CHAPTER › 03

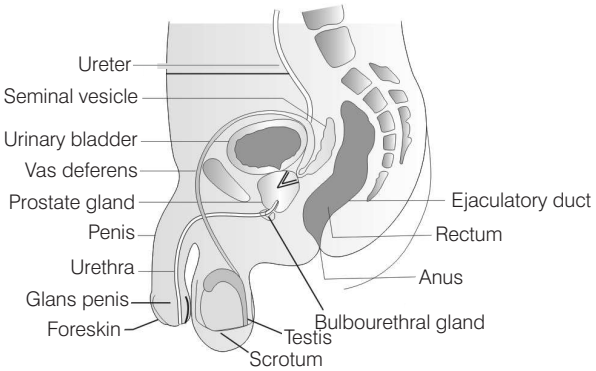
Human Reproduction

NEET KEY NOTES

- Humans are sexually reproducing and viviparous (i.e. give birth to young ones) organisms, having distinct male and female sexes.

Male Reproductive System

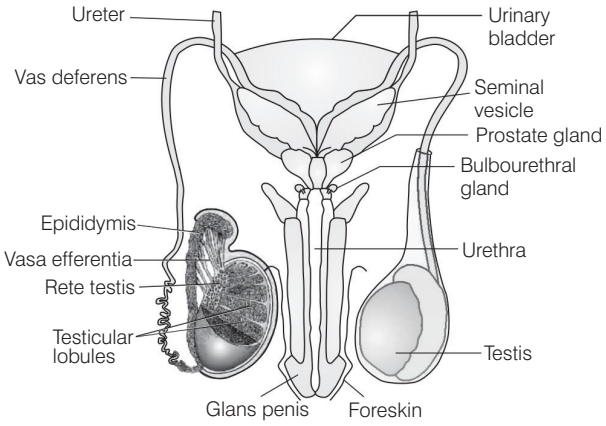
- The male reproductive system is located in the pelvis region.
- It includes a pair of **testes**, **accessory ducts, glands** and the **external genitalia** (penis).



Diagrammatic sectional view of male pelvis showing reproductive system

- The testes are situated outside the abdominal cavity within a pouch called **scrotum**. The scrotum helps in maintaining the low temperature of the testes (2-2.5°C lower than the normal internal body temperature) necessary for the production of sperms (spermatogenesis).
- In adults, each testis is oval in shape, with a length of about 4-5 cm and width of about 2-3 cm.
- Each testis has about 250 compartments called **testicular lobules** and each lobule contains one to three highly coiled **seminiferous tubules**.
- Seminiferous tubules are lined inside by two types of cells, i.e. **male germ cells** (spermatogonia), undergo meiotic divisions leading to sperm formation and **Sertoli cells**, provide nutrition to the dividing germ cells. Region outside the seminiferous tubules has **Leydig cells** or **interstitial cells**, which secrete testicular hormones called **androgens**.
- The male sex accessory ducts include **rete testis**, **vasa efferentia**, **epididymis** and **vas deferens**. These ducts store and transport the sperms from the testis to the outside through urethra. The urethra originates from urinary bladder and extends through the penis to its external opening, i.e. **urethral meatus**.

- The penis is the highly vascularised external copulatory organ in males. The enlarged end of penis called the glans penis, covered by a loose fold of skin called **foreskin**.

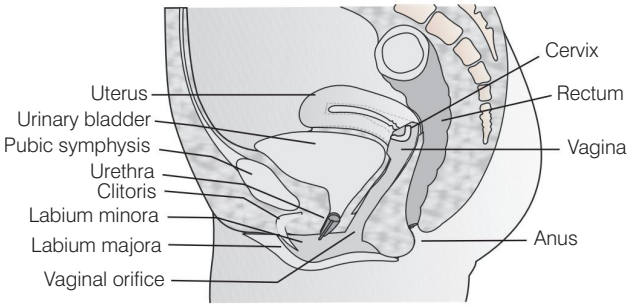


Diagrammatic view of male reproductive system (part of testis is open to show inner details)

- The male accessory glands include paired **seminal vesicles**, a **prostate** and paired **bulbourethral glands**. Secretions of these glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. This secretion along with the sperm forms **semen**.

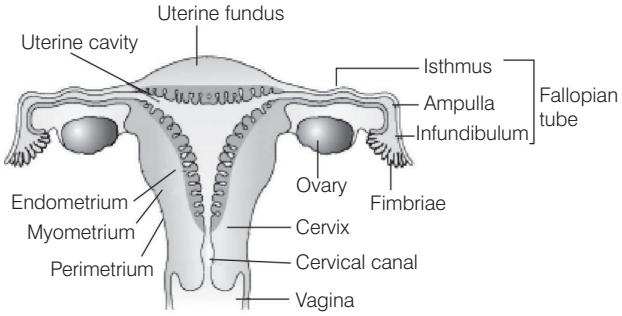
Female Reproductive System

- It includes a pair of **ovaries**, pair of **Fallopian tubes** (oviducts), **uterus, cervix**, **vagina** and **external genitalia** and a pair of **mammary glands**.



Diagrammatic sectional view of female pelvis showing reproductive system

- **Ovaries** are the primary female sex organ that produce ova and ovarian hormones.
- The ovaries are located one on each side of the lower abdomen. Each ovary is about 2-4 cm in length and is connected to the pelvic wall and uterus by ligaments. Each ovary is covered by a thin epithelium which encloses the ovarian stroma. The stroma is divided into two zones, i.e. a peripheral cortex and an inner medulla.
- The oviducts (Fallopian tube), uterus and vagina constitute the female accessory ducts.
- Each Fallopian tube is about 10-12 cm long and 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. The infundibulum leads to a wider part of the oviduct called **ampulla.** The last part of the oviduct, **isthmus** has a narrow lumen and it joins the uterus.



Diagrammatic sectional view of the female reproductive system

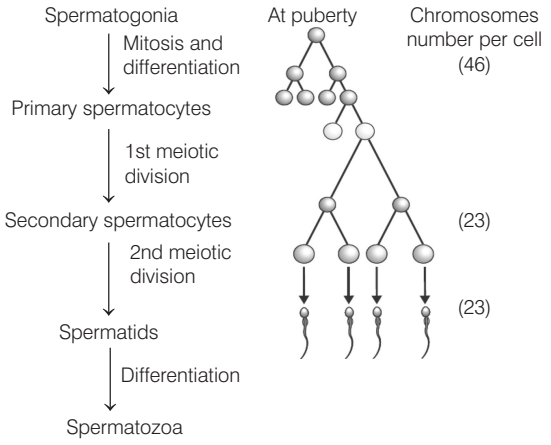
- **Uterus** (womb) opens into vagina through a narrow cervix. The cavity of the cervix is called **cervical canal** which forms the birth canal along with the vagina.
- The uterus has three layers of tissue, i.e. the external thin membranous **perimetrium**, middle thick layer of smooth muscle, **myometrium** and inner glandular layer called **endometrium**.
- The female external genitalia include
  - **Mons pubis** A cushion of fatty tissue covered by skin and pubic hair.
  - **Labia majora** Fat padded skin folds, extend from mons pubis and surround the vaginal opening.
  - **Labia minora** A pair of inner folds of tissue under labia majora.
  - **Hymen** The membrane that partially covers the vaginal opening.
  - **Clitoris** A tiny finger-like structure, lying at the upper junction of two labia minora above the urethral opening, is sensitive to stimulation.
- In females, the mammary glands are one of the secondary sexual characteristics. These are paired structures that contain glandular tissue and variable amount of fat.
- Glandular tissue is divided into 15-20 **mammary lobes**, having clusters of cells called **alveoli**.
- The mammary alveolus secretes milk and stores in its lumen. These alveoli open into mammary tubules, which join to form **mammary duct**. The numerous mammary ducts connect to form wider ampulla which connects to **lactiferous duct** from which milk is sucked out.

Gametogenesis

- It is the process by which the primary sex organs, the testis in the males and the ovaries in the females produce gametes, i.e. sperms and ovum.

Spermatogenesis

- It is a process of formation of sperm through meiotic division and later some structural modifications from germ cells present in testes in males.
  - The germ cells called **spermatogonia** are present on the inside wall of the seminiferous tubules.
  - These cells are diploid and increase in number through mitosis.
  - Some of the spermatogonia, **primary spermatocytes**, undergo meiosis, forming two equal cells called **secondary spermatocytes**. They are haploid (with 23 chromosomes but are still duplicate).
  - Each of the two secondary spermatocytes undergoes second cell division (to separate the duplicate chromosomes) producing four haploid **spermatids**. Each has only one set of 23 (unpaired, unduplicated) chromosomes.
  - Spermatids transform into **spermatozoa** (sperm cells) by developing a head, neck, middle piece and a tail. This process is called **spermiogenesis**.
  - Sperm heads become embedded in the Sertoli cells that provide nourishment and molecular signals.
  - Final release of sperms (spermiation) from seminiferous tubules is under the influence of hormonal and physiological signals.
- Spermatogenesis includes three phases as indicated in the following figure



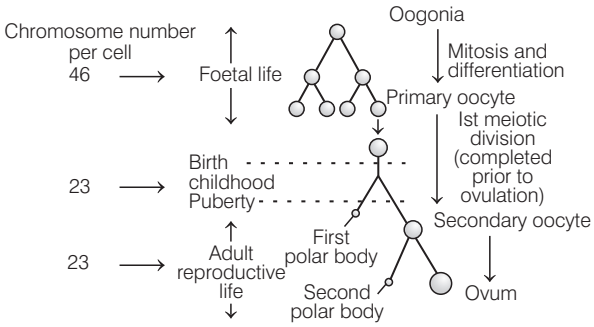
Diagrammatic view of phases in spermatogenesis

- It starts at the age of puberty due to significant increase in the secretion of Gonadotropin Releasing Hormone (GnRH).
- The increased level of GnRH acts at the anterior pituitary and stimulates Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH).
- LH acts on the Leydig cells and stimulates synthesis and secretion of androgens, which in turn stimulate the process of spermatogenesis.
- FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of **spermiogenesis**.
- A normal human sperm structure is composed of a **head, neck**, a **middle piece** and **a tail**.
- Head contains anterior small **acrosome**, which is filled with enzymes and help in the fertilisation of the ovum.
- Middle piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitates sperm motility essential for fertilisation.

Oogenesis

- It is the process of formation of female gametes (oocyte) through meiotic division of germ cells, present in the ovary in females.
  - It is initiated during the embryonic development stage when two million gamete mother cells (oogonia) are formed in each foetal ovary.
  - Oogonia start meiotic division which gets arrested at prophase-I stage. They are referred to as **primary oocytes.**
  - Each oocyte gets surrounded by the layers of granulosa cells that nourish it. Oocyte along with the cell layers around, is called **primary follicle**.
  - More layers of granulosa cells and another theca layer surround it and now it is called **secondary follicle**.
  - Secondary follicle transforms into **tertiary follicle** that has a fluid-filled cavity called **antrum**.
  - The primary oocyte within the tertiary follicle grows in size and completes its first meiotic division now.
  - This is an unequal division that results in the formation of a large haploid cell called **secondary oocyte** and a tiny cell called **first polar body.** Secondary oocyte keeps nearly all the nutrient rich cytoplasm, leaving only a haploid nucleus to the polar body.
  - The tertiary follicle undergoes certain changes to mature into **Graafian follicle**. The oocyte gets glycoprotein deposits that form a non-cellular coating called **zona pellucida,** around it.
  - The Graafian follicle ruptures to release secondary oocyte (ovum) from the ovary.
- The release of haploid secondary oocyte from the ovary, under the influence of LH surge, is called **ovulation**.

- The first menstruation starts at puberty and is called **menarche**, while its stoppage around 50 years of age is called **menopause**.
- The menstruation and the related events are repeated every 28-29 days (in normal females) in a cyclical fashion, that is why it is called **menstrual cycle**.
- Changes in the levels of pituitary and ovarian hormones bring about the cyclical changes in the ovary and uterus during menstrual cycle. It takes place in ovaries.



Diagrammatic view of phases in oogenesis

Menstrual Cycle

- The reproductive cycle in female primates is called menstrual cycle.
- The major events of menstrual cycle are
  - **Menstrual** (bleeding) **phase** lasts for about 3-5 days. The endometrium lining of uterus breaks down due to the deficiency of progesterone. Blood vessels rupture, causing bleeding through vagina.
  - **Follicular** (proliferative) **phase** lasts for about 14 days. The endometrium rebuilds, FSH and LH secretions increase that stimulate follicular development as well as secretion of oestrogen.
  - **Ovulatory phase** occurs at about 14th day. Both LH and FSH attain a peak level. Maximum level of LH (LH surge) ruptures the Graafian follicle and thereby, release the ovum.
  - **Luteal** (secretory) **phase** lasts for about 10 days. The remaining part of Graafian follicle transforms into **corpus luteum**, which secretes progesterone for the maintenance of endometrium.
- After menstruation, the process of ovulation will occur again and the same process follows in a time period of 28-29 days.
- Cyclic menstruation indicates the normal reproductive phase and it continues from menarche to menopause.

Fertilisation and Implantation

- A sperm during fertilisation comes in contact with the **zona pellucida** of the ovum and induces changes in the membrane, which blocks the entry of the other sperms. Thus, ensuring that only one sperm can fertilise an ovum, i.e. prevents polyspermy.
- The secretions of the acrosome help the sperm to enter into the cytoplasm of the ovum through zona pellucida and the plasma membrane. **Corona radiata** is the innermost layer of ovum. It is dissolved by corona-penetrating enzymes of acrosome.
- This induces the completion of meiotic division of the secondary oocyte. The secondary meiotic division results in the formation of a **secondary polar body** and a haploid ovum.
- The haploid nucleus of the sperm and that of ovum fuse together to form a **diploid zygote**.
- Sex of the baby is decided at this stage. After fusion of the male and female gametes, the zygote would carry either XX or XY depending on whether the sperm carrying X or Y fertilised the ovum. The zygote carrying XX would develop into a female baby and XY would form a male baby.
- The mitotic division starts as the zygote (fertilised ovum) moves through the isthmus of the oviduct towards the uterus, forming 2, 4, 8, 16 daughter cells called **blastomeres**. This process is called **cleavage**.
- During cleavage, the young embryo slowly moves down the Fallopian tube towards the uterus and events taking place are during this route are as follows
  - The embryo with 8-16 blastomeres is called **morula**. But, it is not larger than a zygote.
  - The morula continues to divide and transforms into **blastocyst,** as it moves further into the uterus. This process of transformation is called **blastulation**.
  - The blastomeres in the blastocyst are arranged into an outer layer called **trophoblast** and the inner group of cells attached to trophoblast called the **inner cell mass**.
  - The trophoblast layer then gets attached to the endometrium and the inner cell mass differentiates into the **embryo**. After attachment, the uterine cells divide rapidly and cover the blastocyst.
  - As a result, the blastocyst becomes embedded in the endometrium of the uterus. This is called **implantation** and it leads to **pregnancy** (i.e. the time from conception to birth).

Pregnancy and Embryonic Development

- After implantation, finger-like projections appear on the trophoblast called **chorionic villi**, which are surrounded by the uterine tissue and maternal blood.
- The chorionic villi and the uterine tissue become inter-digitated with each other and jointly form a structural and functional unit between foetus and maternal body called **placenta**.
- The placenta performs the following functions
  - It facilitates the supply of oxygen and nutrients to the embryo.
  - It aids in the removal of carbon dioxide and waste materials produced by the foetus.
  - The placenta is connected to the embryo through the **umbilical cord**, which helps in the transport of substances to and from the embryo.
  - Placenta also acts as an endocrine tissue and produces several hormones like **human Chorionic Gonadotropin** (hCG), **human Placental Lactogen** (hPL), oestrogen, progestogens, etc.
  - In the later phase of pregnancy, hormone called **relaxin** is also secreted by the ovary. It is important to note that hCG, hPL and relaxin are produced in women only during pregnancy.
- Immediately after implantation, the inner cell mass differentiates into three germ layers, i.e. **ectoderm** (outer layer), **endoderm** (inner layer) and **mesoderm** (develop between ectoderm and endoderm).
- These three layers give rise to all tissues (organs) in adults. Inner cell mass contains **stem cells** which have the potency to give rise to all the tissues and organs.

End Products of Embryonic Germ Layers

Ectoderm	Mesoderm	Endoderm
Epidermis	Dermis	Lining of the digestive system
Hair, nails, sweat glands	All muscles of the body	Lining of the respiratory system
Brain and spinal cord	Cartilage	Urethra and urinary bladder
Cranial and spinal nerves	Bone	Gall bladder
Retina, lens and cornea of eye	Blood	Liver and pancreas
Inner ear	All other connective tissues	Thyroid gland
Epithelium of nose, mouth and anus	Blood vessels	Parathyroid gland
Enamel of teeth	Reproductive organs and kidneys	Thymus

- In humans, pregnancy lasts for 9 months and **foetal heart** is formed after one month of pregnancy.
- The first sign of growing foetus may be noticed by listening to the heart sound carefully through stethoscope.
- By the end of second month, the foetus develops limbs and digits. By the end of 12 weeks, major organ systems and external genitalia are well-developed.
- The first movement of the foetus and appearance of hair can be observed during the fifth month.
- By the end of 24 weeks (second trimester), the body is covered with fine hair, eyelids get separated and eyelashes are formed.
- By the end of nine months of pregnancy, the foetus becomes fully developed and is ready for delivery.

Parturition and Lactation

- The time period during which the embryo remains in the uterus is called **gestation period**. It is about 9 months in humans.
- Vigorous contraction of the uterus at the end of pregnancy causes expulsion/delivery of the foetus. This process of delivery of the foetus (childbirth) is called **parturition.** It is induced by a complex neuroendocrine mechanism.
- The signals of parturition originate from the fully developed foetus and the placenta, which induce mild uterine contractions called **foetal-ejection reflex**.
  - This triggers the release of **oxytocin** from the maternal pituitary. It promotes contractions of uterine muscles, which in turn stimulate further secretion of oxytocin.
  - The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger contractions. This leads to the expulsion of the baby out of the uterus through the birth canal.
  - Soon after the birth of baby, placenta is also expelled out of the uterus. Relaxin hormone relaxes the pelvic ligaments of mother to prepare for the childbirth.
- The mammary glands in females undergo differentiation during pregnancy. The production and release of milk by the mammary glands of female after birth of a young one is called **lactation**.
- The first milk, which comes out from the mother's mammary glands just after childbirth is called **colostrum**. It is rich in proteins and energy along with the antibodies that provide passive immunity to the newborn.

Mastering NCERT

MULTIPLE CHOICE QUESTIONS

TOPIC 1 ~ *Male Reproductive System*

1 Pouch in which testes are suspended outside the abdominal cavity, is
(a) tunica albuginea (b) inguinal canal
(c) epididymis (d) scrotum

2 Function of scrotum is to maintain the
(a) temperature of testes
(b) body temperature
(c) level of growth hormone
(d) level of male hormone

3 Approximate length and width of testis are
(a) 4-5 cm and 2-3 cm (b) 5-6 cm and 3-4 cm
(c) 6-7 cm and 4-5 cm (d) 7-8 cm and 8-9 cm

4 How many compartments (approximately) are there in each human testis?
(a) 250 (b) 300 (c) 350 (d) 400

5 Compartments in mammalian testes are called
(a) testicular lobules (b) seminiferous tubules
(c) Sertoli cells (d) interstitial cells

6 Testicular lobules contain
(a) 3-5 seminiferous tubules
(b) 2-6 seminiferous tubules
(c) 5-7 seminiferous tubules
(d) 1-3 seminiferous tubules

7 The seminiferous tubules of the testis is lined on its inside by
(a) spermatocytes (b) spermatogonia
(c) cells of Sertoli (d) Both (b) and (c)

8 …… provide nutrition to the male germ cells.
(a) Interstitial cells
(b) Leydig cells
(c) Sertoli cells
(d) Both (a) and (b)

9 Which of the following cells present in the mammalian testes forms the sperms?
(a) Leydig cells (b) Spermatogonia
(c) Interstitial cells (d) Sertoli cells

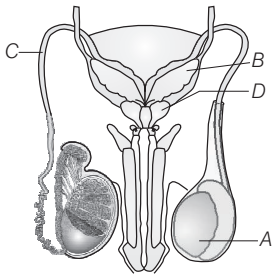
10 Region outside the seminiferous tubules is called
(a) interdigital space (b) interferous space
(c) interstitial space (d) blind space

11 The seminiferous tubules of the testis open into the vasa efferentia by
(a) vasa deferentia (b) rete testis
(c) epididymis (d) seminiferous tubules

12 Select the correct sequence for transport of sperm cells in male reproductive system. ***NEET 2019, 16***
(a) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus
(b) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra
(c) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus
(d) Testis → Epididymis → Vasa efferentia → Rete testis → Inguinal canal → Urethra

13 Choose the incorrect pair.
(a) Leydig cells — Secrete testicular hormone
(b) Vasa efferentia and epididymis — Accessory ducts
(c) Vas deferens — Loops over the urinary bladder
(d) Ejaculatory duct — Vasa efferentia and seminal vesicle

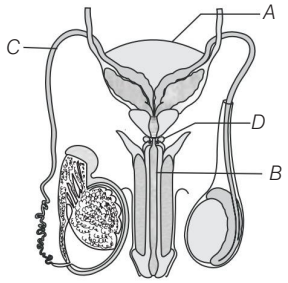
14 Choose the correct option. ***AIIMS 2019***



(a) A– Testis–possesses 3-4 testicular lobule
(b) B– Seminal vesicle–storage of sperm
(c) C– Vas deferens–helps in sperm transfer
(d) D– Prostate gland–secretes seminal fluid

15 The shared terminal duct of the reproductive and urinary system in the human male is ***CBSE-AIPMT 2014***
(a) urethra (b) ureter
(c) vas deferens (d) vasa efferentia

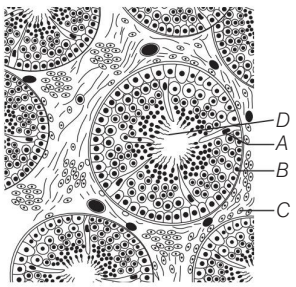
16 Identify *A, B, C* and *D* in the given diagram.



(a) A–Urinary bladder, B–Bulbourethral gland, C–Prostate gland, D–Seminal vesicles
(b) A–Urinary bladder, B–Urethra, C–Vas deferens, D–Bulbourethral gland
(c) A–Prostate gland, B–Seminal vesicles, C–Urinary bladder, D–Bulbourethral gland
(d) A–Bulbourethral gland, B–Urinary bladder, C–Seminal vesicles, D–Prostate gland

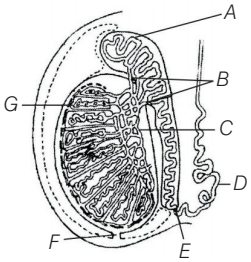
17 Identify the accessory glands found in males.
(a) Seminal vesicles (b) Prostate gland
(c) Bulbourethral gland (d) All of these

18 The given diagram refers to TS of testis showing sectional view of a few seminiferous tubules. Identify the parts labelled *A-D* and select the correct option.



(a) A–Sertoli cells, B–Spermatozoa, C–Interstitial cells, D–Sperms
(b) A–Sertoli cells, B–Secondary spermatocyte, C–Interstitial cells, D–Spermatozoa
(c) A–Interstitial cells, B–Spermatogonia, C–Sertoli cells, D–Sperms
(d) A–Sertoli cells, B–Spermatogonia, C–Interstitial cells, D–Spermatozoa

19 The given digaram shows LS of testis showing various parts. Identify the parts labelled (*A-G*) from the list given below.



I. Caput epididymis
II. Cauda epididymis
III. Vas deferens
IV. Vasa efferentia
V. Corpus epididymis
VI. Seminiferous tubules
VII. Tunica vaginalis
VIII. Tunica albuginea
IX. Tunica vasculosa
X. Rete testis

Codes

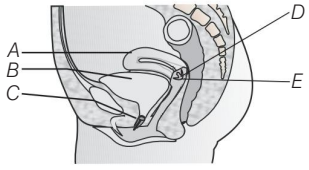
	A	B	C	D	E	F	G
(a)	II	III	IV	X	VI	I	IX
(b)	V	IV	III	VI	I	X	VII
(c)	I	IV	X	III	II	VI	VIII
(d)	I	VI	IV	III	V	X	IX

TOPIC 2 ~ *Female Reproductive System*

20 The ovaries are located one on each side of the…*A*…. Each ovary is about 2-4 cm in length connected to the …*B*… wall by …*C*… . Each ovary is covered by a thin epithelium which encloses the ovarian stroma. Stroma is divided into two zones …*D*… and …*E*… . Fill the suitable choices for *A-E*.

(a) A–inner medulla, B–peripheral cortex, C–ligaments, D–pelvic wall, E-lower abdomen
(b) A–lower abdomen B–pelvic, C–ligaments, D–peripheral cortex, E–inner medulla
(c) A–pelvic wall, B–lower abdomen, C–ligaments, D–inner medulla, E–peripheral cortex
(d) A–inner medulla, B–peripheral cortex, C–lower abdomen, D–pelvic wall, E–ligaments

21 The following diagram refers to female reproductive system of human. Identify *A* to *E*.



(a) A–Urethra, B–Urinary bladder, C–Uterus, D–Cervix, E–Vagina
(b) A–Urethra, B–Urinary bladder, C–Uterus, D–Vagina, E–Cervix
(c) A–Urethra, B–Urinary bladder, C–Uterus, D–Cervix, E–Vagina
(d) A–Uterus, B–Urinary bladder, C–Urethra, D–Cervix, E–Vagina

22 Oviducts are also called
(a) Fallopian tubes (b) uterus
(c) vagina (d) ovary

23 Human Fallopian tube is about
(a) 8-9 cm long (b) 9-10 cm long
(c) 10-12 cm long (d) 12-17 cm long

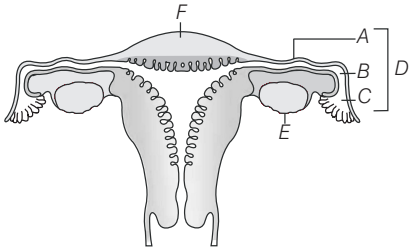
24 Funnel-shaped part of oviduct closer to the ovary is called
(a) fimbriae (b) infundibulum
(c) ampulla (d) isthmus

25 Fimbriae are associated with which organ?
(a) Fallopian tube (b) Uterus ***JIPMER 2018***
(c) Vagina (d) Ovary

26 The main function of fimbriae of Fallopian tube is
(a) help in development of ovary
(b) help in collection of the ovum after ovulation
(c) help in development of ova
(d) help in fertilisation

27 Choose the incorrect pair.
(a) Finger-like projections – Fimbriae
(b) Narrow part of oviduct – Ampulla
(c) Part of oviduct joining the uterus – Isthmus
(d) None of the above

28 The following diagram refers to the female reproductive system of humans. Identify *A*-*F*.

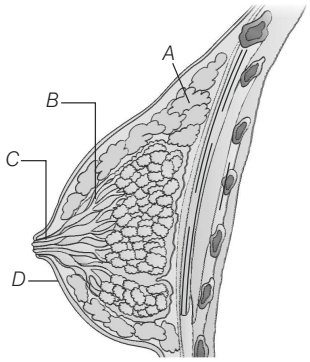


(a) A–Ampulla, B–Isthmus, C–Infundibulum, D–Fallopian tube, E–Ovary, F–Uterine fundus
(b) A–Isthmus, B–Infundibulum, C–Ampulla, D–Fallopian tube, E–Ovary, F–Uterine fundus
(c) A–Isthmus, B–Ampulla, C–Infundibulum, D–Fallopian tube, E–Ovary, F–Uterine fundus
(d) A–Ampulla, B–Infundibulum, C–Isthmus, D–Fallopian tube, E–Ovary, F–Uterine fundus

29 Choose the incorrect pair.
(a) Cushion of fatty tissue covered by pubic hair –Mons pubis
(b) Membrane covering opening of vagina–Hymen
(c) Finger-like structure above the urethral opening –Clitoris
(d) Uterine layer exhibiting strong contraction during delivery–Endometrium

30 The main tissue present in breast is …… tissue.
(a) glandular (b) squamous
(c) ciliated (d) epithelium

31 Given the diagrammatic sectional view of mammary gland. Identify *A, B, C* and *D*.



(a) A–Alveolus, B–Mammary duct, C–Lactiferous duct, D–Areola
(b) A–Alveolus, B–Lactiferous duct, C–Mammary duct, D–Areola
(c) A–Alveolus, B–Mammary duct, C–Lactiferous duct, D–Lactogenic spot
(d) A–Fat, B–Mammary duct, C–Lactiferous duct, D–Areola

32 Several mammary ducts join to form a wider mammary ampulla, which is connected to
(a) lactiferous duct
(b) seminiferous duct
(c) seminiferous tubules
(d) nipple

33 Pick the odd one out from each series given below and select the correct option.
I. Scrotum, rete testis, Fallopian tube, vas deferens.
II. Ovary, uterus, vagina, ejaculatory duct.
III. Acrosome, Graafian follicle, corpus luteum, cervix.
IV. Prostate, testis, seminal vesicles, Cowper's gland.

	I	II	III	IV
(a)	Vas deferens	Vagina	Cervix	Cowper's gland
(b)	Rete testis	Ovary	Graafian follicle	Prostate
(c)	Scrotum	Uterus	Corpus luteum	Seminal vesicles
(d)	Fallopian tube	Ejaculatory duct	Acrosome	Testis

34 A sectional view of mammary gland shows
I. nipple and areola.
II. mammary lobes (alveolus) and duct.
III. ribs.
IV. ampulla and lactiferous duct.
Choose the correct option from the above.
(a) I, II, III and IV (b) I, II and III
(c) III, IV and II (d) I, IV and III

TOPIC 3 ~ *Gametogenesis*

35 Number of chromosomes present in spermatogonium is ***JIPMER 2019***
(a) 46 (b) 23 (c) 48 (d) 43

36 Which cells come earliest in the sequence of sperm production?
(a) Spermatozoa (b) Spermatocyte
(c) Spermatid (d) Spermatogonia

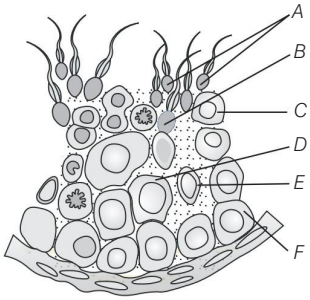
37 Which of the following undergoes meiosis-I division during spermatogenesis?
(a) Primary spermatocytes (b) Secondary spermatocytes
(c) Sertoli cell (d) Leydig cell

38 Number of chromosomes present in secondary spermatocyte is ***JIPMER 2019***
(a) 22 (b) 23 (c) 24 (d) 25

39 Which one of the following cells have haploid number of chromosome?
(a) Primary spermatocytes (b) Secondary spermatocytes
(c) Spermatid (d) Both (b) and (c)

40 During spermatogenesis, which cells are the first to contain haploid number of chromosomes?
(a) Spermatogonium
(b) Primary spermatocyte
(c) Secondary spermatocyte
(d) Spermatid

41 Find out spermatid and Sertoli cell in given below diagram.



(a) *D* and *E* (b) *E* and *F* (c) *A* and *C* (d) *B* and *E*

42 Spermiogenesis is
(a) spermatids transformed into spermatozoa
(b) spermatozoa transformed into spermatids
(c) spermatozoa transformed to spermatocytes
(d) spermatid to secondary spermatocytes

43 What is the correct sequence of sperm formation? ***NEET 2013***
(a) Spermatid, Spermatocyte, Spermatogonia, Spermatozoa
(b) Spermatogonia, Spermatocyte, Spermatozoa, Spermatid
(c) Spermatogonia, Spermatozoa, Spermatocyte, Spermatid
(d) Spermatogonia, Spermatocyte, Spermatid, Spermatozoa

44 The difference between spermiogenesis and spermiation is ***NEET 2018***
(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 through seminiferous tubules

45 Spermatogenesis starts at puberty due to significant increase in the secretion of
(a) GnRH (b) prolactin
(c) testosterone (d) oestrogen

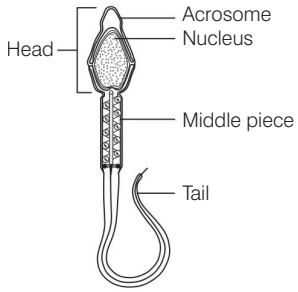
46 GnRH, a hypothalamic hormone, needed in reproduction, acts on ***NEET 2017***
(a) anterior pituitary gland and stimulates secretion of LH and oxytocin
(b) anterior pituitary gland and stimulates secretion of LH and FSH
(c) posterior pituitary gland and stimulates secretion of oxytocin and FSH
(d) posterior pituitary gland and stimulates secretion of LH and relaxin

47 Give the name of two hormones *A* and *B* in the figure given below.

(a) FSH and GH (b) LH and androgens
(c) GH and LH (d) GH and lactin

48 Sperms of mammals depend for movement on
(a) only tail (b) tail and middle piece
(c) middle piece (d) Only head

49 Which one of the labelled part utilises fructose as a source of energy? ***JIPMER 2019***



(a) Head (b) Tail
(c) Acrosome (d) Middle piece

50 Choose the incorrect pair.
(a) Acrosome – Enzyme filled cap structure on sperm head
(b) Middle piece – Possesses numerous mitochondria
(c) Sperm tail – Facilitates sperm motility essential for fertilisation
(d) Semen – Contains only sperms

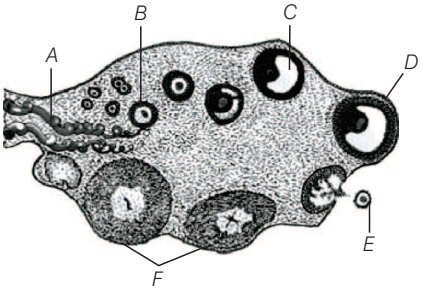
51 Choose the incorrect pair.
(a) Antrum – Fluid-filled cavity in primary follicle
(b) Tertiary follicle – Primary oocyte completes its Ist meiotic division inside it
(c) Secondary oocyte – Haploid cell formed after Ist meiotic division
(d) Graafian follicle – Mature tertiary follicle which ruptures during ovulation

52 The new membrane formed by follicular cells in secondary oocyte is called
(a) zona granulosa
(b) zona pellucida
(c) plasma membrane
(d) tertiary membrane

53 Which of the following layers in an antral follicle is acellular? ***CBSE-AIPMT 2015***
(a) Granulosa (b) Theca interna
(c) Stroma (d) Zona pellucida

54 At which stage of the development, ovum is released from the ovary of the human female?
(a) Primary oocyte (b) Oogonium
(c) Secondary oocyte (d) Ootid

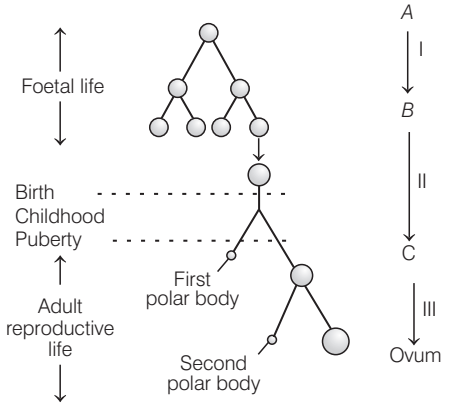
55 Consider the figure given below.



Select the option which correctly identifies the parts labelled as *C, D* and *F.*

	C	D	F
(a)	Primary follicle	Secondary follicle	Corpus luteum
(b)	Secondary follicle	Graafian follicle	Corpus luteum
(c)	Tertiary follicle	Primary follicle	Secondary follicle
(d)	Tertiary follicle	Graafian follicle	Corpus luteum

56 Identify *A, B* and *C* in the figure given below.



(a) A–Secondary oocyte, B–Oogonia, C–Primary oocyte
(b) A–Oogonia, B–Primary oocyte, C–Secondary oocyte
(c) A–Secondary oocyte, B–Primary oocyte, C–Oogonia
(d) A–Oogonia, B–Secondary oocyte, C–Primary oocyte

57 Mark the wrong item in each series and select the correct option.
I. Spermatocyte, polar body, spermatid, spermatogonium
II. Endometrium, corpus luteum, acrosome, Graafian follicle
III. Vas deferens, Fallopian tube, epididymis, Cowper's gland
IV. Testes, prostate, seminal vesicles, Cowper's gland

	I	II	III	IV
(a)	Spermatid	Endometrium	Epididymis	Prostate
(b)	Polar body	Acrosome	Fallopian tube	Testes
(c)	Spermatocyte	Corpus luteum	Vas deferens	Cowper's gland
(d)	Spermatogonium	Graafian follicle	Cowper's gland	Seminal vesicles

TOPIC 4~ *Menstrual Cycle*

58 The reproductive cycle in the female primates such as monkeys, apes and human beings is called
(a) menstrual cycle (b) oestrus cycle
(c) circadian cycle (d) ovulatory cycle

59 The first menstruation that begins at puberty is called
(a) menopause (b) ovulation
(c) gametogenesis (d) menarch

60 Menstrual flow occurs due to the lack of ***CBSE-AIPMT 2012***
(a) progesterone (b) FSH
(c) oxytocin (d) vasopressin

61 In an ideal menstrual cycle, the menstrual phase last for
(a) 3-5 days (b) 5-6 days (c) 1-3 days (d) 2-3 days

62 A regular cycling woman is not menstruating, which one of the following is the most likely to be the root cause?
(a) Maintenance of the hypertrophical endometrial lining
(b) Maintenance of high concentration of sex-hormones in the bloodstream
(c) Regression of well-developed corpus luteum
(d) Fertilisation of the ovum

63 What happens during the follicular phase of menstrual cycle?
(a) Proliferation of endometrium
(b) Reduction in blood supply to endometrium
(c) Regression of endometrium
(d) No effect on endometrium

64 Level of LH is maximum ***JIPMER 2019***
(a) just before ovulation
(b) just after ovulation
(c) at the time of ovulation
(d) during menstrual bleeding phase

65 When does ovulation occur in a healthy menstruating female?
(a) 9-14 days (b) 14-16 days
(c) 16-28 days (d) 20-26 days

66 Rapid secretion of LH in ovulatory phase causes
(a) rupturing of Graafian follicle
(b) release of ova
(c) ovulation
(d) All of the above

67 Which of the following events is not associated with ovulation in human female? ***CBSE-AIPMT 2015***
(a) Decrease in oestradiol
(b) Full developement of Graafian follicle
(c) Release of secondary oocyte
(d) LH surge

68 No new follicles develop in the luteal phase of the menstrual cycle because ***NEET (Odisha) 2019***
(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 (b) and (c)

69 Formation of corpus luteum is induced by ***JIPMER 2018***
(a) LH
(b) oestrogen
(c) FSH
(d) progesterone

70 A temporary endocrine gland in the human body is ***NEET 2017***
(a) pineal gland (b) corpus cardiacum
(c) corpus luteum (d) corpus allatum

71 The main function of mammalian corpus luteum is to produce ***CBSE-AIPMT 2014, 1995***
(a) oestrogen only
(b) progesterone only
(c) human chorionic gonadotropin
(d) relaxin only

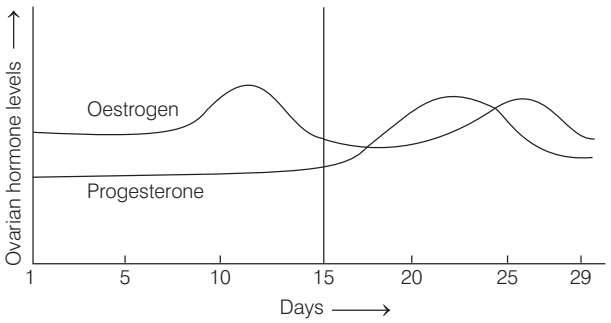
72 Endometrium, epithelial glands and connective tissue of uterus are broken due to the
(a) lack of oestrogen (b) lack of progesterone
(c) lack of FSH (d) excess of FSH

73 If the mammalian ovum fails to get fertilised, which one of the following is likely to happen?
(a) Corpus luteum will degenerate
(b) Oestrogen secretion further decreases
(c) Primary follicle starts developing
(d) Progesterone secretion rapidly increases

74 Which of them is not a correct match?
(a) Proliferative phase–Rapid regeneration of myometrium and maturation of Graafian follicle
(b) Secretory phase–Development of corpus luteum and increased secretion of progesterone
(c) Menstruation–Breakdown of endometrium
(d) Ovulation–LH and FSH attain peak level and cause rupture of Graafian follicle

75 Correct sequence of secretion of hormone from beginning of menstrual cycle to the end is
(a) FSH, progesterone, LH
(b) oestrogen, FSH and progesterone
(c) FSH, oestrogen, progesterone
(d) oestrogen, progesterone, FSH

76 Read the graph and correlate the uterine events that take place according to the hormonal levels on *A*. 6-15 days, *B*. 16-25 days, *C*. 3-5 days (if the ovum is not fertilised).

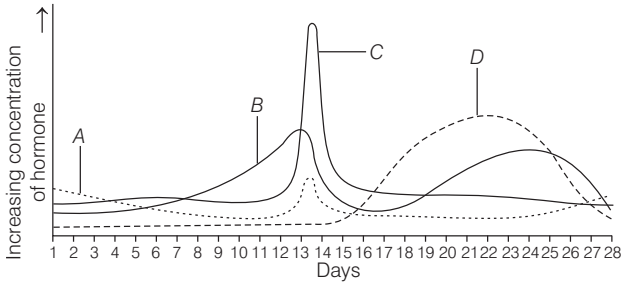


(a) A–Degeneration of endometrium, B–Myometrium thickness, becomes vascularised ready to receive and implant embryo, C–Regeneration of endometrium
(b) A–Degeneration of endometrium, B–Endometrium thickness increases, becomes vascularised, ready to receive and implant ovum, C–Regeneration of endometrium

(c) A–Regeneration of endometrium, B–Endometrium becomes thick and vascularised ready to receive and implant embryo, C–Degeneration of endometrium

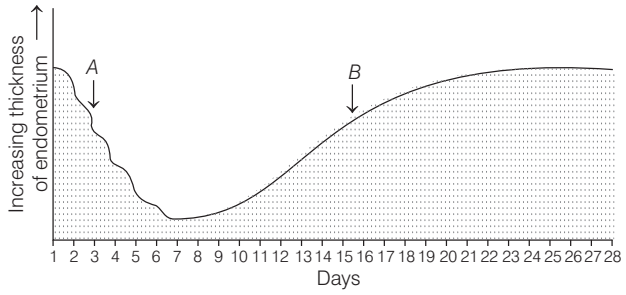
(d) A–Regeneration of myometrium, B–Endometrium becomes thick and vascularised, ready to receive and implant embryo, C–Degeneration of endometrium

77 The following graph of relative concentrations of the four hormones present in the blood plasma of a woman during her menstrual cycle. Identify the hormones *A*, *B*, *C* and *D*.



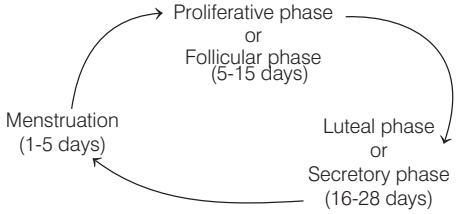
(a) A–FSH, B–Progesterone, C–LH, D–Oestrogen
(b) A–LH, B–Progesterone, C–FSH, D–Oestrogen
(c) A–FSH, B–Oestrogen, C–LH, D–Progesterone
(d) A–LH, B–Oestrogen, C–FSH, D–Progesterone

78 The diagram shows the changes that take place in the endometrium during a normal menstruation. Identify *A* and *B*.



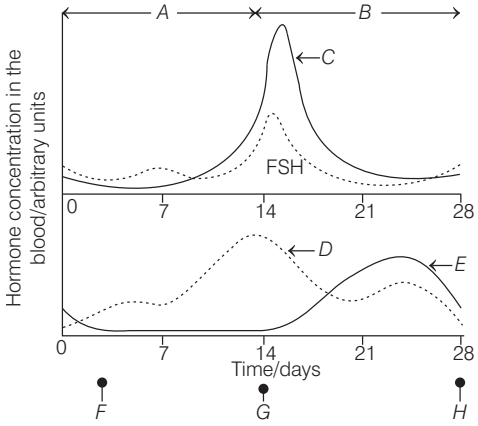
(a) A–Ovulation, B–Menopause
(b) A–Ovulation, B–Menstruation
(c) A–Menstruation, B–Ovulation
(d) A–Menopause, B–Ovulation

79 The events of the menstrual cycle are represented below. In which of the following options the level of FSH, LH and progesterone is mentioned correctly?



	13-14 Days			20-28 Days		
	FSH	**LH**	**Proges -terone**	**FSH**	**LH**	**Progesterone**
(a)	High	High	Low	Low	Low	High
(b)	High	High	High	Low	Low	Low
(c)	Low	Low	Low	High	High	High
(d)	Low	Low	High	High	Low	Low

80 The diagram shows some of the changes in blood hormone concentration which occurs during the menstrual cycle. Match *A, B, C, D, E, F, G* and *H* of graph with the hormones and events given below.



Hormones and Events

I. Oestrogen
II. Ovulation
III. Repair of endometrium
IV. Luteinizing hormone
V. Menstruation
VI. Luteal phase
VII. Progesterone
VIII. Ovarian phase

	A	B	C	D	E	F	G	H
(a)	IV	I	VI	V	III	VIII	VII	II
(b)	VIII	III	IV	II	I	VI	VII	V
(c)	VIII	VI	IV	I	VII	III	II	V
(d)	I	III	V	VII	VIII	VI	IV	II

81 Some important events in the human female reproductive cycle are given below. Arrange the events in proper sequence.

I. Secretion of FSH.
II. Growth of corpus luteum.
III. Growth of the follicle and oogenesis.
IV. Ovulation.
V. Sudden increase in the levels of LH.

Choose the correct option.

(a) III→ I→ IV→ II→ V
(b) I→ III→ V→ IV→ II
(c) I→ IV→ III→ V→ II
(d) II→ I→ III→ IV→ V

82 Cessation of menstrual cycle at the age of 50 is called

(a) ovulation
(b) gametogenesis
(c) menses
(d) menopause

TOPIC 5 ~ *Fertilisation and Implantation*

83 Capacitation occurs in ***NEET 2017***
(a) rete testis (b) epididymis
(c) vas deferens (d) female reproductive tract

84 Fertilisation in humans is practically feasible only if ***NEET 2016***
(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

85 Everytime copulation does not lead to fertilisation and pregnancy because of failure of sperm to reach the
(a) ampulla (b) cervix
(c) endometrium (d) myometrium

86 During fertilisation, a sperm comes in contact with the zona pellucida layer of the ovum and induces changes in the membrane that block the entry of …*A*… . The secretions of the …*B*… help the sperm enter into the cytoplasm of the ovum.

	A	B
(a)	eggs	zona pellucida
(b)	eggs	acrosome
(c)	additional sperms	acrosome
(d)	additional sperms	zona pellucida

87 What is acrosomal reaction? ***JIPMER 2018***
(a) Contact of sperms with eggs
(b) Digestion of zona pellucida
(c) Disintegration of acrosome
(d) Contact of acrosome and nucleus of egg

88 Extrusion of second polar body from egg nucleus occurs ***NEET 2019***
(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

89 In human females, meiosis-II is not complete until ***CBSE-AIPMT 2014***
(a) puberty (b) fertilisation
(c) uterine implantion (d) birth

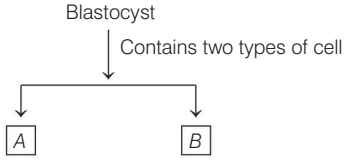
90 The sex of the foetus will be decided at
(a) fertilisation by male gamete
(b) implantation
(c) fertilisation by female gamete
(d) the start of cleavage

91 Cleavage is the rapid mitotic division occurring on the way through isthmus to oviduct. It occurs in
(a) gametes (b) zygote
(c) sperm (d) ova

92 Cleavage forms 2-4-8-16 cells. These cells are called
(a) blastocysts (b) blastomeres
(c) morula (d) trophoblast

93 Embryo at 8-16 cells stage is called
(a) blastula (b) morula
(c) trophoblast (d) All of these

94 Study the chart given below.

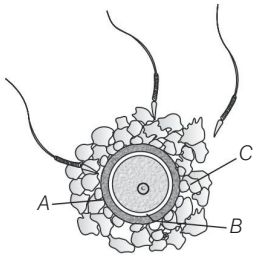


Select the option containing the correct identify of *A* and *B*.
(a) A–Trophoblast, B–Inner cell mass
(b) A–Placenta, B–Embryoblast
(c) A–Placenta, B–Trophoblast
(d) None of the above

95 Trophoblast of blastocyst attaches to the
(a) endometrium (b) myometrium
(c) perimetrium (d) mesoderm

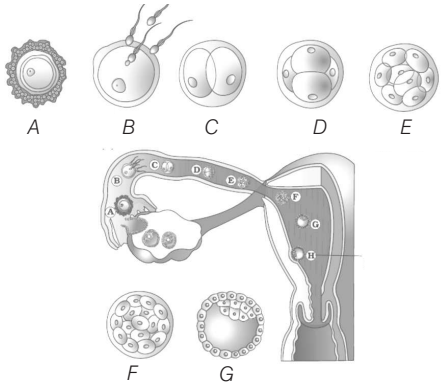
96 Inner cell mass or embryoblast gives rise to
(a) foetal part (b) embryo
(c) notochord (d) nourishment cell

97 The given diagram refers to ovum surrounded by few sperms. Identify *A, B* and *C* in the diagram.



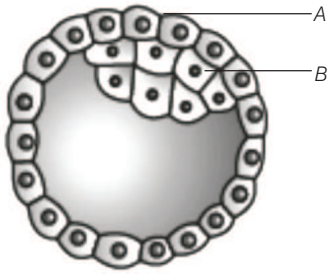
(a) A–Zona pellucida, B–Perivitelline space, C–Corona reticulata
(b) A–Zona pellucida, B–Vitelline membrane, C–Corona radiata
(c) A–Zona pellucida, B–Perivitelline space, C–Corona radiata
(d) A–Oolemma, B–Perivitelline space, C–Corona radiata

98 Consider the figure given below which depicts the sequence of embryonic development in humans. Identify *E* and *G*.



	E	G
(a)	Morula	Blastula
(b)	Morula	Blastocyst
(c)	Gastrula	Blastocyst
(d)	Gastrula	Blastula

99 Identify *A* and *B* and their respective functions.



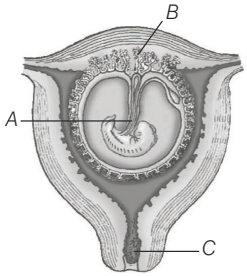
	A	B	**Function of** A	**Function of** B
(a)	Trophoblast	Inner cell mass	Gets attached to the endometrium	Differentiated as embryo
(b)	Inner cell mass	Trophoblast	Gets attached to the endometrium	Differentiated as embryo
(c)	Trophoblast	Inner cell mass	Differentiated as embryo	Gets attached to the endometrium
(d)	Ectoderm	Endoderm	Differentiated as embryo	Gets attached to the endometrium

TOPIC 6 ~ *Pregnancy and Embryonic Development*

100 After implantation, finger-like projections appear on the trophoblast called … *A*… . They are surrounded by … *B*… and maternal blood.
Here, *A* and *B* refer to
(a) A–chorion, B–foetal cell
(b) A–chorionic villi, B–uterine tissue
(c) A–uterine tissue, B–chorionic villi
(d) A–foetal cell, B–chorion

101 Chorionic villi and uterine tissue become interdigitated with each other and jointly form
(a) trophoblast (b) inner cell mass
(c) placenta (d) embryo

102 In the given diagram, find out *A*, *B* and *C*.



(a) A–Plug of mucus in cervix, B–Placental villi C–Umbilical cord
(b) A–Umbilical cord, B–Placental villi,C–Plug of mucus in cervix
(c) A–Umbilical cord, B–Plug of mucus in cervix, C–Placental villi
(d) A–Placental villi, B–Plug of mucus in cervix,C–Umbilical cord

103 Several hormones like hCG, hPL, oestrogen, progesterone are produced by ***NEET 2016***
(a) ovary (b) placenta
(c) Fallopian tube (d) pituitary

104 Hormones secreted by the placenta to maintain pregnancy are ***NEET 2018***
(a) hCG, hPL, progestogens, oestrogens
(b) hCG, hPL, oestrogens, relaxin, oxytocin
(c) hCG, hPL, progestogens, prolactin
(d) hCG, progestogens, oestrogens, glucocorticoids

105 Which one is present in the urine of pregnant woman? ***JIPMER 2018***
(a) hCG (b) LH (c) Oestrogen (d) FSH

106 Structure analogous to the placenta in mammals. ***JIPMER 2019***
(a) Chorion (b) Amnion (c) Yolk sac (d) Allantois

107 Relaxin (a hormone) is secreted by
(a) placenta
(b) ovary
(c) anterior lobe of pituitary
(d) posterior lobe of pituitary

108 Soon after implantation, the inner cell mass differentiates into outer …*A*…, middle …*B*… and an inner …*C*… . *A, B* and *C* in the given sentence are
(a) A–mesoderm, B–ectoderm, C–endoderm
(b) A–ectoderm, B–mesoderm, C–endoderm
(c) A–ectoderm, B–endoderm, C–mesoderm
(d) A–mesoderm, B–endoderm, C–ectoderm

109 Identify the correctly matched pair/pairs of the germ layers and their derivatives.
I. Ectoderm – Epidermis II. Endoderm – Dermis
III. Mesoderm – Muscles IV. Mesoderm – Cartilage
V. Endoderm – Enamel of teeth
Choose the option containing the correctly matched pairs.
(a) I and IV (b) I and II
(c) I, III and IV (d) I, II, III and V

110 The amnion of mammalian embryo is derived from ***NEET 2018***
(a) mesoderm and trophoblast
(b) endoderm and mesoderm
(c) ectoderm and mesoderm
(d) ectoderm and endoderm

111 Gastrulation means ***JIPMER 2019***
(a) conversion of blastula into morula
(b) formation of three germ layers
(c) a phase in which organogenesis takes places
(d) a phase chracterised by inner cell mass

112 The correct sequence is ***JIPMER 2018***
(a) Zygote → Cleavage → Morula → Blastula → Gastrula
(b) Cleavage → Zygote → Morula → Blastula → Gastrula
(c) Zygote → Morula → Blastula → Cleavage → Gastrula
(d) Zygote → Blastula → Morula → Cleavage → Gastrula

113 Choose the incorrect pair.

	Organ	Time of development in foetus
(a)	Heart	After one month of pregnancy
(b)	Limbs and digits	By the end of second month
(c)	External genital organs	By the end of 24 weeks (second trimester)
(d)	First movement of foetus	During the fifth month

TOPIC 7 ~ *Parturition and Lactation*

114 Parturition is induced by
(a) neural mechanism
(b) endocrine mechanism
(c) neuroendocrine mechanism
(d) hormonal mechanism

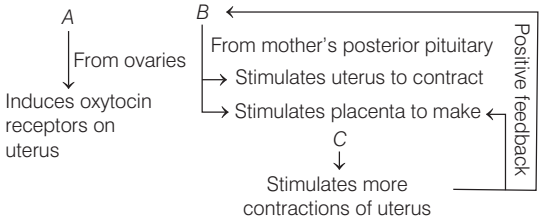
115 Signals for parturition originate from ***CBSE-AIPMT 2012, 10***
(a) Both placenta as well as fully developed foetus
(b) oxytocin released from maternal pituitary
(c) placenta
(d) fully developed foetus

116 Identify the correct sequence in which the various stages of parturition take place.
(a) Shedding of placenta → Dilation of cervix → Delivery of the baby
(b) Dilation of the cervix → Shedding of placenta → Delivery of the baby
(c) Dilation of the cervix → Delivery of the baby → Shedding of placenta
(d) None of the above

117 Which of the following hormones is responsible for both the milk-ejection reflex and the foetal-ejection reflex? ***NEET (Odisha) 2019***
(a) Oestrogen (b) Prolactin
(c) Oxytocin (d) Relaxin

118 Which one of the following is not the function of placenta? It ***NEET 2013***
(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

119 Name *A, B* and *C* hormones in the given figure.



(a) A–Prostaglandin, B–Oxytocin, C–Oestrogen
(b) A–Oestrogen, B–Oxytocin, C–Prostaglandin
(c) A–Oestrogen, B–Prostaglandin, C–Oxytocin
(d) A–Prostaglandin, B–Oestrogen, C–Oxytocin

120 Colostrum is important for newly born because
(a) it contains essential antigen
(b) it contains essential antibodies
(c) Both (a) and (b)
(d) it has more nutrients than ordinary milk

NEET

SPECIAL TYPES QUESTIONS

I. Assertion and Reason

■ **Direction** (Q. No. 121-135) *In each of the following questions, a statement of Assertion (A) is given and followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as*

(a) If both A and R are true and R is the correct explanation of the A

(b) If both A and R are true, but R is not the correct explanation of the A

(c) If A is true, but R is false

(d) If A is false, but R is true

121 **Assertion** (A) The testes are situated outside the abdominal cavity within scrotum.

Reason (R) Muscles in scrotum helps to maintain low temperature of testes, necessary for spermatogenesis.

122 **Assertion** (A) In the testis, spermatogenesis occurs in the seminiferous tubules and testosterone secretion takes place from the Sertoli cells.

Reason (R) Testosterone brings growth and maturation of secondary sex organs and also the development of accessory sex characters.

123 **Assertion** (A) The Sertoli cells are present in seminiferous tubules.

Reason (R) Sertoli cells provide nutrition to the germ cells and spermatozoa.

124 **Assertion** (A) The bulbourethral gland is a male accessory gland.

Reason (R) Its secretion helps in the lubrication of the penis, thereby facilitating reproduction.

125 **Assertion** (A) Fimbriae are finger-like projections of infundibulum part of oviduct which is closest to ovary.

Reason (R) They are important for the collection of ovum after ovulation from ovary.

126 **Assertion** (A) In females, parturition is the act of giving birth to a baby. ***AIIMS 2018***

Reason (R) Signals for parturition originate from a fully developed foetus.

127 **Assertion** (A) Ovum retains most of the contents of the primary oocyte and is much larger than a spermatozoa.

Reason (R) Ovum needs energy to go about in search of a spermatozoa for fertilisation.

128 **Assertion** (A) Menstrual phase is also compared to shedding tears for the lost ovum.

Reason (R) In the menstrual phase, loss of endometrial lining takes place due to reduced titre of progesterone.

129 **Assertion** (A) Production of FSH and LH increases in the ovulation phase.

Reason (R) Due to decrease in the level of LH ovulation (releasing of ova) takes place.

130 **Assertion** (A) Progesterone is essential for maintenance of the endometrium.

Reason (R) Endometrium is essential for implantation of fertilised ovum.

131 **Assertion** (A) Not all copulations lead to pregnancy.

Reason (R) Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary-isthmic junction.

132 **Assertion** (A) In humans, the gamete contributed by the male determines whether the child produced will be male or female.

Reason (R) Sex in humans is a polygenic trait, depending upon a cumulative effect of some genes on X-chromosome.

133 **Assertion** (A) Placenta is an endocrine gland.

Reason (R) It secretes many hormones essential for pregnancy.

134 **Assertion** (A) The presence of hCG in woman urine is the basis for pregnancy test.

Reason (R) A woman passes out hCG in the urine during pregnancy.

135 **Assertion** (A) Breastfeeding during initial period of infant growth is recommended.

Reason (R) Colostrum contains several antibodies, essential to render immunity in newborns.

II. Statement Based Questions

136 Choose the correct statement.

(a) Size of testis is 4-5 cm in length and 1 cm in width

(b) The scrotum is maintained at body temperature

(c) The testes are situated outside the abdominal cavity in humans

(d) The earliest stages of spermatogenesis occur outside the testis

137 Choose the incorrect statement (s).
(a) Oogonia are formed and added after birth
(b) Oogenesis is initiated during the embryonic development
(c) No more gamete mother cells are formed in females after birth
(d) All of the above

138 Which of the following statement is incorrect?
(a) Each ovary is about 2 to 4 cm in length and is connected to the pelvic wall and uterus by ligaments
(b) Each ovary is covered by a thin epithelium which encloses the ovarian stroma
(c) Ovaries produce several steroid hormones only
(d) the stroma of ovary is divided into a peripheral cortex and an inner medulla

139 Read the following statements.
I. The uterus is present in single pair and is also called womb.
II. The shape of uterus is like an inverted pear.
III. The uterus opens into vagina through a narrow cervix.
IV. Birth canal is formed by cervical canal and vagina.
V. Perimetrium of uterus wall is external and thick, myometrium is middle thin layer of smooth muscles and endometrium is inner glandular layer.

Which of the above statements are correct ?
(a) I, II and III (b) II, III and IV
(c) IV and V (d) I and V

140 Read the following statements.
I. Spermatogonia and spermatids are diploid.
II. The extrusion of second polar body from nucleus occurs after the entry of sperm and completion of fertilisation.
III. Spermatogenesis and sperm differentiation under the control of FSH and testosterone.
IV. A change in ovum after penetration of sperm the formation of second polar body.
V. The secondary oocyte in the Graaffian follicle forms a new membrane called zona pellucida surrounding it.

Which of the above statements are correct?
(a) I, II, III and V (b) I and III
(c) Only III (d) II, III, IV and V

141 Read the following statements.
I. Each testis has about 25 compartments called testicular lobules.
II. Each testicular lobule contains one to three highly coiled seminiferous tubules in which sperms are produced.
III. Sertoli cells act as nurse cells of testicles.
IV. Sertoli cells are activated by FSH secreted by the adenohypophysis.

Which of the above statements are incorrect?
(a) I and III (b) Only I
(c) II and IV (d) III and IV

142 Which of the following statement/s is not correct?
(a) The external opening of penis is called urethral meatus
(b) Glans penis is covered by loose fold of skin called foreskin
(c) Secretion of bulbourethral gland helps in lubrication of penis
(d) None of the above

143 Which of the following statement is false for uterus?
(a) It is also called womb and its shape is like an inverted pear
(b) It is supported by ligaments attached to the pelvic wall
(c) It opens into oviducts through cervix whose cavity is called cervical canal
(d) It is bound by three layers, outer perimetrium, middle myometrium and inner endometrium

144 Which one of the following statement is false in respect of viability of mammalian sperm? ***CBSE-AIPMT 2012***
(a) Sperm is viable for only up to 24 hrs
(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

145 Which of the following statement is not correct for oogonia?
(a) They are million gamete mother cells
(b) They are formed within each foetal ovary
(c) They are formed throughout the life of female
(d) They start division and get arrested at prophase-I of meiotic division

146 Select the incorrect statement. ***NEET 2016***
(a) LH and FSH trigger 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

147 Identify the correct statement(s) for placenta.
(a) It facilitates the supply of O_2 and nutrients to embryo
(b) It is connected to embryo through umbilical cord
(c) It removes CO_2 and excretory material produced by embryo
(d) All of the above

148 Identify the correct statement on 'inhibin'. ***NEET 2016***
(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

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

CBSE-AIPMT 2014, 12

(a) High level of FSH and LH stimulates the thickening of endometrium
(b) High level of FSH and LH facilitates implantation of the embryo
(c) High level of hCG stimulates the synthesis of oestrogen and progesterone
(d) High level of hCG stimulates the thickening of endometrium

150 Consider the following three statements related to the human male reproductive system and select the correct option stating which ones are True (T) and which ones are False (F).

I. Middle piece of spermatozoon is also termed as power house of spermatozoon.
II. Vas deferens joins a duct from seminal vesicle and form vasa efferentia.
III. Semen is a collection of secretions from the seminal vesicles, prostate gland, Cowper's glands and sperms from testes.

	I	II	III		I	II	III
(a)	T	F	T	(b)	F	F	T
(c)	T	T	F	(d)	F	T	T

151 Read the following statements and select the correct option(s).

I. Maintenance of hygiene and sanitation during menstruation is very important.
II. Primary oocytes surrounded by a layer of granulosa cells and called primary follicle.
III. Seminal plasma is rich in fructose, calcium and certain enzymes.
IV. In females, uterus is single and also called womb.

(a) Only I (b) I and II
(c) Only III (d) All of these

152 Given below are four statements (I-IV) regarding embryonic development in humans.

I. Cleavage divisions bring about considerable increase in the mass of protoplasm.
II. With more cleavage divisions, the resultant blastomeres become smaller and smaller.
III. The blastomeres in the blastocyst are arranged into two layers, i.e. trophoblast and endometrium.
IV. Cleavage divisions result in a solid ball of cells called morula.

Which of the above two statements are correct?

(a) I and III (b) II and IV (c) I and II (d) III and IV

153 Read the given statements and select the correct option.

I. The production of sperms and ovum by the testis in males and the ovaries in female, respectively, called gametogenesis.
II. Each spermatogonium in seminiferous tubule is diploid and contains 46 chromosomes.

(a) Both statements are incorrect
(b) Statement I is correct, but statement II is incorrect
(c) Both statements are correct
(d) Statement I is incorrect, but statement II is correct.

154 Which of the following statements is correct?

I. Oogenesis is initiated during the embryonic development stage .
II. At puberty only 60, 000-80, 000 primary follicles are left in each ovary.
III. The primary follicles surrounded with many layers of granulosa cells and form a new theca called secondary follicles.
IV. Changing of sanitary napkins or pads after every 4-5 hours is necessary for maintaining menstrual hygiene.

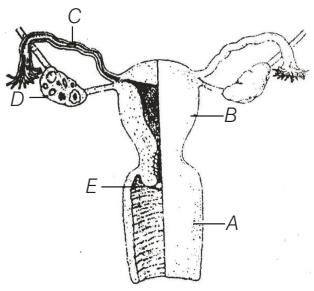
(a) I and II (b) I, II, III and IV
(c) I and III (d) None of these

155 Regarding male pronucleus which among the following statement is correct?

I. It is the sperm nucleus after entering the ovum at fertilisation.
II. Both head and neck of sperm contribute to pronucleus formation.
III. Male pronucleus contains mitochondria.
IV. Sperm head contains pronucleus having diploid set of chromosomes.

(a) Only II (b) III and IV (c) Only I (d) II and IV

156 Study the figure of the human female reproductive system given below.



Read the following statements and select the option containing the incorrect statement(s).

I. A–ovary produces oestrogen required for the development of female primary sex characters.
II. A–Vagina receives the penis during copulation.
III. B–Uterus serves as the site for implantation of the fertilised egg.
IV. C–Oviduct serves as the site for fertilisation of the egg.

(a) I and II (b) Only I
(c) Only II (d) II and IV

III. Matching Type Questions

157 Match the following columns.

	Column I (Events)		Column II (Features)
A.	Parturition	1.	Attachment of zygote to endometrium
B.	Gestation	2.	Release of egg
C.	Ovulation	3.	Delivery of baby
D.	Implantation	4.	Period between fertilisation and the birth
E.	Fertilisation	5.	Fusion of male and female gametes

Codes

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

158 Match the following columns.

	Column I		Column II
A.	Testis	1.	Gives specific constituents to semen
B.	Vulva	2.	Oogenesis
C.	Prostate fluid	3.	Scrotum
D.	Production of ova	4.	Labia majora

Codes

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

159 Match the following columns.

	Column I (Female reproductive parts)		Column II (Related to)
A.	Ovaries	1.	Fertilisation
B.	Oviduct	2.	Ovulation
C.	Uterus	3.	Pregnancy
D.	Cervix	4.	Childbirth

Codes

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

160 Match the following columns.

	Column I		Column II
A.	Acrosome	1.	Rudimentary tissue
B.	Endometrium	2.	Uterus
C.	Polar body	3.	Oogenesis
D.	Clitoris	4.	Spermatozoa

Codes

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

161 Match the following columns.

	Column I (Layers of uterus)		Column II (Features)
A.	Perimetrium	1.	Inner glandular layer of uterus
B.	Endometrium	2.	External thin membrane of uterus
C.	Myometrium	3.	Middle thick membrane of uterus

Codes

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

162 Match the following columns. ***NEET 2018***

	Column I		Column II
A.	Proliferative phase	1.	Breakdown of endometrial lining
B.	Secretory phase	2.	Follicular phase
C.	Menstruation	3.	Luteal phase

Codes

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

163 Match the following columns.

	Column I (Stages of menstrual cycle)		Column II (Names)
A.	Stage-I	1.	Menstrual phase
B.	Stage-II	2.	Follicular proliferative
C.	Stage-III	3.	Ovulatory phase
D.	Stage-IV	4.	Luteal/Secretory phase

Codes

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

164 Match the following columns.

	Column I		Column II
A.	Hyaluronidase	1.	Acrosomal reaction
B.	Corpus luteum	2.	Morphogenetic movements
C.	Gastrulation	3.	Progesterone
D.	Capacitation	4.	Mammary gland
E.	Colostrum	5.	Sperm activation

Codes

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

165 Match the following columns.

	Column I		Column II
A.	Endometrium	1.	Copulation site
B.	Menopause	2.	Site of implantation
C.	Fallopian tube	3.	Stopping of menstruation
D.	Vagina	4.	Site of fertilisation

Codes

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

166 Match the following columns.

	Column I (Hormones)		Column II (Functions)
A.	FSH	1.	Prepares endometrium wall for implantation
B.	LH	2.	Develops female secondary sexual characters
C.	Progesterone	3.	Maturation of Graafian follicle
D.	Oestrogen	4.	Maintenance of corpus luteum

Codes

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

167 Match the following columns. ***NEET 2016***

	Column I		Column II
A.	Mons pubis	1.	Embryo formation
B.	Antrum	2.	Sperm
C.	Trophectoderm	3.	Female external genitalia
D.	Nebenkern	4.	Graafian follicle

Codes

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

NCERT & NCERT Exemplar

MULTIPLE CHOICE QUESTIONS

NCERT

168 Name the hormones involved in the regulation of spermatogenesis.
(a) LH and FSH (b) Testosterone only
(c) Testosterone and LH (d) LH only

169 Read the following statements.
I. Androgens are produced by Sertoli cells.
II. Presence or absence of hymen is not a reliable indicator of virginity or sexual experience.
III. Leydig cells synthesise androgens.
IV. Oogenesis takes place in corpus luteum.
Identify whether the given above statements are true or false.

	I	II	III	IV		I	II	III	IV
(a)	T	F	F	T	(b)	T	F	T	F
(c)	F	T	T	F	(d)	F	F	T	T

170 How many eggs do you think would have been released by human ovary if the mother gave birth to identical twins?
(a) One, fertilised by two sperms
(b) Two, fertilised by different sperms
(c) One, fertilised by single sperm
(d) Two, fertilised by single sperm

171 How many eggs do you think were released by the ovary of a female dog which gave birth to 6 puppies?
(a) One (b) Three
(c) Six (d) Indefinite

NCERT Exemplar

172 Spot the odd one out from the following structures with reference to the male reproductive system.
(a) Rete testis
(b) Epididymis
(c) Vasa efferentia
(d) Isthmus

173 The vasa deferens receives duct from the seminal vesicle and opens into urethra as
(a) epididymis
(b) ejaculatory duct
(c) efferent ductule
(d) ureter

174 Urethral meatus refers to the
(a) urinogenital duct
(b) opening of vas deferens into urethra
(c) external opening of the urinogenital duct
(d) muscles surrounding the urinogenital duct

175 Seminal plasma, the fluid part of semen is contributed by

I. seminal vesicle
II. prostate gland
III. urethra
IV. bulbourethral gland

(a) I and II (b) I, II and IV
(c) II, III and IV (d) I and IV

176 Which one of the following is not a male accessory gland?

(a) Seminal vesicle (b) Mammary gland
(c) Prostate (d) Bulbourethral gland

177 Mature Graafian follicle is generally present in the ovary of a healthy human female around

(a) 5-8 days of menstrual cycle
(b) 11-17 days of menstrual cycle
(c) 18-23 days of menstrual cycle
(d) 24-28 days of menstrual cycle

178 Spermiation is the process of the release of sperms from

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

179 Acrosomal reaction of the sperm occurs due to

(a) its contact with zona pellucida of the ova
(b) reactions within the uterine environment of the female
(c) reactions within the epididymal environment of the male
(d) androgens produced in the uterus

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

(a) hCG (b) Oestrogens
(c) Progesterone (d) LH

181 Morula is a developmental stage

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

182 Match the following columns.

Column I	Column II
A. Trophoblast	1. Embedding of blastocyst in the endometrium
B. Cleavage	2. Group of cells that would differentiate as embryo
C. Inner cell mass	3. Outer layer of blastocyst attached to the endometrium
D. Implantation	4. Mitotic division of zygote

Codes

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

183 Choose the incorrect statement from the following.

(a) In birds and mammals, internal fertilisation takes place
(b) Colostrum contains antibodies and nutrients
(c) Polyspermy in mammals is prevented by the chemical changes on the egg surface
(d) In the human female, implantation occurs almost seven days after fertilisation

184 Identify the correct statement from the following.

(a) High levels of oestrogen triggers the ovulatory surge
(b) Oogonial cells start to proliferate and give rise to functional ova in regular cycles from puberty onwards
(c) Sperms released from seminiferous tubules are highly motile
(d) Progesterone level is high during the post ovulatory phase of menstrual cycle

185 The spermatogonia undergo division to produce sperms by the process of spermatogenesis.

Choose the correct one with reference to above.

(a) Spermatogonia have 46 chromosomes and always undergo meiotic cell division
(b) Primary spermatocytes divide by mitotic cell division
(c) Secondary spermatocytes have 23 chromosomes and undergo second meiotic division
(d) Spermatozoa are transformed into spermatids

186 Match between the following representing parts of the sperm and their functions and choose the correct option.

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

Codes

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

187 Which among the following has 23 chromosomes?

(a) Spermatogonia (b) Zygote
(c) Secondary oocyte (d) Oogonia

188 The membranous cover of the ovum at ovulation is

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

189 Identify the odd one from the following.

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

Answers

Mastering NCERT with MCQs

1 (d)	2 (a)	3 (a)	4 (a)	5 (a)	6 (d)	7 (d)	8 (c)	9 (b)	10 (c)	11 (b)	12 (a)	13 (d)	14 (c)	15 (a)
16 (b)	17 (d)	18 (d)	19 (c)	20 (b)	21 (d)	22 (a)	23 (c)	24 (b)	25 (a)	26 (b)	27 (b)	28 (c)	29 (d)	30 (a)
31 (d)	32 (a)	33 (d)	34 (a)	35 (a)	36 (d)	37 (a)	38 (b)	39 (d)	40 (c)	41 (d)	42 (a)	43 (d)	44 (d)	45 (a)
46 (b)	47 (b)	48 (b)	49 (d)	50 (d)	51 (a)	52 (b)	53 (d)	54 (c)	55 (d)	56 (b)	57 (b)	58 (a)	59 (d)	60 (a)
61 (a)	62 (d)	63 (a)	64 (c)	65 (b)	66 (d)	67 (a)	68 (a)	69 (a)	70 (c)	71 (b)	72 (b)	73 (a)	74 (a)	75 (c)
76 (c)	77 (c)	78 (c)	79 (a)	80 (c)	81 (b)	82 (d)	83 (d)	84 (a)	85 (a)	86 (c)	87 (b)	88 (d)	89 (b)	90 (a)
91 (b)	92 (b)	93 (b)	94 (a)	95 (a)	96 (b)	97 (c)	98 (b)	99 (a)	100 (b)	101 (c)	102 (b)	103 (b)	104 (a)	105 (a)
106 (a)	107 (b)	108 (b)	109 (c)	110 (c)	111 (b)	112 (a)	113 (c)	114 (c)	115 (a)	116 (c)	117 (c)	118 (d)	119 (b)	120 (b)

NEET Special Types Questions

121 (a)	122 (d)	123 (b)	124 (a)	125 (b)	126 (b)	127 (c)	128 (a)	129 (c)	130 (b)	131 (a)	132 (c)	133 (b)	134 (a)	135 (a)
136 (c)	137 (a)	138 (c)	139 (b)	140 (d)	141 (b)	142 (d)	143 (c)	144 (a)	145 (c)	146 (b)	147 (d)	148 (a)	149 (c)	150 (a)
151 (d)	152 (b)	153 (c)	154 (b)	155 (c)	156 (b)	157 (d)	158 (a)	159 (a)	160 (b)	161 (a)	162 (a)	163 (c)	164 (b)	165 (a)
166 (a)	167 (b)													

NCERT & NCERT Exemplar Questions

168 (a)	169 (c)	170 (c)	171 (c)	172 (d)	173 (b)	174 (c)	175 (b)	176 (b)	177 (b)	178 (a)	179 (a)	180 (d)	181 (a)	182 (b)
183 (b)	184 (d)	185 (c)	186 (b)	187 (c)	188 (a)	189 (a)								

Answers & Explanations

2 (*a*) The testes are suspended outside the abdominal cavity within a pouch called scrotum. Scrotum maintains the temperature of testes, i.e. 2-2.5°C below the body temperature, necessary for spermatogenesis.

3 (*a*) Each human testis is oval in shape, with a length of about 4-5 cm and a width of about 2-3 cm.

7 (*d*) Each seminiferous tubule is lined on its inside by two types of cells called male germ cells (spermatogonia) and Sertoli cells.

9 (*b*) Spermatogonia or male germ cells undergo meiotic divisions finally leading to sperm formation.

10 (*c*) Region outside the seminiferous tubules is called interstitial space, contains small blood vessels and interstitial cells or Leydig cells.

13 (*d*) Option (d) contains the incorrect pair. It can be corrected as

Ejaculatory duct is formed by the union of vasa deferentia and duct of the seminal vesicle.

Rest of the pairs are correct.

14 (*c*) Option (c) is the correct one. The correct information about the remaining incorrect option is as follows

Each testis (A) possesses about 250 compartments called testicular lobules.

Seminal vesicle (B) secretes mucous and a watery alkaline fluid rich in nutrients like fructose, citric acid, inositol and prostaglandins. It provides energy to the spermatozoa.

Prostate gland (D) releases an alkaline fluid that is rich in citrate ions, calcium phosphate and proteolytic enzymes to aid in sperm motility.

15 (*a*) The shared terminal duct of the reproductive and urinary system in the human male is urethra. The urethra is about 8 inches (20 cm) long and opens at the end of the penis. The urethra provides an exit for urine from the bladder as well as for as semen from vasa efferentia during ejaculation.

17 (*d*) The accessory glands found in males are paired seminal vesicles, the unpaired prostate gland and the paired bulbourethral glands.

27 (*b*) Option (b) contains the incorrect pair. It can be corrected as
Ampulla is the wider part of oviduct.
Rest all the pairs are correct.

29 (*d*) Option (d) contains the incorrect pair and can be corrected as
Myometrium is the muscular layer of uterus which exhibits strong contractions during delivery.
Endometrium is the glandular layer, which undergoes cyclic changes during menstrual cycle.
Rest all the pairs are correct.

32 (*a*) Several mammary ducts join to form a wider mammary ampulla which is connected to the lactiferous duct through which milk is sucked out.

33 (*d*) Option (d) is correct.

In the first group, Fallopian tube is the odd one out as it is a part of the female reproductive part. Rest are male reproductive parts.

In the second series, ejaculatory duct is the odd one out as it is a part of the male reproductive tract. Rest are parts in females.

In the third series, acrosome is the odd one out as it is a part of the sperm (male gamete). Rest are parts in female.

In the fourth series, testis is odd one out as it is a primary male reproductive organ. Rest are accessory glands of male reproductive system.

35 (*a*) Spermatogonium is diploid (2*n*) and contains 46 chromosomes. These multiply by mitotic division to form primary spermatocyte (2*n*).

37 (*a*) Primary spermatocytes (2*n*) undergo meiosis-I to give rise to haploid secondary spermatocyes. The secondary spermatocytes undergo meiosis-II to produce spermatids which are then released as spermatids.

40 (*c*) Secondary spermatocytes are the first cells in spermatogenesis in which the chromosome number becomes half. Thus, they contain haploid number of chromosomes.

43 (*d*) The correct sequence of sperm formation is Spermatogonia $\rightarrow$ Spermatocyte $\rightarrow$ Spermatid $\rightarrow$ Spermatozoa.
Spermatogonia are present on the inside wall of seminiferous tubule which undergoes mitotic division and increase their number. Primary spermatocytes are some of the spermatogonia, which periodically undergo meiosis and form secondary spermatocytes. These undergo the second meiotic division to produce four, equal haploid spermatids. The spermatids are further transformed into spermatozoa (sperm) and are finally released.

44 (*d*) Spermiogenesis is the process of transformation of spermatids (*n*) into spermatozoa (*n*) or sperms. It involves the differentiation phase in which one spermatid develops into one spermatozoon. Spermiation involves the release of sperms from seminiferous tubules through Sertoli cells.

45 (*a*) Spermatogenesis is initiated at puberty due to the increase in Gonadotropin Releasing Hormone (GnRH) by hypothalamus.

46 (*b*) GnRH is a hypothalamic hormone. It stimulates the anterior lobe of pituitary gland to secrete LH and FSH.

48 (*b*) Sperms of mammals depend for movement on tail and middle piece. The middle piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitates sperm motility essential for fertilisation.

49 (*d*) The middle piece of the sperm utilises fructose as a source of energy. It is packed with numerous mitochondria which utilise fructose as a source of energy to provide motility to sperm to reach out ovum (egg cell).

50 (*d*) Option (d) contains the incorrect match. It can be corrected as
The combined secretion of three glands namely, seminal vesicles, prostate gland, Cowper's gland, together with sperms collectively form semen.
Rest of the matches are correct.

51 (*a*) Option (a) contains the incorrect match. It can be corrected as
Antrum is the fluid-filled cavity which is found in tertiary follicle or Graafian follicle.
Rest of the matches are correct.

53 (*d*) The zona pellucida in an antral follicle is acellular. It is a glycoprotein layer surrounding the plasma membrane of the mammalian oocytes.

57 (*b*) Option (b) is correct.

In the first series, polar body is the odd one out as it is a structure formed through oogenesis in females. Rest are structure of spermatogenesis.

In the second series, acrosome is the odd one out as it is a part of the sperm or the male gamete. Rest are parts in females.

In the third series, Fallopian tube is the odd one out as it is a part of the female reproductive system. Rest are structure in males.

In the fourth series, testes is the odd one out as it is the primary sex organ of the male reproductive system. Rest are accessory glands of male reproductive system.

58 (*a*) The rhythmic series of changes that occurs in the reproductive organs of female primates like monkeys, apes and human beings, is called menstrual cycle.
It is repeated at an average interval of about 28/29 days.

60 (*a*) Menstrual flow occurs due to the lack of progesterone. Progesterone is secreted by corpus luteum and is essential for the maintenance of endometrium. In the absence of progesterone, the endometrium starts to degenerate. This leads to menstrual flow in which the endometrial wall gets shed off.

63 (*a*) During the follicular phase of menstrual cycle, the endometrium of the uterus regenerates through proliferation.

64 (*c*) The level of LH is maximum at the time of ovulation (i.e. ovulatory phase) in the menstrual cycle. It is called as LH surge. It induces rupture of Graafian follicles and thereby the release of ovum, i.e. ovulation.

67 (*a*) Decrease in oestradiol is not associated with ovulation in human females. Oestradiol is also known as oestrogen which is a primary female sex hormone. During the ovulation in human females, level of oestradiol increases. Its main function is to mature and maintain the reproductive tract.

68 (*a*) No new follicles develop in the luteal phase of menstrual cycle because after ovulation follicles do not remain in the ovary. It is because during this phase, Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) levels decrease. Instead, the already ruptured follicle closes after releasing the egg and forms

a corpus luteum during luteal phase, which produces progesterone.

69 (*a*) The formation of corpus luteum is induced by LH (Luteinizing Hormone). LH causes ovulation and stimulates the remaining cells of the ovarian follicle to develop corpus luteum.

70 (*c*) Corpus luteum is a temporary endocrine gland in the human body. It secretes small amount of oestradiol and significant amount of progesterone hormone. In the absence of fertilisation, the corpus luteum degenerates.

71 (*b*) The main function of mammalian corpus luteum is the secretion of progesterone, which is essential for the maintenance of endometrium.

74 (*a*) Option (a) shows incorrect match. It can be corrected as

Regeneration of endometrium under the influence of oestrogen and maturation of Graafian follicle occurs during the proliferative phase.

Rest of the options are correct matches.

79 (*a*) Option (a) depicts the correct levels of LH, FSH and progesterone. On the 13-14 days (Proliferative phase) FSH and LH have high concentration, whereas progesterone has low concentration.

On the 20-28 days (Luteal phase), FSH and LH have low concentration, whereas progesterone has high concentration.

81 (*b*) The option depicting the correct sequence events occurring in the female reproductive cycle is $I \rightarrow III \rightarrow V \rightarrow IV \rightarrow II$.

In human female reproductive cycle or menstrual cycle, during proliferative phase, the anterior lobe of pituitary gland secretes the Follicle Stimulating Hormone (FSH), which stimulates ovarian follicle to secrete oestrogen. During the second week of reproductive cycle, most of the developing follicle die and usually one follicle continues to mature. Also, the Luteinizing Hormone (LH) in blood level increases and a small surge of FSH occurs. Ovulation takes place, which releases immature egg into abdominal cavity.

During ovulation, the follicle breaks upon and collapses under the continuous influence of Luteinizing Hormone (LH). It begins to enlarge and forms a yellowish structure called corpus luteum or yellow body.

83 (*d*) Capacitation is the process, where the spermatozoa acquire the capacity to fertilise the eggs. It occurs in female reproductive tract.

84 (*a*) Fertilisation in human, is practically feasible only if the ovum and sperms are transported simultaneously at the ampullary-isthmic junction of Fallopian tube. This is the reason why every copulation does not lead to fertilisation and pregnancy.

87 (*b*) Acrosomal reaction is the digestion of the zona pellucida. It involves the progressive fusion of the acrosomal membrane with the plasma membrane of the sperm. It creates pores through which the acrosomal enzymes can be released by exocytosis.

These enzymes include a protein digesting enzyme, corona penetrating enzyme, zona lysin (acrosin) and hyaluronidase. These enzymes allow the sperm to digest and create a path through the zona pellucida to the oocyte.

88 (*d*) Extrusion of second polar body from egg nucleus occurs after the entry of sperm but before fertilisation. The entry of sperm into female egg causes the breakdown of Metaphase Promoting Factor (MPF) and turns on Anaphase Promoting Factor (APF). Hence, the secondary oocyte completes its meiotic division after fertilisation and is said to be activated.

90 (*a*) The sex of the foetus will be decided at fertilisation by male gamete. The chromosome pattern in the human female is XX and in the male is XY. If the sperm carrying X-chromosome fertilises the ovum, the zygote would develop into a female and if Y fertilises the ovum, the zygote would be a male. Thus, the sex of the foetus depends on the type of chromosome present in male gamete which fertilises the egg.

91 (*b*) Zygote divides rapidly by mitotic division when it moves through the isthmus of the oviduct towards the uterus. This rapid division is called cleavage.

101 (*c*) Chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between the developing embryo and the maternal body. This structure is called placenta.

104 (*a*) Placenta acts as endocrine tissue and secretes the following hormones to maintain pregnancy

- **human Chorionic Gonadotropin** (hCG) It stimulates and maintains the corpus luteum to secrete progesterone until the end of pregnancy.
- **human Placental Lactogen** (hPL) It is also known Human Chorionic Somatomammotropin (HCS), it stimulates the growth of mammary glands during pregnancy.
- **Progesterone** and **oestrogen** support foetal growth, maintain pregnancy, inhibit uterine contractions, etc.

106 (*a*) Chorion serves as the structure analogous to placenta in mammals. It completely encloses the developing embryo and extraembryonic tissues like placenta, it is also highly specialised to facilitate the transfer of nutrients, gases and wastes between the embryo and mother's body. This is accomplished by chorionic villi that emerge from the chorion and invade the endometrium.

107 (*b*) Relaxin is secreted by the ovaries in the later phase of pregnancy. Relaxin increases the flexibility of the pubic symphysis and ligaments of the sacroiliac and sacrococcygeal joints that help to dilate the cervix during labour.

109 (*c*) Option (c) depicts the correctly matched pairs. Rest of the incorrect pairs can be corrected as

- Mesoderm gives rise to dermis.
- Ectoderm gives rise to enamel of teeth.

110 (*c*) Amnion of mammalian embryo is derived from ectoderm and mesoderm. It is one of the extraembryonic membrane which is formed by the amniogenic cells of ectodermal origin on the inner side and somatopleuric extraembryonic mesoderm on the outer side. This membrane acts as a shock absorber for the foetus, regulates foetal body temperature and prevents desiccation.

111 (*b*) Gastrulation is a process by which blastocyst transforms into the three layered (germ layers) structure called gastrula. The three germ layers are inner endoderm, middle mesoderm and outermost ectoderm. These give rise to all the tissues and organs of the developing foetus.

112 (*a*) The correct sequence of embryonic development is Zygote → Cleavage → Morula → Blastula → Gastrula.

Fertilisation of the haploid egg by a haploid sperm gives rise to a diploid zygote. At about 30-36 hrs after fertilisation, the zygote divides into smaller cells by a process called cleavage.

It is division of cells. It results in a solid ball of cells, called morula. It is a 16-celled stage. It forms blastula which is a 64-celled stage. It contains a fluid-filled cavity called blastocoel. It ultimately leads to the formation of multilayered gastrula.

113 (*c*) Option (c) contains the incorrect pair. It can be corrected as

By the end of 12 weeks (first trimester), most of the major organ systems like the limbs and external genital organs are well-developed.

Rest of the options are correct pairs.

115 (*a*) The process of delivery of the foetus (childbirth) is called parturition which is induced by a complex neuroendocrine mechanism.

The signals for parturition originate from the fully developed foetus and also from the placenta which induce mild uterine contractions called foetal-ejection reflex.

117 (*c*) Oxytocin hormone is responsible for both the milk ejection reflex and foetal-ejection reflex. It is a peptide hormone normally produced in the hypothalamus and released by the posterior pituitary gland.

118 (*d*) Option (d) is not correct function of placenta. Pituitary secretes oxytocin during parturition. It is not a function of the placenta.

The functions of placenta are to supply oxygen and nutrients to embryo, secrete oestrogen, facilitate removal of carbon dioxide and waste materials from embryo.

120 (*b*) Colostrum is the milk produced during the initial few days of lactation. It contains several essential antibodies, which are absolutely essential to develop resistance against pathogenicity in newborn. So, it is recommended by doctors to feed newborn from breast milk during the initial period of infant growth.

121 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

The testes are situated outside the abdominal cavity within a pouch called scrotum. The scrotum helps in maintaining the low temperature of the testes (2-2.5°C) lower than the normal internal body temperature necessary for spermatogenesis.

122 (*d*) Assertion is false, but Reason is true. Assertion can be corrected as

In the testis, spermatogenesis occurs in the seminiferous tubules and testosterone secretion takes place in interstitial cells.

123 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

Seminiferous tubule is lined on its inside by two types of cells called male germ cells and Sertoli cells. The male germ cells form sperm and Sertoli cells provide nutrition to the germ cells.

124 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

The bulbourethral gland is a male accessory gland. Its secretions help in lubricating the penis to facilitate reproduction.

125 (*b*) Both Assertion and Reason true, but Reason is not the correct explanation of Assertion.

The correct explanation would be

Fimbrae are finger-like projections of infundibulum of the oviduct which is closest to the ovary. Fimbrae collect the released from ovary and move it down into the Fallopian tube.

126 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

The act of giving birth to a baby is called parturition. It is induced by a complex neuroendocrine mechanism. The signals originate from a fully developed foetus and the placenta, which induces mild uterine contractions.

127 (*c*) Assertion is true, but Reason is false and it can be corrected as

It is the sperm, which needs energy to move about in female reproductive tract in search of ova so that fertilisation can take place.

128 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Menstrual phase is the phase of menstrual flow/menses which continues for 3-5 days and involves discharge of blood (a total of 50-100 mL) along with shedding off endometrial lining (uterus, Fallopian tube and vagina) due to reduced levels of both oestrogen and progesterone hormones. As such menstrual phase is also called funeral of unfertilised egg or shedding tears of lost ovum.

129 (*c*) Assertion is true, but Reason is false. It can be corrected as

In menstrual cycle, rapid secretion of LH leads to its maximum level during mid-cycle. It is called LH surge. It induces rupture of Graafian follicle, thereby releasing ovum (ovulation).

130 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

Large amount of progesterone is essential for the maintenance of the endometrium, to which fertilised ovum gets attached (implantation).

131 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

All copulations do not lead to fertilisation as the synchronisation of sperm and ova reaching the ampullary-isthmic junction of the Fallopian tube is important.

132 (*c*) Assertion is true, Reason is false. It can be corrected as

In human, the gametes contributed by the male determines the sex of the child. Thus, sex in human is a polygenic trait depending upon a cumulative effect of some genes present on Y-chromosome and not on X-chromosome.

133 (*b*) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.

Placenta acts as an endocrine tissue and produces several hormones like hCG, hPL, oestrogens, progestogens, etc., which are essential for pregnancy.

135 (*a*) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Colostrum is the milk produced during the initial few days of lactation. It is rich in antibodies essential to render immunity for newborn babies. So, breastfeeding is highly recommended during the initial period of infant growth.

136 (*c*) The statement in option (c) is correct.

Rest of the statements are incorrect and can be corrected as

- Size of testis is 4-5 cm in length and 2-3 cm in width.
- The scrotum is maintained at a temperature 2-2.5°C lower than normal body temperature.
- The earliest stages of spermatogenesis occur within the testis.

137 (*a*) The statement in option (a) is incorrect and can be corrected as

Oogonia are formed in the female at the foetal stage and no more oogonia are formed and added after birth.

Rest of the statements are correct.

138 (*c*) The statement in option (c) is incorrect and can be corrected as

Ovaries produce several steroid hormones and the female gamete (ovum).

139 (*b*) The statements II, III and IV are correct.

Statements I and V are incorrect and can be corrected as

- The uterus is single and is also called womb.
- Perimetrium of uterus is external and thin, myometrium is the middle thick layer of smooth muscles and endometrium is the inner glandular layer.

140 (*d*) Statements II, III, IV and V are correct.

Statement I is incorrect and can be corrected as

Spermatogonia are diploid and spermatids are haploid.

141 (*b*) Statement I is incorrect and can be corrected as

Each testis has about 250 compartments called testicular lobules.

Rest of the statements are correct.

143 (*c*) Statement in option (c) represents the false statement for uterus. It can be corrected as

It opens into vagina through a narrow cervix. The cavity of the cervix is called cervical canal.

Rest of the statements are correct for uterus.

144 (*a*) Statement in option (a) is incorrect and can be corrected as

Viability of a sperm means the capability of a sperm, fertilising an egg. Sperms are viable for 24 hrs-48 hrs, whereas the ovum is viable for only 24 hrs.

Rest of the statements are correct.

145 (*c*) Statement in option (c) represents the incorrect statement for oogonia and can be corrected as

Formation of millions of oogonia is initiated during the embryonic development stage within each foetal ovary, no more oogonia are formed and added after birth.

Rest of the statements are correct.

146 (*b*) Statement in option (b) represents the incorrect statement. It can be corrected as

The secretion of gonadotropins (LH and FSH) increases gradually during the follicular phase and stimulates follicular development as well as secretions of oestrogens by growing follicles.

Rest of the statements are correct

149 (*c*) Statement in option (c) is correct. Rest of the statements are incorrect and can be corrected as

- High levels of FSH and LH stimulates ovulation (not the thickening of endometrium or implantation of the embryo).
- High levels of oestrogen stimulates the thickening of the endometrium.

150 (*a*) The statements I and III are true, but II is false. Statement II can be corrected as

Vas deferens joins a duct from seminal vesicle to form ejaculatory duct.

152 (*b*) Statements II and IV are correct. Statements I and III are incorrect and can be corrected as

- Cleavage divisions bring about considerable decrease in the mass of protoplasm.
- Blastomeres arrange themselves to form inner cell mass and trophoblast.

155 (*c*) Only statement I is correct regarding male pronucleus. Others statements are incorrect and can be corrected as

- Only the head of the sperm contributes towards pronucleus formation.
- Male pronucleus lacks mitochondria.
- Sperm head contains pronucleus having haploid set of chromosomes.

156 (*b*) Statement I is the only incorrect statement. It can be corrected as

D–Ovary produces oestrogen required for the development of secondary sexual characters in females.

Rest of the statements are correct.

168 (*a*) LH and FSH regulate the process of spermatogenesis. FSH acts on Sertoli cells whereas LH acts on Leydig cells.

169 (*c*) Statements II and III and true. Statements I and IV are false and can be corrected as

- Androgens are produced by Leydig's cells.
- Oogenesis takes place in the ovary.

170 (*c*) Identical twins are produced from a single egg (fertilised by single sperm) by the separation of early blastomeres resulting from first zygotic cleavage. They have same the genetic makeup.

171 (*c*) Dogs and rodents are polyovulatory species. In these animals, more than one ovum is released from ovary at the time of ovulation. Hence, six eggs were released by the ovary of a female dog produce six puppies.

172 (*d*) Isthmus is the odd one out of the given options as it is a part of the Fallopian tube (of the female reproductive system). Rest of the options, i.e. rete testis, epididymis and vasa efferentia are a part of the male reproductive system.

173 (*b*) The vas deferens joins a duct from the seminal vesicle and opens into the urethra as the ejaculatory duct. These ducts store and transport the sperms.

174 (*c*) The urethra originates from the urinary bladder and extends through the penis to its external opening called urethral meatus. In other words, it is the external opening of the urinogenital duct.

175 (*b*) Seminal vesicles, prostate and the bulbourethral glands are the male accessory glands whose secretions constitute the seminal plasma (semen).

Urethra does not secrete semen. The transport of sperms from the testis to the outside occurs through urethra.

176 (*b*) Mammary gland is a part of female reproductive system. Rest are the male accessory glands.

177 (*b*) In humans, the menstrual cycle lasts for about 28/29 days. During 11–17 days of the menstrual cycle a mature Graafian follicle is seen in healthy human female.

179 (*a*) Binding of the sperm head to a receptor molecule on the zona pellucida layer of the ova induces the acrosome of the sperm to release its hydrolytic enzymes.

180 (*d*) Placenta acts as an endocrine tissue and produces several hormones like human chorionic gonadotropin, oestrogen, progesterone, etc. LH is produced by the anterior lobe of the pituitary gland.

181 (*a*) The embryo with 8-16 blastomeres is called a morula. It is an embryonic developmental stage between the zygote and the blastocyst.

183 (*b*) Statement in option (b) is incorrect and can be corrected as

Colostrum contains several antibodies which are absoutely essential to develop immunity in newborns.

Rest of the statements are correct.

184 (*d*) Option (d) represents the correct statement. Other statements are incorrect and can be corrected as

- Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge.
- Oogenesis is initiated during the early embryonal stage when million of gamete mother cells (oogonia) are formed within each foetal ovary, no more oogonia are formed and added after birth.
- Sperms released from epididymis are highly motile.

185 (*c*) Option (c) contains the correct statement. Rest of the statements are incorrect and can be corrected as

- Spermatogonia are diploid cells present on the inside wall of seminiferous tubules that multiply by mitotic divisions.
- Primary spermatocyte undergo meiosis-I to give rise to secondary spermatocytes (haploid).
- Each secondary spermatocyte has 23 chromosomes and undergoes meiosis-II to gives rise to two haploid spermatids which are transferred to spermatozoa by spermiogensis.

188 (*a*) The outermost membranous cover of the ovum at ovulation is corona radiata. It is formed by follicular cells. Inner to corona radiata is zona pellucida, which is made up of three different glycoproteins secreted by the ovum itself.

189 (*a*) Labia minora are paired folds of tissues under labia majora which in turn surrounds the vaginal opening. It is a part of the external genitalia of the female reproductive system.

Fimbriae, infundibulum and isthmus along with ampulla are parts of oviduct (Fallopian tube).