and stimulates contraction of uterine muscles and labour pain for child birth, when secretion of progesterone hormone declines, making the end of pregnancy.



Related Theory

Relaxin hormone produced by the placenta increases flexibility of pubic symphysis and dilates uterine cavity which helps in pushing the baby down into the cervix. Dilation occurs in vagina too. This results in rupturing of amniotic membrane and flowing out of amniotic fluid.

103. (B) The posterior pituitary gland secretes oxytocin, a peptide hormone. It induces severe uterine contractions in females during parturition. It causes the uterine walls to contract during labor pain and promotes lactation after birth. It is also linked to emotions and sensations like empathy, trust, sexual activity, and relationship formation.

