

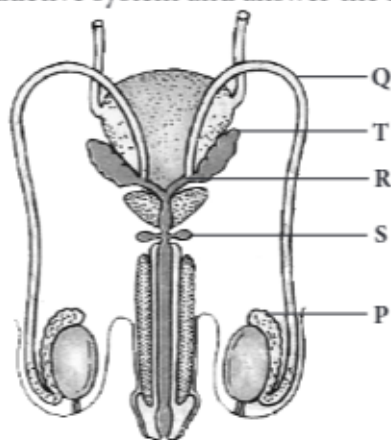
Human Reproduction

CASE STUDY / PASSAGE BASED QUESTIONS

1

Read the following and answer any four questions from 1(i) to 1(v) given below:

Human male reproductive system comprises of a pair of testes, primary sex organs associated with formation of gametes and production of sex hormone. Study the given figure of human male reproductive system and answer the following questions.



- (i) Which of the following is correct for labelled part P?
- P is rete testis which transports sperms to outside.
 - P is epididymis which secretes fluid that nourish the sperms.
 - P is epididymis that carry sperms and secretion of seminal vesicles.
 - P is rete testis which lies along inner side of each testis and stores the sperms.
- (ii) Identify the correctly matched pair.
- | | |
|-------------------------|--------------------------|
| (a) Q - Vasa efferentia | (b) R - Ejaculatory duct |
| (c) S - Seminal vesicle | (d) T - Cowper's gland |
- (iii) Which statement is incorrect for Q?
- It carries spermatozoa from epididymis to ejaculatory duct.
 - Q are only 2 in number.
 - It arises from rete testis.
 - It constitutes male sex accessory duct.
- (iv) Which structure passes through the prostate gland and carries sperms and secretion of seminal vesicle?
- | | | | |
|-------|-------|-------|-------|
| (a) P | (b) T | (c) S | (d) R |
|-------|-------|-------|-------|

Syllabus

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis;

menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

- (v) **Assertion :** Mucus present in secretion of bulbourethral gland decreases the number of sperms damaged during ejaculation.
Reason : Mucus lubricates the end of penis and lining of the urethra.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

2

Read the following and answer any four questions from 2(i) to 2(v) given below:

Oogenesis is the process of formation of ovum in ovaries. It consists of three phases : multiplication, growth and maturation. Oogenesis is controlled by hormones GnRH, LH, FSH. GnRH secreted by the hypothalamus stimulates the anterior lobe of pituitary gland to secrete LH and FSH.

- (i) What is the function of hormone FSH?
- (a) It inhibits the formation of estrogen.
(b) It induces the release of secondary oocyte
(c) It stimulates the growth of Graafian follicles.
(d) It causes ovulation.
- (ii) Which hormone induces the rupture of the mature Graafian follicle?
- (a) Follicle stimulating hormone (b) Gonadotropin releasing hormone
(c) Progesterone (d) Luteinising hormone
- (iii) Which cell division is involved in the formation of secondary oocyte?
- (a) Mitosis (b) Meiosis I (c) Amitosis (d) Meiosis II
- (iv) Identify the function(s) of LH.
- (A) Release of secondary oocyte from Graafian follicle.
(B) Stimulates corpus luteum to secrete progesterone.
(C) Stimulates estrogen formation.
(D) Promotes development of egg to form secondary oocyte.
- (a) (A) and (B) only (b) (B) and (C) only
(c) (A), (C) and (D) only (d) (B) only
- (v) **Assertion :** The increase in progesterone level exerts positive feedback on GnRH.
Reason : The rising level of progesterone stimulate production of FSH and LH.
- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

3

Read the following and answer any four questions from 3(i) to 3(v) given below:

The first menstruation is called menarche, that usually occurs between 12 and 15 years. In human females, menstruation is repeated at an average interval of about 28/29 days and is called menstrual cycle. It is regulated by certain hormones, as pituitary gland is stimulated by releasing factors produced in the hypothalamus. The

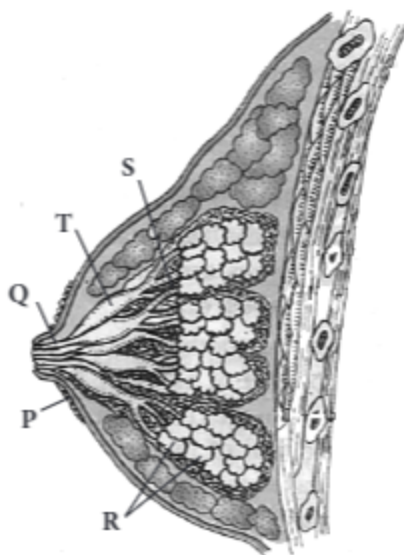
hormones produced by pituitary gland influence the ovaries. The hormones secreted by the ovaries affect the walls of the uterus.

- (i) The breakdown of endometrium is characteristic of
- | | |
|-------------------------|----------------------|
| (a) proliferative phase | (b) luteal phase |
| (c) ovulatory phase | (d) menstrual phase. |
- (ii) Which days of the menstrual cycle marks the proliferative phase?
- | | | | |
|---------|-----------|----------|-----------|
| (a) 1–5 | (b) 15–28 | (c) 6–13 | (d) 10–14 |
|---------|-----------|----------|-----------|
- (iii) Which of the following occurs during secretory phase?
- | |
|--|
| (a) Empty Graafian follicle changes into corpus luteum. |
| (b) Primary follicle changes into Graafian follicle. |
| (c) Endometrium rebuilds and estrogen secretion increases. |
| (d) LH surge inducing release of an ovum. |
- (iv) Identify the hormones that attain peak level during ovulatory phase.
- | | | | |
|---------|------------------|--------|----------------------|
| (a) FSH | (b) Progesterone | (c) LH | (d) Both (a) and (c) |
|---------|------------------|--------|----------------------|
- (v) Withdrawal of which hormone causes degeneration of corpus luteum?
- | | | | |
|---------|--------|------------------|--------------|
| (a) FSH | (b) LH | (c) Progesterone | (d) Estrogen |
|---------|--------|------------------|--------------|

4

Read the following and answer any four questions from 4(i) to 4(v) given below:

A functional mammary gland is characteristic of all female mammals. Mammary glands are paired structures that contain glandular tissue and variable amount of fat. Refer to the given figure of a mammary gland and answer the following questions.



- (i) Mammary glands are modified
- | | |
|-------------------------|----------------------|
| (a) sweat glands | (b) sebaceous glands |
| (c) sudoriferous glands | (d) lacrimal glands. |
- (ii) Identify the incorrectly matched pair.
- | | |
|----------------------|--------------------------|
| (a) P – Areola | (b) Q – Lactiferous duct |
| (c) S – Mammary duct | (d) T – Mammary alveoli |

(iii) Mammary ducts expand to form

- (a) mammary alveoli
- (b) mammary ampullae
- (c) lactiferous ducts
- (d) mammary tubules.

(iv) What is areola?

- (a) Grape-like clusters of milk secreting structures
- (b) Fatty tissue between the mammary lobes
- (c) Circular pigmented area of skin around nipple
- (d) Connective tissue that supports the alveoli and ducts

(v) **Assertion:** The size of breast depends on the amount of adipose tissue.

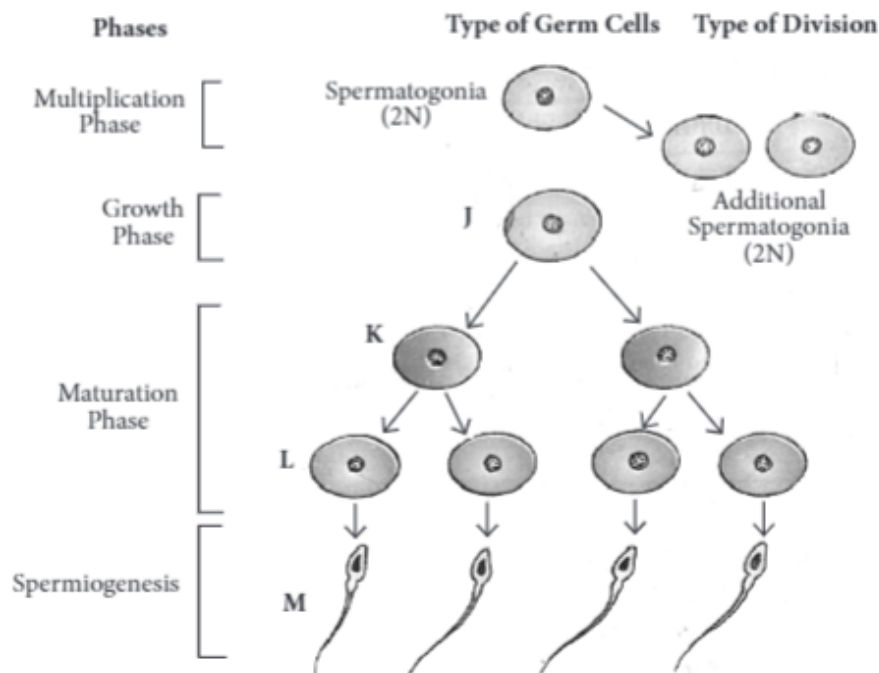
Reason : The adipose tissue supports the alveoli and the ducts.

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

5

Read the following and answer any four questions from 5(i) to 5(v) given below:

In testis, the immature male germ cells produce sperms by spermatogenesis that begins at puberty. It occurs in the seminiferous tubules of the testes. Seminiferous tubules are lined by germinal epithelium. Study the schematic representation of spermatogenesis and answer the following questions.



(i) Which cell division occurs during multiplication phase?

- (a) Mitosis
- (b) Meiosis I
- (c) Meiosis II
- (d) Both (b) and (c)

(ii) How many chromosomes are present in secondary spermatocyte and spermatid respectively?

- (a) 46, 23
- (b) 46, 46
- (c) 23, 23
- (d) 23, XY

(iii) Transformation of L into M is known as

- (a) spermiation
- (b) spermateliosis
- (c) spermatogenesis
- (d) none of these.

(iv) Select the correct option.

- (a) Type A spermatogonia grows to larger primary spermatocyte.
- (b) One spermatogonium forms two spermatids.
- (c) Spermiation is the release of sperms from seminiferous tubules.
- (d) Primary spermatocyte undergoes mitosis to form secondary spermatocytes.

(v) Which hormone acts on spermatogonia to stimulate sperm production?

- (a) LH
- (b) GnRH
- (c) ABP
- (d) FSH

6

Read the following and answer any four questions from 6(i) to 6(v) given below:

Study the given table and answer the questions based on it.

	Hormone	Source	Function
(A)	Oxytocin	W	Ejection of milk
(B)	X	Anterior lobe of pituitary gland	Stimulates secretion of ABP from Sertoli cells
(C)	Y	Placenta	Maintains corpus luteum to secrete progesterone
(D)	Relaxin	Ovary	Z

(i) Identify the hormones X and Y respectively.

- (a) Testosterone, FSH
- (b) LH, hPL
- (c) FSH, hCG
- (d) ICSH, hCG

(ii) W in the given table is

- (a) hypothalamus
- (b) posterior lobe of pituitary
- (c) placenta
- (d) ovary.

(iii) Which of the following is correct for Z?

- (a) Dilation of uterine cervix during labour pains.
- (b) Stimulates the growth of the mammary glands during pregnancy.
- (c) Supports the fetal growth and prevents desiccation.
- (d) Forms protective plug in cervix of uterus during pregnancy.

(iv) Which set of hormones is secreted only during pregnancy?

- (a) Human chorionic gonadotropin, relaxin and human placental lactogen
- (b) Human placental lactogen, estrogen and chorionic thyrotropin
- (c) Human chorionic gonadotropin, human placental lactogen and progesterone
- (d) Chorionic thyrotropin, chorionic gonadotropin and estrogen

(v) **Assertion** : Follicle stimulating hormone controls the maintenance and functions of male reproductive organs.

Reason : FSH acts directly on spermatogonia to stimulate sperm production.

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

7

Read the following and answer any four questions from 7(i) to 7(v) given below:

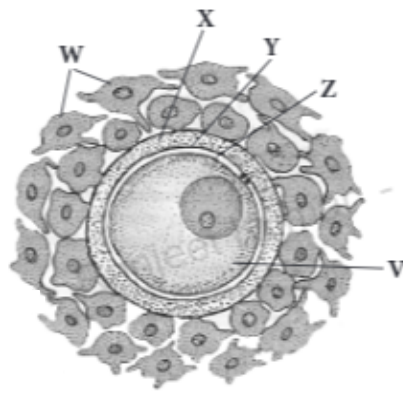
During copulation, semen is released by the penis into the vagina. The motile sperms swim rapidly, fuse with ovum in the ampullary region, resulting in fertilisation. Haploid nucleus of sperm fuse with that of ovum to form diploid zygote.

- (i) In female genital tract, sperms are made capable of fertilising the egg. This phenomenon of sperm activation is called
 - (a) amphimixis
 - (b) cortical reaction
 - (c) capacitation
 - (d) acrosomal reaction.
- (ii) Select the correct sequence of various physical and chemical events that take place during fertilisation.
 - P. Fusion of cortical granules with plasma membrane of secondary oocyte.
 - Q. Formation of fertilisation cone to receive sperm.
 - R. Release of sperm lysin from acrosome.
 - S. Mixing up of chromosomes of a sperm and an ovum.
 - (a) $R \rightarrow Q \rightarrow P \rightarrow S$
 - (b) $Q \rightarrow S \rightarrow R \rightarrow P$
 - (c) $Q \rightarrow R \rightarrow S \rightarrow P$
 - (d) $R \rightarrow P \rightarrow Q \rightarrow S$
- (iii) **Assertion :** Only one sperm can fertilise an ovum.
Reason : The secretion of acrosome help the sperm to enter into cytoplasm of ovum through zona pellucida and plasma membrane.
 - (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - (c) Assertion is true but reason is false.
 - (d) Both assertion and reason are false.
- (iv) What is the significance of fertilisation?
 - (a) It restores haploid number of chromosomes.
 - (b) It produces offspring genetically identical to parents.
 - (c) It initiates cleavage.
 - (d) Both (b) and (c)
- (v) Site of fertilisation in humans is
 - (a) endometrium of uterine cavity
 - (b) ampullary isthmic junction of oviduct
 - (c) cervix of uterus
 - (d) infundibulum of fallopian tube.

8

Read the following and answer any four questions from 8(i) to 8(v) given below:

The mature ovum or a female gamete is spherical in shape. The human ovum is almost free of yolk and is said to be alecithal. Human ovum loses its ability to be fertilised about 24 hours after ovulation. Refer to the given structure of ovum and answer the following questions.



- (i) Thick cellular layer formed of radially elongated follicular cells is
 (a) zona pellucida (b) plasma membrane
 (c) perivitelline membrane (d) corona radiata.
- (ii) In humans, at which stage does ovum get released from ovary?
 (a) Secondary oocyte (b) Oogonium
 (c) Primary oocyte (d) First polar body
- (iii) Cytoplasm of an ovum is enveloped by _____.
 (a) zona pellucida (b) corona radiata
 (c) cell membrane (d) perivitelline space
- (iv) Select the correct option.

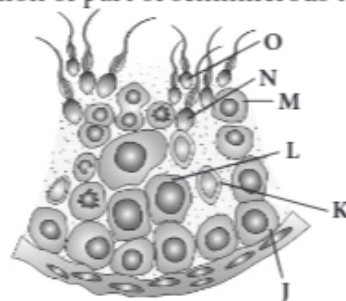
V	W	X
(a) Cytoplasm	Zona pellucida	Plasma membrane
(b) Cortical granules	Corona radiata	Zona pellucida
(c) Cortical granules	Plasma membrane	Corona radiata
(d) Cytoplasm	Corona radiata	Zona pellucida

- (v) Which of the following is not a characteristic of an ovum?
 (a) Nucleus of an ovum has prominent nucleolus.
 (b) Only one ovum formed from one oogonium.
 (c) It lacks centrioles.
 (d) It has very small amount of ooplasm.

9

Read the following and answer any four questions from 9(i) to 9(v) given below:

Each testicular lobule of testis contains one to three highly coiled seminiferous tubules. Wall of each seminiferous tubule is formed of single layered germinal epithelium. Majority of cells in this epithelium are cuboidal called male germ cells. Study the transverse section of part of seminiferous tubule and answer the following questions.



- (i) What is the characteristic of K?
- K is spermatogonium which grows into primary spermatocyte.
 - K is Sertoli cell which provides nutrition to spermatids.
 - K is secondary spermatocyte which undergo meiosis II to form spermatid.
 - K is spermatid being converted into sperm.
- (ii) Which of the following cell undergo reduction division to form secondary spermatocyte?
- J
 - M
 - L
 - K
- (iii) How many among the following have 46 chromosomes?
- J, K, L, M, N, O
- 2
 - 4
 - 5
 - 3
- (iv) Select an option that correctly identifies different labels.
- L – Primary spermatocyte, N – Spermatozoa, M – Secondary spermatocyte
 - J – Spermatogonium, K – Sertoli cell, O – Spermatozoa
 - L – Primary spermatocyte, M – Secondary spermatocyte, N – Spermatozoa
 - J – Spermatogonium, K – Primary spermatocyte, N – Spermatid
- (v) Which hormone initiates spermatogenesis at puberty?
- FSH
 - ICSH
 - ABP
 - GnRH

10

Read the following and answer any four questions from 10(i) to 10(v) given below:

Cleavage is the series of rapid mitotic divisions in zygote and forms blastula. The 2, 4, 8, 16 daughter cells are called blastomeres. Embryo with 64 blastomeres is known as blastocyst and has blastocoel cavity. Blastocyst gets implanted in uterine wall and leads to pregnancy.

- (i) Solid mass of cells with 16 blastomeres is called
- morula
 - blastula
 - gastrula
 - zygote.
- (ii) At which stage of embryonic development trophoectoderm develops?
- Zygote
 - Morula
 - Blastula
 - Gastrula
- (iii) Site of implantation is
- endometrium of uterus
 - cervix
 - uterine fundus
 - infundibulum of oviduct.
- (iv) Correct sequence of various structures formed during embryonic development is
- Morula → Embryo → Gastrula → Blastula
 - Zygote → Embryo → Morula → Blastula
 - Blastula → Morula → Gastrula → Embryo
 - Zygote → Morula → Blastula → Gastrula.
- (v) **Assertion :** Side of blastocyst with inner cell mass is called animal pole.
Reason : Inner cell mass gives rise to embryo.
- Both assertion and reason are true and reason is the correct explanation of assertion.
 - Both assertion and reason are true but reason is not the correct explanation of assertion.
 - Assertion is true but reason is false.
 - Both assertion and reason are false.

ASSERTION & REASON

For question numbers 11-35, two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - (c) Assertion is true but reason is false.
 - (d) Both assertion and reason are false.
11. **Assertion :** In human male, testis are extra abdominal and lie in scrotal sacs.
Reason : Scrotum acts as thermoregulator and keeps testicular temperature lower by 2°C for normal spermatogenesis.
12. **Assertion :** At puberty human male develops secondary sexual characters.
Reason : At puberty there is decreased secretion of testosterone in male.
13. **Assertion :** Cilia lining the fallopian tube helps to pick up and push the released ovum into the oviduct.
Reason : Cilia of fallopian tubes beat towards uterus.
14. **Assertion :** Clitoris of female is homologous to tip of penis.
Reason : Both have same origin and richly supplied with nerves and blood vessels.
15. **Assertion :** Corpus luteum secretes the female hormone progesterone.
Reason : After ovulation, a ruptured follicle turns into yellowish solid mass of cells called corpus albicans.
16. **Assertion :** Epididymis is divided into three parts.
Reason : Epididymis is the organ that stores spermatozoa.
17. **Assertion :** One oogonium produces one ovum and three polar bodies.
Reason : Polar bodies have small amount of cytoplasm.
18. **Assertion :** In morula stage, the cells divide without any increase in size.
Reason : Zona pellucida remains undivided till cleavage is complete.
19. **Assertion :** The second meiotic division of the developing ovarian follicles is completed just after conception.
Reason : Conception is the onset of pregnancy when the implantation of blastocyst take place.
20. **Assertion :** At the time of implantation, which takes place in 14 days, the human embryo is called blastocyst.
Reason : Implantation occurs in the gastrula stage.
21. **Assertion :** If several spermatozoa hit the egg at the same time, all can enter the egg.
Reason : The above process is called amphimixis which can be prevented by fertilisation membrane.
22. **Assertion :** Corpus luteum contains blood clot and fibrin.
Reason : Corpus luteum is formed by the germinal epithelium.
23. **Assertion :** Placenta acts as a major endocrine organ.
Reason : In mammals fetal components of the placenta derive initially from the chondroblast.
24. **Assertion :** In mammals the female secondary sexual characters are developed by gonadotropins.
Reason : Gonadotropins are secreted by Graafian follicle.
25. **Assertion :** Head of sperm consists of acrosome and mitochondria.
Reason : Acrosome contains spiral row of mitochondria.
26. **Assertion :** Ovulation is the release of egg.
Reason : Ovulation takes on 14 days after fertilisation.

27. **Assertion :** Man does not urinate and ejaculate at the same time.
Reason : Membranous and penile part of urethra forms the outflow pathway for the urine and for the seminal fluid.
28. **Assertion :** Seminiferous tubule is related with spermatogenesis.
Reason : Spermatogenesis takes place under the influence of pituitary gonadotrophins and testosterone.
29. **Assertion :** Mammary gland is a modified sweat gland.
Reason : Mammary gland is functional in both male and female.
30. **Assertion :** In blastulation, cell masses show morphogenetic movements.
Reason : A three layered blastocyst is formed during blastulation.
31. **Assertion :** A drop in temperature does not affect spermatogenesis.
Reason : During temperature drop the smooth muscles contracts and bring the testes closer to the pelvic cavity.
32. **Assertion :** Each seminiferous tubule is lined on its inside by three types of cells.
Reason : These cells are male germ cells, Sertoli cells and Leydig's cells.
33. **Assertion :** Infundibulum is a funnel shaped part closer to ovary.
Reason : The edges of infundibulum helps in collection of the ovum after ovulation.
34. **Assertion :** The endometrium undergoes cyclical changes during menstrual cycle.
Reason : The myometrium exhibits strong contractions during delivery of the baby.
35. **Assertion :** All copulations do not lead to the fertilisation and pregnancy.
Reason : Fertilisation can occur only if the ovum and sperms are transported simultaneously to the ampullary – isthmic junction.

HINTS & EXPLANATIONS

- (i) (b) : P is an epididymis that stores the sperms and secretes a fluid which is considered to nourish the sperms.

(ii) (b) : Q – Vas deferens, R – Ejaculatory duct
 S – Bulbourethral gland, T – Seminal vesicle

(iii) (c) : Q (vas deferens) arises from cauda epididymis.

(iv) (d)

(v) (a)
- (i) (c) : FSH stimulates the growth of Graafian follicles, development of egg oocyte within the follicles to complete the meiosis I to form secondary oocyte. It also stimulates the formation of estrogen.

(ii) (d) : LH induces rupture of mature Graafian follicle and thereby the release of secondary oocyte.

(iii) (b) : Refer to answer 2(i).

(iv) (a)

(v) (d) : The rising level of progesterone inhibits the release of GnRH, which in turn inhibits production of FSH, LH and progesterone.
- (i) (d) : During menstrual phase, the endometrium breaks down and menstruation begins.

(ii) (c) : Proliferative phase extends for about 10-12 days usually from day 6th to 13th in a 28 day cycle.

(iii) (a)

(iv) (d) : During ovulatory phase, both LH and FSH attain a peak level.

(v) (b)
- (i) (a)

(ii) (d) : T is mammary ampulla and R is mammary alveoli.

(iii) (b) : Near the nipple, mammary ducts expand to form mammary ampullae where some milk may be stored before going to lactiferous ducts.

(iv) (c)

(v) (c) : The fibrous (connective) tissue supports the alveoli and the ducts.
- (i) (a) : In multiplication phase, the undifferentiated primordial germ cells divide several times by mitosis to produce large number of spermatogonia.

(ii) (c)

(iii) (b) : Transformation of spermatids (L) into spermatozoa (M) is known as spermiogenesis or spermateliosis.

(iv) (c)
(v) (d) : FSH acts on spermatogonia to stimulate sperm production.

6. (i) (c)

(ii) (b)

(iii) (a) : Relaxin increases the flexibility of the pubis symphysis and ligaments of sacroiliac and sacrococcygeal joints and helps to dilate the uterine cervix during labour pains.

(iv) (a) : hPL, hCG and relaxin are produced in women only during pregnancy.

(v) (b)

7. (i) (c) : The secretions of female genital tract remove coating substances deposited on the surface of the sperms. This phenomenon of sperm activation is called capacitation.

(ii) (d)

(iii) (b) : Binding of sperm to the secondary oocyte induces depolarisation of the oocyte plasma membrane. Depolarisation prevents polyspermy and ensures monospermy.

(iv) (c) : Fertilisation restores diploid number of chromosomes. It introduces variations as it combines characters of the two parents.

(v) (b)

8. (i) (d)

(ii) (a) : In humans, ovum is released from the ovary as secondary oocyte.

(iii) (c)

(iv) (b) : V – Cortical granules

W – Cells of corona radiata

X – Zona pellucida

Y – Perivitelline space

Z – Plasma membrane

(v) (d) : Ovum has large amount of cytoplasm called ooplasm.

9. (i) (b)

(ii) (c) : J – Spermatogonium,

K – Sertoli (sustentacular) cell,

L – Primary spermatocyte,

M – Secondary spermatocyte

N – Spermatid,

O – Spermatozoa.

(iii) (a) : Spermatogonium and primary spermatocytes are diploid (2N), i.e., 46 chromosomes.

(iv) (b)

(v) (d) : Spermatogenesis starts at puberty due to significant increase in the secretion of GnRH.

10. (i) (a) : Embryo with 8-16 blastomeres is solid mass of cells, known as morula.

(ii) (c) : Embryo with 64 cells is called blastula (blastocyst) and has blastocyst cavity. Blastocyst is composed of an outer envelope of cells called trophoblast and inner cell mass.

(iii) (a) : Implantation is the attachment of blastocyst to the uterine wall. The portion of blastocyst where the inner cell mass is located lies against the endometrium of uterus.

(iv) (d)

(v) (b)

11. (a) : Scrotum is a place where testes begins to descend during the third month with a concomitant shortening of gubernaculum. Proper descend of testes is essential for complete fertility because sperms needs low temperature by about 2°C from normal body temperature (37°C) to mature. The scrotal sacs has dartos muscles which constantly contracts and relaxes the loose scrotal skin. The loose scrotal skin helps to keep the testicular temperature at 35°C. If the testes do not descend from the abdominal cavity to the scrotum, the high temperature will destroy the sperm producing seminiferous tubules which results in sterility. So, scrotum acts as a thermoregulator and helps in spermatogenesis.

12. (c) : Puberty is the period of life at which the ability to reproduce begins and reproductive organs become functional. In male, the puberty is the period between 13-16 years. Puberty in male is controlled by male sex hormone called testosterone, which is secreted by interstitial or Leydig's cells of the testes under the stimulation of interstitial cells stimulating hormone (ICSH) secreted by anterior pituitary. After puberty the seminiferous tubules start producing sperms. The development of secondary sex organs like prostate, scrotum, penis, etc., starts and secondary sexual characters like growth of hair on face, chest, pubis and axillae, broadening of shoulders, deepening of voice due to enlargement of voice box occurs. In puberty (male), height increases due to rapid growth of muscles and bones.

13. (a)

14. (a) : Clitoris of female is the small, spongy and erectile structure which hangs freely from the front end of vulva. It represents the underdeveloped penis. Whereas penis is a finger-like cylindrical outgrowth of abdomen projecting in between the scrotal sacs.

Clitoris and penis both originate from the same origin, therefore are homologous.

Homologous organs are those organs which have the same origin and may or may not have the same function. Clitoris and penis both are the reproductive organs present in female and male respectively. They are originated from the mesoderm layer and both are supplied with the nerves and blood vessels.

15. (c) : At about the 14th day of the menstrual cycle, the distended mature graafian follicle ruptures and the ovum or secondary oocyte is extruded into the abdominal cavity. This is the process of ovulation which is triggered by a surge in LH secretion. The follicle that ruptures at the time of ovulation promptly fills with blood forming a corpus haemorrhagicum. The granulosa cell and theca cells of the follicle lining promptly begins to proliferate and the clotted blood is rapidly replaced with yellowish, lipid rich in luteal cells forming the corpus luteum. This initiates the luteal phase of the menstrual cycle, during which the luteal cells secrete estrogen and progesterone. Progesterone is a steroid hormone that has functions in preparing the uterus for pregnancy. If pregnancy occurs, the corpus luteum persists and if there is no pregnancy the corpus luteum begins to degenerate about 4 days before the next menses (24th day of the cycle) and is eventually replaced by scar tissue, forming a corpus albicans.

16. (b) : Epididymis lies along the top and side of testes and is divided into 3 parts – anterior caput epididymis; middle corpus epididymis and posterior cauda epididymis.

The epididymis, besides forming a part of tubular conducting system for sperm transport, in it serves as a storage reservoir for sperms.

17. (b)

18. (b) : In morula stage, the cells divide without any increase in size and becomes a solid mass of cells. Zona pellucida remains undivided till cleavage is complete. After damage it breaks down and morula formation starts.

19. (b)

20. (d) : Implantation is the attachment of the early embryo called blastocyst, to the lining of womb. It begins between the fifth and seventh day after the ovulation and is enabled by the secretion of enzymes

that digest a portion of the endometrium. A blastocyst is composed of a hollow sphere of trophoblast cells, inside of which is a small cluster of cells called the inner cell mass. Trophoblast goes on to contribute to fetal membrane systems. While the inner cell mass is destined largely to become the embryo and fetus.

21. (d) : If several spermatozoa hit the egg at the same time, even then only one can get entry into the egg because after the entry of one sperm cell, the egg cell becomes impervious (not able to be penetrated) to other sperm cells. This can be done by fertilizin-antifertilizin compatibility reaction. Fertilizin of egg interacts with antifertilizin of a sperm of the same species. This interaction makes the sperms stick to the egg surface. The process of penetrating the ovum by many sperms is called polyspermy. Once the sperm cell has penetrated the corona radiata and zona pellucida, its unit membrane fuses with the unit membrane surrounding the egg cytoplasm. Just after the entry of sperm in the egg, a fertilisation membrane is formed (by zona pellucida) in the egg. This membrane prevents polyspermic fertilisation. Amphimixis is the mixing up the chromosomes of a sperm and an ovum.

22. (c) : Corpus luteum is formed after the release of secondary oocyte from the Graafian follicle.

23. (c) : Placenta may be defined as the connection between the fetal membranes (amnion and chorion) and the uterine wall (decidua basalis, the portion of the decidua which is directly adjacent to conceptus at the implantation site) for physiological exchange between the fetus and the mother's blood.

In mammals, the fetal components of the placenta derive initially from trophoblast, connected with embryonic blood stream, through its contact with yolk sac. Placenta also acts as a major endocrine organs as it secretes hormones such as estrogen, progesterone and hCG that are essential for maintaining a maternal physiological condition appropriate for continued development of the conceptus.

24. (d) : The female secondary sexual characters are developed by estrogen. Estrogens are steroid hormones secreted by growing ovarian follicles. This hormone is responsible for the development of female secondary sexual and accessory characters. In humans, it is also formed in the adrenal cortex, testis and fetoplacental unit.

Gonadotrophic hormones (LH and FSH) are secreted by the anterior lobe of pituitary gland. LH is responsible for ovulation and transforms Graafian follicle into corpus luteum and FSH stimulates spermatogenesis, maturation of Graafian follicle and secretion of estrogen in ovaries.

25. (d) : Sperm is a microscopic thread like motile cell which is distinguishable into head, middle piece and tail. Head is the enlarged end of sperm which contain 2 components – nucleus capped by acrosome. Acrosome contains sperm lysins (hyaluronidase enzyme) and nucleus is a compact mass of DNA having some protamines. Middle piece is the mitochondrial portion. In between the head and middle piece there is a small constricted neck part containing two centrioles. Tail is narrow vibratile long part with two regions - main and end piece.

26. (c)

27. (b) : Urethra leads from urinary bladder through the prostate gland and into the penis. It consists of four parts – urinary, prostatic, membranous and penile. The urethra (membranous and penile part) in the male forms the outflow pathway for the urine and for the seminal fluid. However, it is physically impossible for a man to urinate and ejaculate at the same time because just prior to ejaculation the internal sphincter closes off the opening of the urinary bladder. The sphincter does not relax until the ejaculation is completed. The closing of this internal sphincter prevents urine from entering the urethra and also prevents the backflow of ejaculatory fluid into the urinary bladder.

28. (b) : The process of development, differentiation and metamorphosis of spermatozoa is known as spermatogenesis. Spermatogenesis takes place within the seminiferous tubules under the influence of pituitary gonadotrophins (FSH and LH) and a male hormone, testosterone secreted by the interstitial cells

of Leydig which represent the endocrine tissue of the testis.

29. (c) : Mammary glands are modified sweat glands that lie over the pectoral muscles. They are also present in male but in a rudimentary form. Essential function of mammary gland is milk production which has nutritive and immunologic functions. Presence of mammary gland in male is a condition called gynecomastia.

30. (d) : In blastulation cells do not move. A single layered hollow blastocyst is formed.

31. (a) : The normal temperature of the testes in the scrotum is about 2° - 2.5°C lower than the internal body temperature. When the body is chilled, the smooth muscle contracts and brings the testes closer to the pelvic cavity. This movement towards the pelvic cavity allows the testes to absorb heat from the rest of the body so that the sperm cells do not become chilled and get optimum temperature for spermatogenesis.

32. (d) : Each seminiferous tubule is lined on its inside by two types of cells called male germ cells (spermatogonia) and Sertoli cells. The regions outside the seminiferous tubules called interstitial spaces, contain Leydig's cells. Leydig's cells synthesise and secrete testicular hormones called androgens.

33. (b) : In human females each Fallopian tube extends from the periphery of each ovary to the uterus, the part closer to the ovary is the funnel shaped infundibulum. The edges of the infundibulum possess finger-like projections called fimbriae, which help in collection of the ovum after ovulation.

34. (b)

35. (a) : Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary-isthmic junction and ovum is released only once a month. This is one of the reasons why all copulations do not lead to fertilisation and pregnancy.