

Reproduction & Embryonic Development Solutions

1. (3)
Sexual reproduction increases genetic diversity within a population. It is a better strategy of reproduction as compared to asexual reproduction.
2. (4)
An animal that is oviparous reproduces by producing internally fertilized or externally fertilized eggs that develop externally.
3. (1)
The testicles of male mammals are suspended in the scrotum because the optimum temperature for sperm production is less than the normal body temperature of the organism.
4. (2)
Spermatogenesis is not directly effected by inhibin because inhibin suppresses FSH which in turn acts on Sertoli cells.
5. (1)
Eggs & sperms are genetically very similar, but structurally very different as both contain haploid chromosomes but egg must provide nutrients for early development while sperms must be able to move efficiently.
6. (2)
If meiotic strategy of spermatogenesis and oogenesis is reversed than sperm production would decrease to one fourth. One oogonium produces one ovum but one spermatogonium produces 4 sperms.
7. (3)
Early in ovarian cycle, estrogen, produced in the follicle inhibits gonadotropin release, while later in the cycle, estrogen stimulates gonadotropin release because the feedback mechanism is dependent on the concentration of estrogen.
8. (2)
In the ovarian cycle of mammals, the eggs are most likely to become fertilized immediately after ovulation as the survival tome of oocyte is very brief.
9. (4)
In a pregnant woman, there is high levels of HCG which stimulates estrogen and progesterone synthesis. HCG is a glycoproteinaceous hormone similar in action to LH.
10. Option (2) is correct i.e.,

(III) – Influndibulum (IV) fimbriae (V) Cervix

11. Option (3) is correct i.e., the correct sequence is
Seminiferous tubule → tubuli recti → rete testis → vasa efferentia
12. Option (1) is correct i.e., The correct sequence is
Germinal epithelium → tunica albuginea → cortex → medulla
13. Option (3) is correct.
Scrotum in males is homologous to labia majora in females.
Penis in males is homologous to clitoris in females.
Prostate gland in males is homologous to Bartholin's gland.
Cowper's gland in males is homologous to Paraurethral gland in females.
14. (4)
Parturition is induced by positive feedback of oxytocin as it stimulates uterus to contract and rise in estrogen/progesterone ratio. Decline in progesterone initiates contraction of myometrium.
15. (2)
The hormones released by placenta have the following functions
- Maintains corpus luteum to secrete progesterone throughout pregnancy
 - Prepare mammary gland for lactation
 - Cause morning sickness
16. (1)
Teratogens are most potent during first trimester of pregnancy.
The developing individual in the womb is less susceptible to teratogens after 3 months.
17. (1)
Each testis is covered with a dense white fibrous tissue which extends inwards forming septa. Septa divide testis into a series of internal compartments forming about 250 lobules. Each lobule has 2 to 3 seminiferous tubules.
18. (3)
Primary oocyte, Primary spermatocyte & sertolii cells are diploid.
19. (4)
Human chorionic gonadotropin (hCG) mimics the action of LH in maintaining corpus luteum in case implantation occurs.
20. (1)
Prior to ovulation/during pre-ovulatory phase there is follicular phase and proliferative phase. During follicular phase nearly 15-20 follicles grow but only one out of these dominates and form Graafian follicle. During proliferative phase there is proliferation of endometrium.
21. (4)

If mammalian ovum fails to get fertilized then there is decrease in estrogen level and progesterone level. Primary follicles develop during follicular phase.

22. (3)

Spermiation is a process in which sperms are released from the Sertoli cells into lumen of seminiferous tubules.

23. (3)

Tertiary follicle is characterized by a fluid filled cavity called antrum or follicular cavity.

24. (2)

The ligament attaching the ovary to the uterus as a supportive fibrous structure is known as ovarian ligament.

25. (1)

Haemoendothelial placenta has only one barrier.

26. (3)

Monozygotic twins develop at early blastocyst stage.

27. (1)

The maternal part of placenta is decidua basalis.

28. (1)

The correct sequence of events in reproductive cycle which leads to destructive phase is rise in progesterone, lack of HCG, degeneration of corpus luteum, fall in progesterone.

29. (4)

The incorrect match is

Acrosin – dissolves coagulated semen.

Acrosin acts on zona pellucida. It helps to digest zona pellucida.

30. (3)

The protein present on the surface of the sperm is antifertilizin. It helps in species specific fertilization.

31. (2)

Oogenesis is completed in three stages namely multiplication phase, growth phase and maturation phase. In maturation phase, secondary oocytes are formed from primary oocytes.

32. (1)

Chorion is made up of trophoblast outside and somatopleuric extra embryonic mesoderm inside.

33. (3)

Gestation period of human female when counted from last menstrual period is about 280 days.

34. (4)

FSH acts on Sertoli cells of the seminiferous tubules of the testis to secrete androgen binding protein (ABP) and inhibin. LH acts on the Leydig's cells of the testis to secrete testosterone.

35. Option (1) is correct.

FSH helps in maturation of Graafian follicle.

LH helps in development of corpus luteum

Progesterone maintains endometrium for implantation

Oestrogen helps in development of secondary sexual characteristics.

36. (2)

Primitive streak in human embryos are formed during gastrulation. It results in formation of 3 germ layers.

37. (2)

Egg is released on 14th day of the normal menstrual cycle of 28 days.

Endometrium secretes nutrients for implantation in between 15th-28th day.

Progesterone level increases in between 15th-28th day.

38. (1)

Gametes are haploid in humans

39. (1)

Tapeworms are self-fertilizing in which the testis of one individual can fertilize the eggs produced by the same individual. Tape worm is hermaphrodite.

40. (2)

Temperature in scrotum necessary for sperm formation should be 2°C below body temperature. Sperm production, maturation of storage requires 2 to 3°C temperature than normal body temp.

41. (1)

Cryptorchidism is non descent of testis in scrotum.

42. (1)

The gestation period refers to the period between fertilization and birth.

43. (3)

The immediate predecessors of spermatids are secondary spermatocytes.

44. (1)

Mammalian eggs have no yolk i.e., alecithal.

45. (3)

Sertoli cells are found in testicular lobules of rabbits and nourish spermatozoa.

46. (1)

Young girls at puberty undergoes sexual growth and begin to develop breasts, high pitch voice, development of external genitalia, deposition of fat in thighs, and buttocks etc.

47. (3)
Number of spermatozoons produced by a single primary spermatocyte is four.
48. (1)
After ovulation in females the collapsed ovarian follicle shrink and becomes filled with cells to form corpus luteum.
49. (1)
Ovulation in mammals is a process in which egg is released from Graafian follicle
50. (3)
Seminal fluid consists of spermatozoa and seminal plasma which is rich in fructose, calcium and certain enzymes like acid phosphatase etc.
51. (3)
Mature sperms are stored in epididymis. Vas deferens is secondary store house for sperms.
52. (3)
About 6-7 mature eggs are produced by each ovary of a non-pregnant woman each year. Each ovary alternate in process of gamete release.
53. (2)
The distal centriole gives attachment to the axial filament but the proximal centriole helps in cleavage of the fertilized egg. It form spindle during cleavage.
54. (2)
The sperms become mature and fully motile in cauda epididymis
55. (3)
Probable fertility period of menstrual cycle (28 days) is from 13-16 days.
56. (3)
Epididymis is a long coiled tube between vasa efferentia and vas deferens.
57. (3)
Chorionic gonadotropin is secreted by placenta.
58. (3)
In mammals, the testis is posteriorly connected to scrotal sac by an elastic cord called gubernaculum.
59. (3)
Vasa deferentia carries spermatozoa from cauda epididymis to the ejaculatory duct.
Seminal fluid is produced from male accessory glands : Seminal vesicles, prostate gland and bulbourethral glands.
60. (4)
The ability of one embryonic tissue to influence the growth and development of another tissue is termed as induction.
61. (1)

The rate of cleavage in zygote depends upon the amount of yolk & even distribution of yolk.

62. (4)

In humans, the foetus has four extraembryonic membranes, has developed organs and is recognizably human after first trimester and is dependent upon the placenta for excretion of wastes and acquisition of nutrients.

63. (2)

Microlecithal eggs are eggs having little yolk. E.g., *Amphioxus*, sea urchin etc.

Mesolecithal eggs are eggs having moderate amount of yolk eg. Petromyzon, frogs, toads etc.

Macrolecithal eggs are eggs having large amount of yolk. E.g. reptiles, birds etc

Isolecithal eggs are eggs having very little amount of yolk and the yolk is distributed uniformly. Example marsupials and eutherian mammals.

64. (3)

Estrogen secreted by ovaries on the onset of puberty is responsible for development of secondary sexual characteristics such as deposition of fat in the breasts, hips, development of external genitalia, pubic hair etc.

65. (1)

The acrosome of a sperm contains hydrolytic enzymes which helps the sperms to enter inside the egg during fertilization.

66. (1)

The fast block to polyspermy develops in response to the opening sodium gates in the plasma membrane.

67. (4)

The slow block to polyspermy develops in response to the formation of fertilization membrane (cortical reaction) in non mammals.

68. (2)

The first extra embryonic membrane to make its appearance in the mammals is Amnion. It is formed from cells of epiblast.

69. (3)

Placenta serves as a lung (exchange of gases between maternal blood and foetal blood), digestive system (nutritive elements from maternal blood passes into foetus through placenta) and kidney (foetal excretory products diffuse into maternal blood from foetal blood)

70. (2)

Most of the organs of human embryo develop by the 2nd month of gestation/ pregnancy.

71. (2)

Morphogenetic movements involve movement of small cell masses. It takes place during gastrulation.

72. (3)

Mesoderm proliferates from caudal end of embryonic disc during gastrulation.

73. (2)

Foetal membranes produced by trophoblast are chorion and amnion.

74. (4)

Cleavage differs from mitosis because in cleavage there is no growth phase, consumption of O_2 increases and nucleus – cytoplasmic ratio increases.

75. (2)

Hormone administered for hastening child birth is meant for activation of smooth muscles.

76. (4)

Zona pellucida is a thick, non-cellular layer.

77. (4)

Zona pellucida disintegrates just after completion of cleavage.

78. (1)

The endoderm give rise to lining of digestive tract, enamel of teeth, salivary glands, epidermis of skin, hair, nails, pituitary gland, mammary glands etc.

79. (1)

The release of the oocyte from the Graafian follicle is caused by a surge in the level of luteinizing hormone.

80. (4)

During fetal development, oogonia in human females halt meiosis at prophase I of meiosis I.

81. (1)

The corpus luteum is maintained for the first 10 weeks of pregnancy by hCG.

82. (2)

Contraction of mammary glands and ducts during the milk-ejection reflex is stimulated by oxytocin.

83. (1)

If GnRH were secreted in large amount and at constant rate rather than in a pulsatile fashion, then LH secretion will increase at first and then it will decrease due to negative feedback effect.



Reproduction & Embryonic Development

Solutions

ASSERTION AND REASONING TYPE

1. (2)

2. (4)

3. (1)

4. (3)

Gamete formation is not completely absent. For example spore formation in fungi, gemmule formation in sponges etc.

5. (2)

6. (3)

Fertilization can be internal (e.g., mammals) or can be external (e.g., earthworm).

7. (1)

8. (1)

9. (1)

10. (1)

11. (4)

There is incomplete parthenogenesis in bees, males are haploid as they are developed from unfertilized eggs whereas queen bee and females are diploid as they are developed from fertilized eggs.

12. (1)

13. (2)

Testes are present outside the abdominal cavity because formation of sperm needs body temperature 2-2.5°C lesser than normal body temperature.

14. (3)

Seminiferous tubules are lined with spermatogenic cells that give rise to sperm cells. Sertoli cells are embedded among developing sperm cells that extends from basement membrane to the lumen of the tubule whereas leydig's cells are present in the spaces between seminiferous tubules.

15. (3)

The male accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens.

16. (1)

17. (1)
18. Seminal plasma is collective product of male accessory glands – seminal vesicles, prostate glands, cowper's gland and ejaculatory duct.
19. (1)
20. (1)
21. (1)
22. GnRH from hypothalamus stimulate anterior pituitary to secrete FSH which stimulates sertoli cells in the testes to stimulate spermatogenesis.
23. (1)
24. (3)
25. (1)
26. (3)
27. (2)
- During capacitation the secretions of female genital tract removes coating substances deposited on sperms especially acrosome as a result receptor sites on acrosome are exposed and it becomes active to penetrate egg.
28. (2)
- If sperm that will lose their acrosome before encountering the oocyte will be able to bind (fertilizin and antifertilizin reaction) to zona pellucida but will be unable to digest zona pellucida and fertilize egg.
29. (2)
30. (1)
31. (2)
32. (4)
- After hysterectomy, menstrual cycle will not take place but ovarian cycle will. FSH secretion has no relation with uterus.
33. (3)
- Eggs of most mammals, including humans are of alecithal type.
34. (1)
35. (1)
36. (2)

PREVIOUS YEARS QUESTIONS

1. (1)

Cyclic Parthenogenesis refers to the process whereby certain organisms (e.g. rotifers) alternate sexual reproduction with parthenogenesis.

Diploid Parthenogenesis can occur without meiosis through mitotic oogenesis. This is called apomictic parthenogenesis. Mature egg cells are produced by mitotic divisions, and these cells directly develop into embryos. The offspring produced by apomictic parthenogenesis are full clones of their mother. E.g. aphids.

2. (1)

Parthenogenesis is formation of an organism directly from the ovum without fertilization. e.g. drones (male) honey bees

Parthenocarpy is the formation of fruits without fertilization e.g. banana

5. (2)

Hyaluronidase enzyme breaks down hyaluronic acid which joins the cells of corona radiata around the ovum

9. (4)

Azoospermia commonly occurs after vasectomy. The sperms don't reach the ejaculatory duct but semen is formed.

11. (3)

Semen is made up of 60% seminal fluid from seminal vesicles, 30% of prostatic fluid and 10% sperms

12. (4)

Progesterone holds the endometrium and doesn't allow it to degenerate. Decreased progesterone causes degeneration of endometrium and bleeding

13. (1)

Ovulation occurs at the end of Follicular phase or proliferative phase.

14. (3)

Corpus luteum is a yellow colour body present in the ovary which produces progesterone and estrogen. It has lutein protein & carotene pigment.

Macula lutea is a yellow colour area in the retina of the eye which has maximum visual acuity.

16. (1)

In a 28 day menstrual cycle

1st-5th day is menstrual phase which has duration of 5 days

6th -13th day is follicular/ proliferative phase which has duration of 7-8 days

14th day is ovulatory phase which has duration of 1 day

15th -28th day is luteal/ secretory phase which has duration of 13-14 days

17. (3)

Corona radiata are cells of Graafian follicle (follicular cells) which cover the ovum after ovulation. They are stuck to each other with the help of hyaluronic acid.

18. (3)

Nebenkern is spirally arranged mitochondria seen in human sperm.

19. Polar bodies formed during the oogenesis. They are formed to limit the number of eggs. Also polar body formation helps in distributing more nutrients to the viable egg which can be used by the embryo

21. (2)

When the egg is present in the Graafian follicle is surrounded by three layers;

outer- discus proliferous, middle-corona radiata and inner- zona pellucida

22. (4)

The sequence of oogenesis is

Primordial germ cell (2n) → Oogonium (2n) → Primary oocyte (2n) → Secondary oocyte (n) and 1st polar body (n) → Ovum (n) and 2nd polar body

24. (2)

Antrum is the cavity of Graafian follicle filled with Liquor folliculi

25. (1)

Cathepsins are proteases (enzymes that degrades proteins) found in all animals. There are approximately a dozen cathepsins, which are distinguished by their structure, catalytic mechanism, and the proteins they cleave.

Most of the members become activated at the low pH found in lysosomes. Thus, the activity of this family lies almost entirely within lysosomes.

Cathepsins have a vital role in mammalian cellular turnover, e.g. bone resorption.

26. (2)

At birth, the girl child contains about a million primordial follicles out of which many degenerate and are absorbed till puberty by a process called follicular atresia.

28. (1)

There are two types of animals:

1. Spontaneous ovulators in whom ovulation takes place without any external stimulus. e.g. Humans
2. Induced ovulators in whom ovulation takes place only when a external stimulus like sexual intercourse takes place. e.g. Cats

29. (3)

After menstruation, the pituitary produces FSH to stimulate the conversion of a new primary follicle into Graafian follicle. Theca interna of Graafian follicle produces estrogen.

When estrogen level reaches its peak, the pituitary produces LH and causes ovulation. Due to LH the empty Graafian follicle is converted to corpus luteum which produces progesterone.

31. (4)

Lion, bat, hippopotamus, cat, kangaroo, hedgehog (spiny)- Terrestrial mammals (viviparous)

Whale, dolphin- Aquatic Mammals (viviparous)

Shrew, Lemurs, loris- Primates belonging to Mammalia (viviparous)

Ostrich, kiwi, penguin- egg laying birds

32. (2)

Gray crescent is the appearance of a light-colored band in the newly fertilized egg of certain amphibians, right after their fertilization. It lies just opposite the site of entry of sperm into ovum

33. (4)

There are 3 extra embryonic membranes- amnion, chorion and allantois. All of them are derived from trophoblast. Only Reptiles, aves and Mammals have these extra-embryonic membranes (Amniotes)

34. (3)

Vitellogenesis (also known as yolk deposition) is the process of yolk formation via nutrients being deposited in the oocyte, or female germ cell involved in reproduction. It occurs in all animal groups other than the mammals

36. (2)

Fertilizin is a glycoprotein present on the surface of egg and Anti-fertilizin is protein present on the surface of sperms. Fertilizin and Anti-fertilizin are species specific. Thus if ovum and sperm are of two different species, fertilizin- antifertilizin reaction wont take place and there wont be fertilization

37. (4)

Nervous system, brain, spinal cord, retina of eye- ectodermal derivatives

Connective tissue, heart (cardiac muscles), urinary bladder (visceral muscles)- mesodermal derivatives

40. (2)

In placental mammals, the allantois is part of and forms an axis for the development of the umbilical cord.

The human allantois is an endodermal fold of the developing hindgut which becomes surrounded by the mesodermal connecting stalk. The connecting stalk forms the umbilical blood vessels. The fetal bladder is connected to the allantois, which removes nitrogenous waste from the fetal bladder. The allantois is vestigial and may regress, but the homologous blood vessels persist as the umbilical arteries and veins connecting the embryo with the placenta.

42. (1)

Epiboly is a cell movement that occurs in the early embryo, at the same time as gastrulation. It is one of many movements in the early embryo that allow for dramatic physical restructuring. The movement is generally characterized as being a thinning and spreading of cell layers.

47. (2)

A large amount of yolk in the egg will interfere with cleavage making the divisions incomplete. Humans have micro-lecithal eggs and hence cleavage is complete.

48. (4)

High amount of progesterone in blood prevents menstruation.

50. (3)

In this question, option 2 states that proliferative phase has "Rapid regeneration of myometrium". It should be "Rapid regeneration of endometrium"

Option 4 states that Menstruation has "Breakdown of myometrium". It should be "Breakdown of endometrium"

51. (2)

Human Chorionic Gonadotropin (HCG) is produced by the embryo. Presence of HCG in the urine of mother is a sure test for pregnancy as HCG is not produced by mother

53. (2)

Meiosis part II takes place only when the sperm penetrates the ovum (in the secondary oocyte stage). It produces final ovum and the 2nd Polar body.

54. (4)

Blastocyst gets implanted into the endometrium 7 days after fertilization. The trophoblast form an outer layer called syncytio-trophoblast which release lytic enzymes for implantation. The embryo receives nutrition from uterine milk even before implantation.

55. (1)

Fructose is present only in semen and no other body fluid. Hence presence of fructose indicates a sign of sexual intercourse in rape cases.

58. (1)

The temperature required for spermatogenesis is 2°C less than the normal body temperature

