

Reproductive System

Both male & female produce reproductive germ cells known as gametes.

Male \Rightarrow sperm

Female \Rightarrow ovum

Female Reproductive System

Female reproductive system is divided into 2 parts

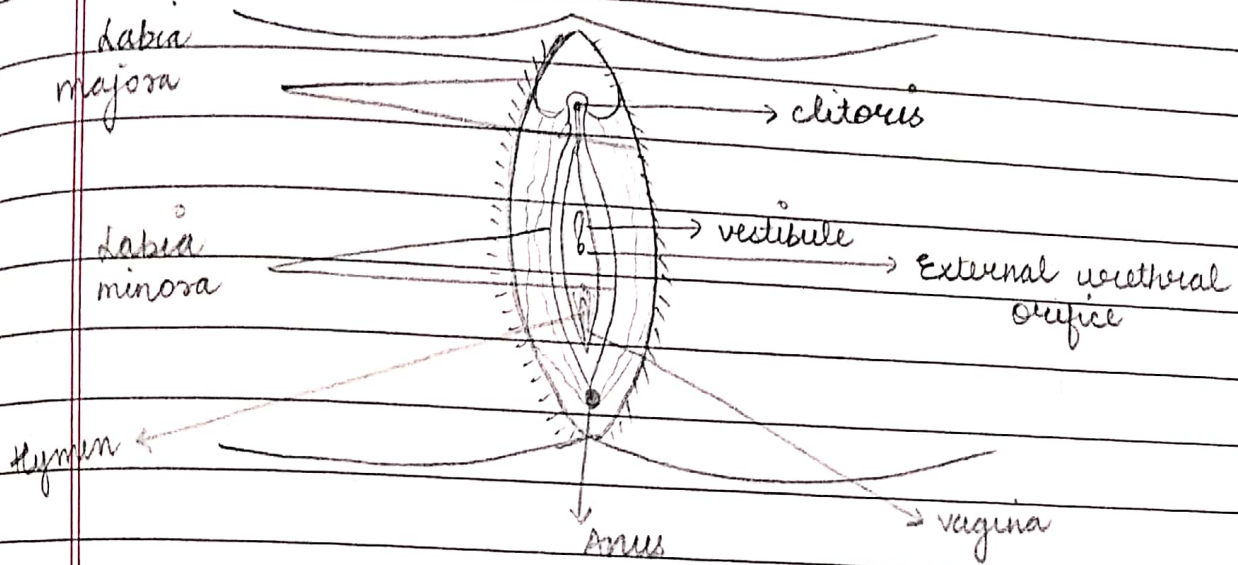
①. External :-

- Labia majora
- Labia minora
- Clitoris
- Hymen
- Vestibules
- vestibule glands (Bartholin's glands).

②. Internal :-

- Vagina
- Uterus
- two uterine tube
- two ovaries

①. EXTERNAL :



a) ⇒ Labia majora ⇒ These are two large folds forming boundary of external vulva. It is composed of skin, fibre tissue & sebaceous gland.

Function ⇒ Anteriorly, the folds joins in front of anus.

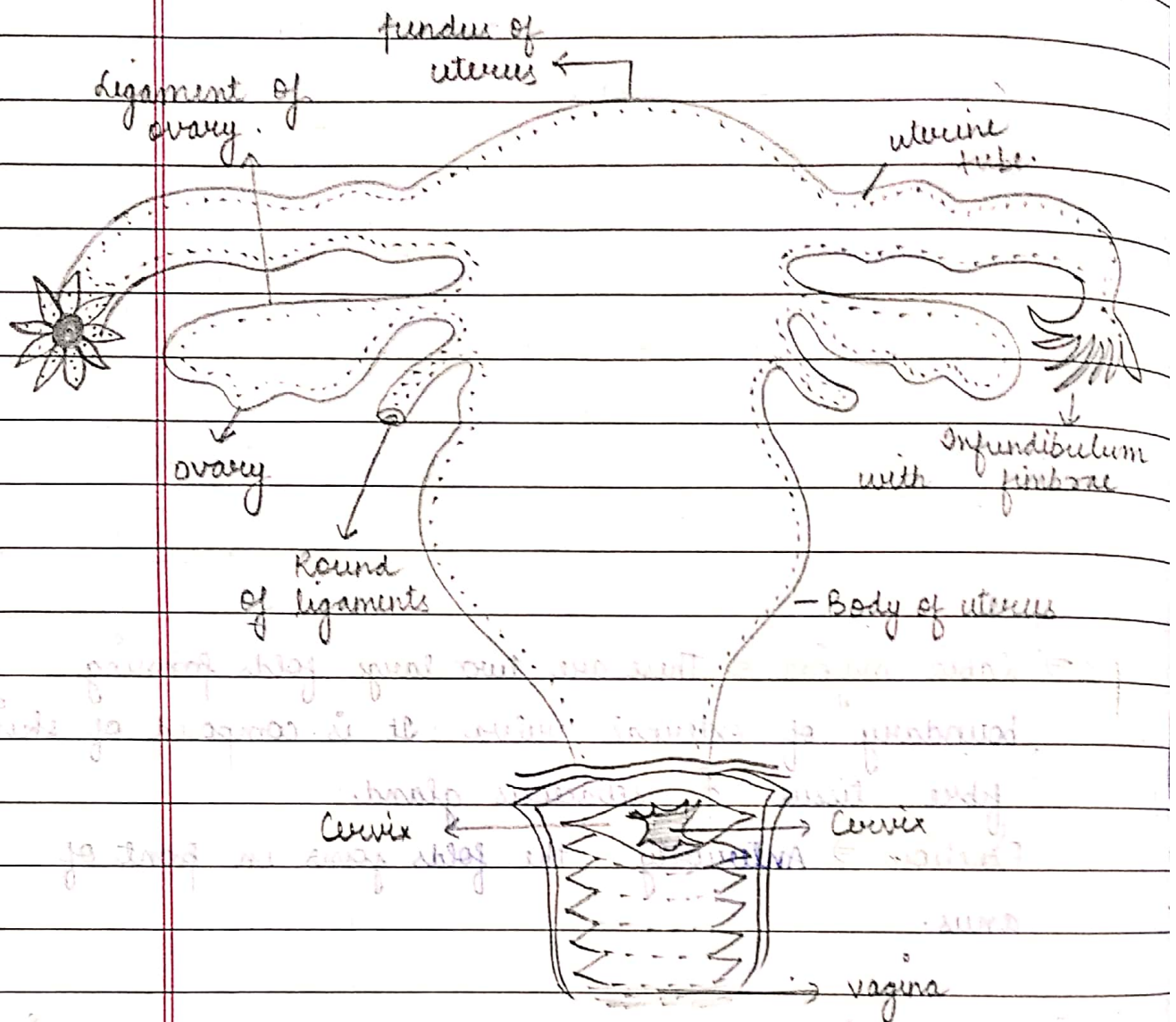
b) Labia minora ⇒ There are two small folds b/w labia majora.

c) Clitoris ⇒ It is same as penis in male. It contains sensory nerve endings & erectile tissues. It has no reproductive significance.

d) Hymen ⇒ It is thin layer of mucous membrane. It is partially the opening of vagina.

e) Vestibular glands ⇒ situated on each side of vagina. They have opening in vestibule. They secrete mucous.

②. INTERNAL :-



①. Vagina \Rightarrow It is the fibro-muscular tube & this tube is lined with ^{stratified} squamous epithelium. Vagina has

3 layers -

(i) outer layer

(ii) middle layer

(iii) inner layer

(i) outer layer \Rightarrow is formed up of connective tissue

(ii) middle layer \Rightarrow is formed up of smooth muscles

(iii) inner layer \Rightarrow is formed up of stratified squamous epithelium.

Functions \Rightarrow acts as receptive penis during intercourse & elastic passage way through which baby expels out during child birth.

(b) Uterus \Rightarrow It is hollow muscular organ. It lies in b/w urinary bladder & rectum. Uterus is divided into three parts.

(i) Fundus \Rightarrow It is a dome shaped part above the opening of uterine tube.

(ii) Body \Rightarrow Body is the main part of uterus.

(iii) Cervix \Rightarrow Cervix is neck of uterus.

Imp. Structure of Uterus \Rightarrow

Uterus has 3 layers -

(1) Perimetrium \Rightarrow It extends over the fundus & body & over the upper surface of urinary bladder. This fold of perimetrium forms vestibular pouch.

(2) Myometrium \Rightarrow It is a layer of tissue in the uterine bones.

(3) Endometrium \Rightarrow composed of epithelium containing a no. of mucous cells.

(c) Uterine Tube \Rightarrow It is about 10cm long & extends from uterus. They lie in the upper border of ligament & each tube has finger like structure.

Function \Rightarrow movement of ovum from ovary to uterus by peristalsis (wave like motion).

Fertilised ovum occurring uterine tube.

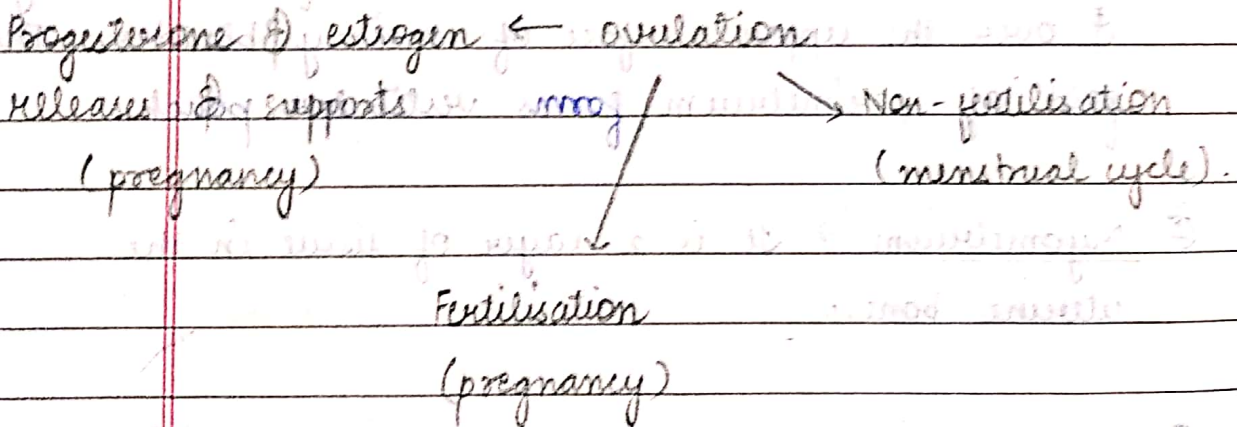
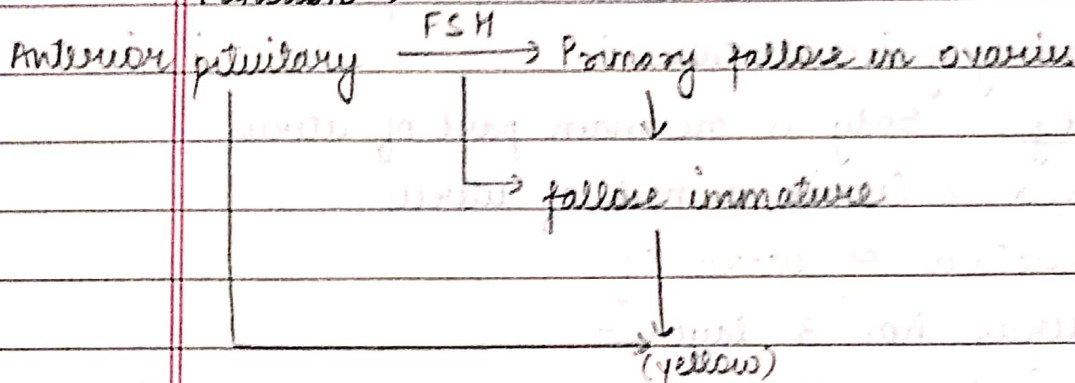
(d) Ovary \Rightarrow Ovary has two layers -

(i) Medulla \Rightarrow This layer lies in centre & consists of fibrous tissues & blood vessels.

(ii) Cortex \Rightarrow

Ovary are present in female from birth

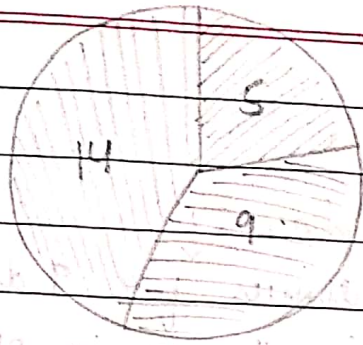
Function \Rightarrow



Menstruation Cycle -

It is the cycle of flow of blood which shades endometrium from the uterus of females.

Steps of menstruation -



1. Menstruation phase \Rightarrow 4 days
2. Proliferative phase \Rightarrow 15-20 days
3. Secretory phase \Rightarrow 20-28 days.

1. Menstruation phase \downarrow

This phase continues for 5 days & the secretion of blood from vagina.

FSH stimulates ovary.



Ovary secretes oestrogen



Follicle secretes more oestrogen



Ovulation



Corpus luteum forms (high level of oestrogen & progesterone).

\downarrow
Fertilisation (+ve)

\downarrow
Fertilisation (-ve).



Corpus luteum matures



Recession of Corpus luteum



High level of progesterone & oestrogens occurs pregnancy



Menstruation

↓ Decidua forms

2. Proliferative phase : ↓

- This phase continues for 9 days after menstruation phase in which the repair of shed endometrium occurs.
- In this phase the ovary is prepared & the ovum is developed in ovary.
- By the oestrogen hormone, ovulation occurs & corpus luteum forms.

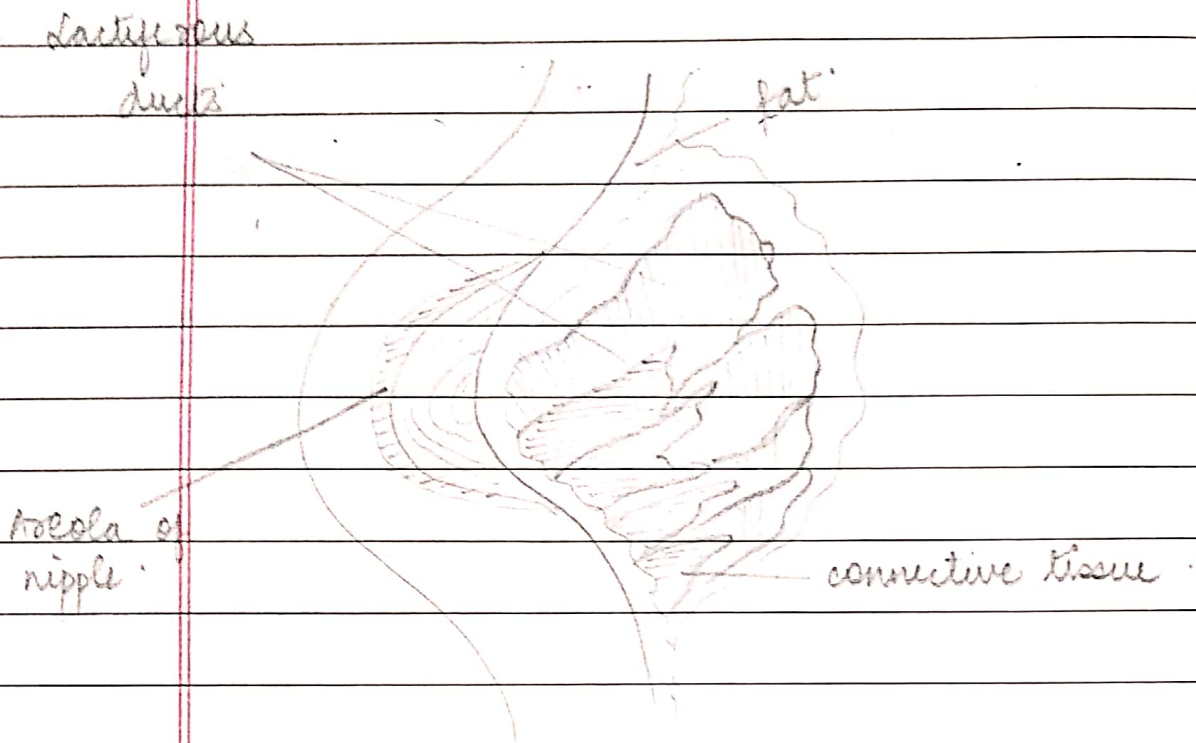
3. Secretory phase : ↓

The phase continues for next 14 days.

During this phase, after repairing of endometrium, preparation of ovary to accept fertilised ovum & the secretion of progesterone initiates & pregnancy occurs.

Then, during pregnancy the secretion of progesterone stops & after sometime endometrium breaks & menstrual cycle starts.

Mammary Glands -



- ⇒ The mammary glands or breast consists of varying amount of glandular tissue responsible for milk production. It is supported by fatty tissues & fibrous connective tissue.
- ⇒ Each breast contains 20 lobes. Each of which contains a no. of glandular tissue where milk is produced is called lobules.
- ⇒ Lobules open into lactiferous duct which drain milk towards the nipples.
- ⇒ Breast itself covered in subcutaneous fat.

Function:-

In females, the breast is immature until puberty. Thereafter, they develop under the influence of estrogen & progesterone. During

pregnancy hormones stimulates. After baby is born the hormone prolactin from the anterior pituitary gland stimulates the production of milk.

Male Reproductive System-

Fig-?

1. Scrotum \Rightarrow Pouch of deeply pigmented skin, fibrous tissues, connective tissue & muscles. It consists of peritonium; divided into two compartments, each of which contains one testis, epididymis, it lies in front of upper part of thigh & behind the penis.

Function of scrotum \Rightarrow Scrotum produces the male sex hormone - testosterone.

• The function of scrotum is to hold the testis & help in regulation of temperature.

2. Testis \Rightarrow They are reproductive glands of male about 4.5 cm long, 2.5 cm wide, 3 cm thick & surrounded by 3 layers of tissues -

(a) tunica vaginalis \Rightarrow A double membrane forming outer covering of testis.

(b) tunica albuginea \Rightarrow This is the fibrous covering.

(c) tunica vasculosa \Rightarrow consists of connective tissue.
Structure \Rightarrow In each testis there are 200-300 lobules.

• In each lobule, there are 1-4 convoluted loops.

Functions \Rightarrow Sperms are produced in the seminiferous tubules of testis.

3. Spermatic cords \Rightarrow They suspend the testis in the scrotum.

• Each cord contains a testicular artery, vein.

4. Deferent ducts \Rightarrow 45 cm long.
 • Passes upwards from testis & extend towards bladder where seminal vesicle joins it to form ejaculatory duct.

5. Seminal vesicles \Rightarrow Two small fibro-muscular pouch lined with columnar epithelium on posterior wall of bladder
 Functions :-

• Seminal vesicles contract & seminal fluid ejaculat

6. Ejaculatory Duct \Rightarrow Two tubes about 2 cm long from a seminal vesicle & a deferent duct.

• They pass through prostate glands.

• It carry seminal fluid to urethra.

7. Prostate gland \Rightarrow Lies in front of rectum.

• It consists of outer fibrous covering & layer of smooth muscles.

Functions \Rightarrow secretion of thin milky fluid that makes about 30% of semen & gives it a milky appearance.

• Contains a clotting enzyme which thickens the semen.

8. Urethra \Rightarrow Urethra runs through the corpus spongiosum. & provides a common pathway for flow of urine & semen.

- About 19-20 cm long & consists of 3 parts -
 - (a) Prostatic urethra
 - (b) Membranous urethra
 - (c) penial urethra

9. Penis \Rightarrow Penis has a root & a body.

- Root lies in perineum & body surrounds the urethra.

- Penis is formed by 3 cylindrical mass of erectile tissue & smooth muscles.

- Penis is made up of several parts -

(a) Glans (head of penis) \Rightarrow In man, glans is covered with pink moist tissue known as mucosa.

(b) Corpus cavernosum \Rightarrow Two columns of tissue running along the sides of penis. Blood fills this tissue to cause an erection.

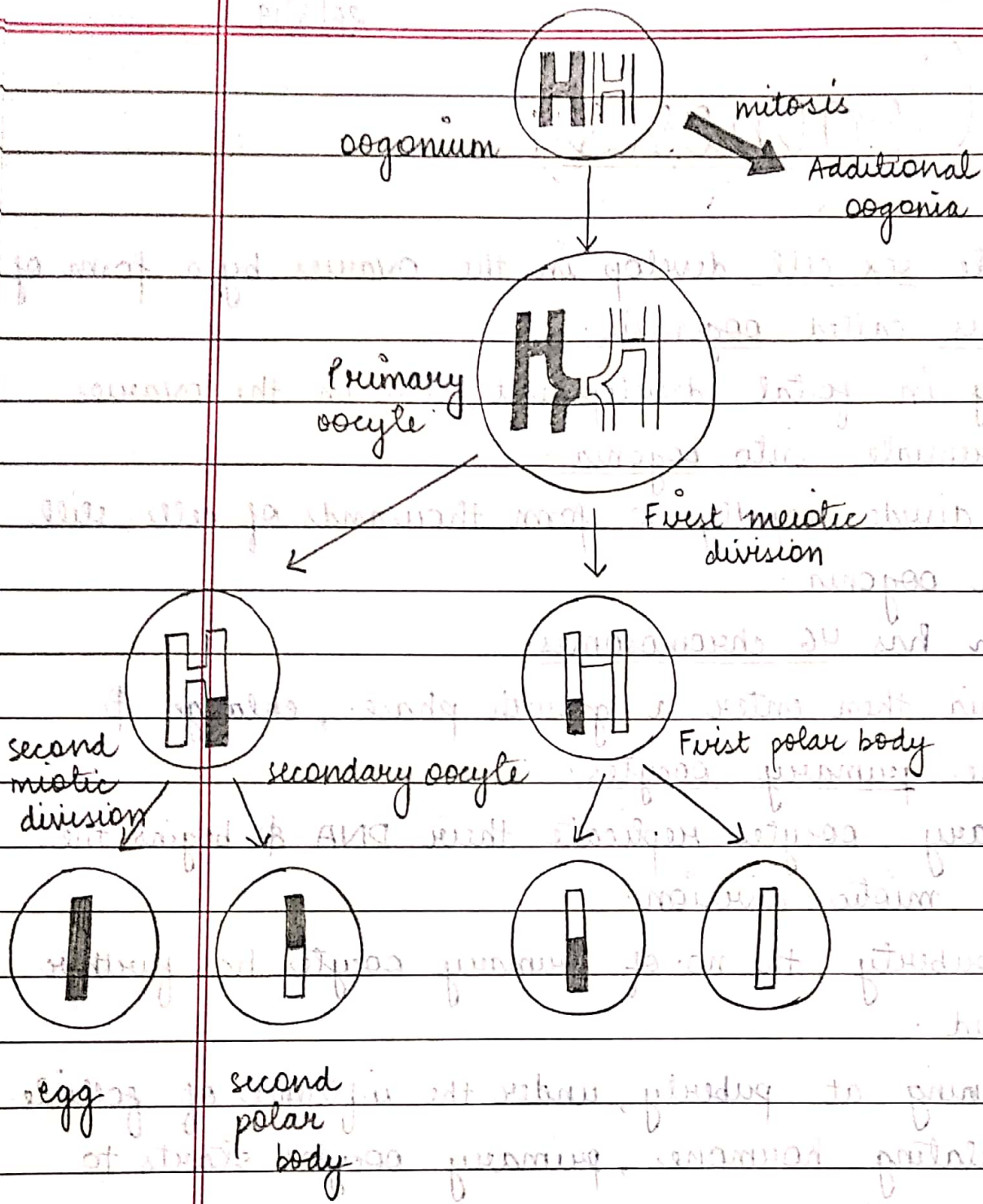
(c) Corpus spongiosum \Rightarrow A column of sponge like tissue along the front of the penis & ending at the glans.

Functions :-

- \Rightarrow Urination
- \Rightarrow Sexuality
- \Rightarrow Reproduction

Oogenesis

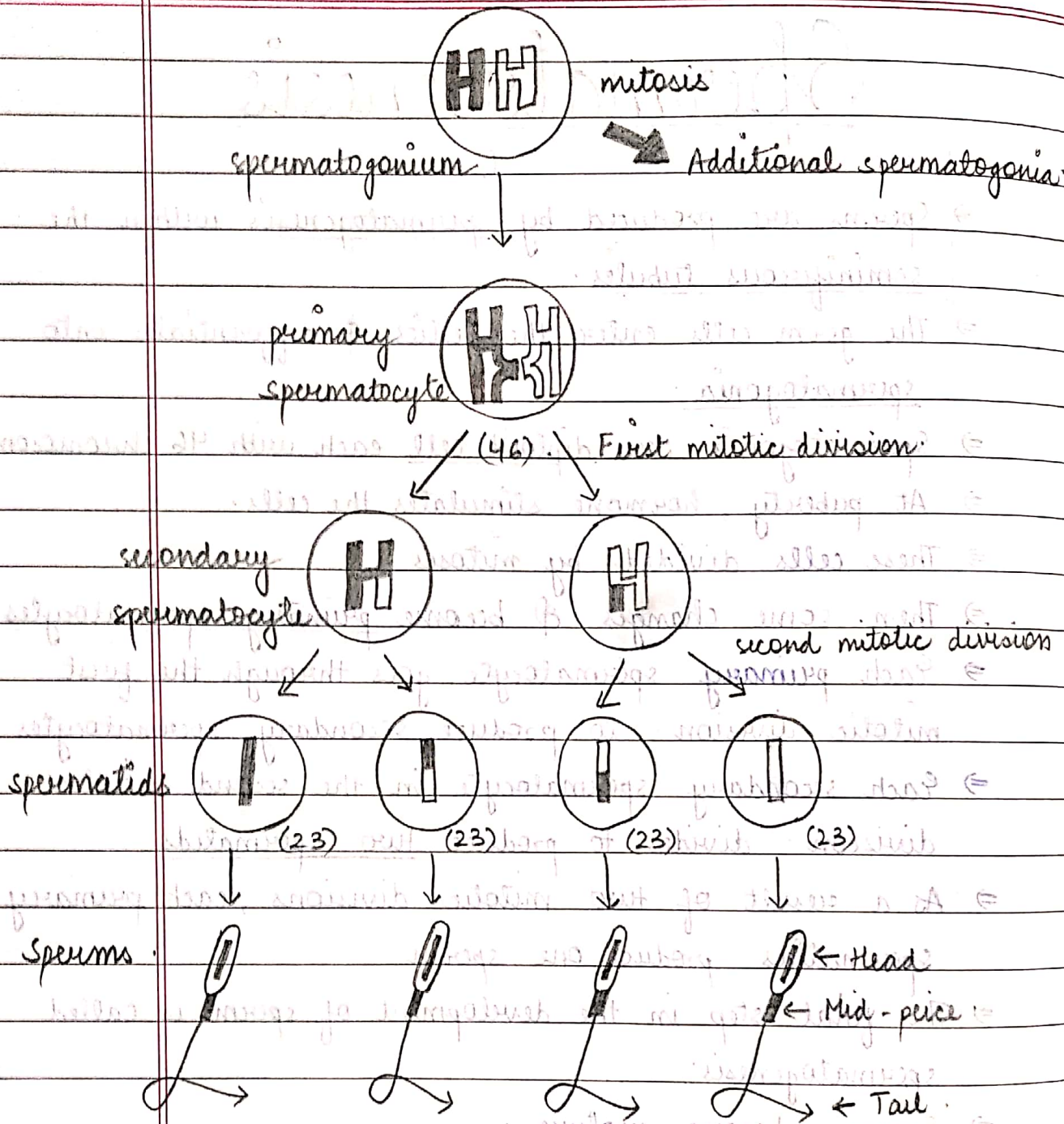
- ⇒ Female sex cells develop in the ovaries by a form of meiosis called oogenesis.
- ⇒ Early in fetal development, cells in the ovaries differentiate into oogonia.
- ⇒ These divide rapidly to form thousands of cells, still called oogonia.
- ⇒ which has 46 chromosomes.
- ⇒ Oogonia then enter a growth phase, enlarge & become primary oocytes.
- ⇒ Primary oocytes replicate their DNA & begins the first mitotic division.
- ⇒ By puberty, the no. of primary oocytes has further declined.
- ⇒ Beginning at puberty, under the influence of follicle stimulating hormone, primary oocytes starts to grow again each month.
- ⇒ Secondary oocytes begins the second mitotic division but the process stop in metaphase.
- ⇒ At this point ovulation occurs.



PROCESS OF OOGENESIS

Spermatogenesis

- ⇒ Sperms are produced by spermatogenesis within the seminiferous tubules.
- ⇒ The germ cells enter the testis & differentiate into spermatogonia.
- ⇒ Spermatogonia are diploid cell each with 46 chromosomes.
- ⇒ At puberty, hormone stimulates the cells.
- ⇒ These cells divided by mitosis.
- ⇒ Then some changes & become primary spermatocytes.
- ⇒ Each primary spermatocyte goes through the first mitotic division to produce secondary spermatocytes.
- ⇒ Each secondary spermatocyte in the second mitotic division divides to produce two spermatids.
- ⇒ As a result of two mitotic divisions, each primary spermatids produce one sperm.
- ⇒ The final step in the development of sperm is called spermatogenesis.
- ⇒ Sperms become mature.



SPERMATOGENESIS.

→ Diploid - Each chromosome is one of a pair, one inherited from the mother and one from the father, so the human cell has 46 chromosomes that can be arranged as 23 pairs.

→ A cell with 23 pair of chromosomes is termed diploid.

Haploid - Gametes (spermatozoa and ova), with only half of the normal complement i.e. 23 chromosomes instead of 46, are described as haploid.

→ Chromosomes belonging to the same pair are called homologous chromosomes.

→ The complete set of chromosomes from a cell is its karyotype.

→ First 22 pairs are collectively known as autosomes.
23 pair - are called sex chromosomes

→ Gonads - testes in males and ovaries in females. —
Produce gametes and secrete ~~sex~~ sex hormones.

→ Gynecology:- is the specialized branch of medicine
(Gynecologist) concerned with the diagnosis and treatment
of disease of the female reproductive system.

Urology - is the study of the Urinary system.

(Urologists)

Andrology:- The branch of medicine that deals with
(Andrologists) male disorders, especially infertility and
sexual dysfunction.

1. Menstrual Phase :- (about 4 days)

When the ovum is not fertilised the corpus luteum starts to degenerate.

Progesterone and oestrogen level falls and the functional layer of endometrium which is dependent on high level of these ovarian hormones.

The menstrual flow consist of the secretion from the endometrial glands, endometrial cells, blood & from broken-down capillaries, unfertilised ovum.

High circulated level of ^{ovarian} progesterone & oestrogen inhibit the anterior pituitary and blocking the release of FSH & LH & should pregnancy occur then increasing oestrogen & progesterone level prevent the menstrual & release of another ovum after degeneration of the corpus luteum.

2. Proliferative phase - (about 10 days)

At this stage an ovarian follicle stimulated by FSH, is growing towards maturity & is producing oestrogen which stimulate proliferation of functional layer of the endometrium in preparation for the reception of a fertilised ovum.

This phase ends when ovulation occurs & oestrogen producing by the follicle declines.

3. Secretory Phase - about 14 days

Immediately after ovulation, the cells lining the ovarian follicle are stimulated by LH and develop into the corpus luteum which produce progesterone & oestrogen.

Under the influence of progesterone the endometrium becomes oedematous and the secretory glands.

The ovum may survive in a fertilisable form for a very short time after ovulation probably as little as 8 hrs.

The spermatozoa deposited in the vagina may be capable of fertilising the ovum for 24 hr.

This means that the period in each cycle during which fertilisation can occur is relatively short.

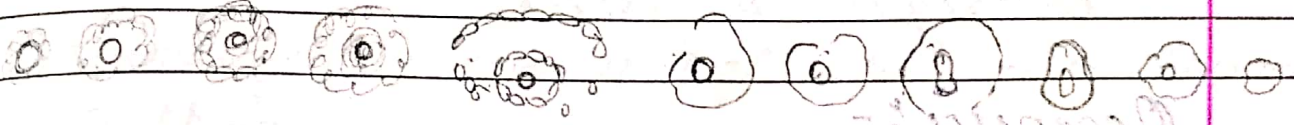
If the ovum is not fertilised mature menstruation occurs & a new cycle begins.

If the ovum is fertilised there is no breakdown of the endometrium & no menstruation.

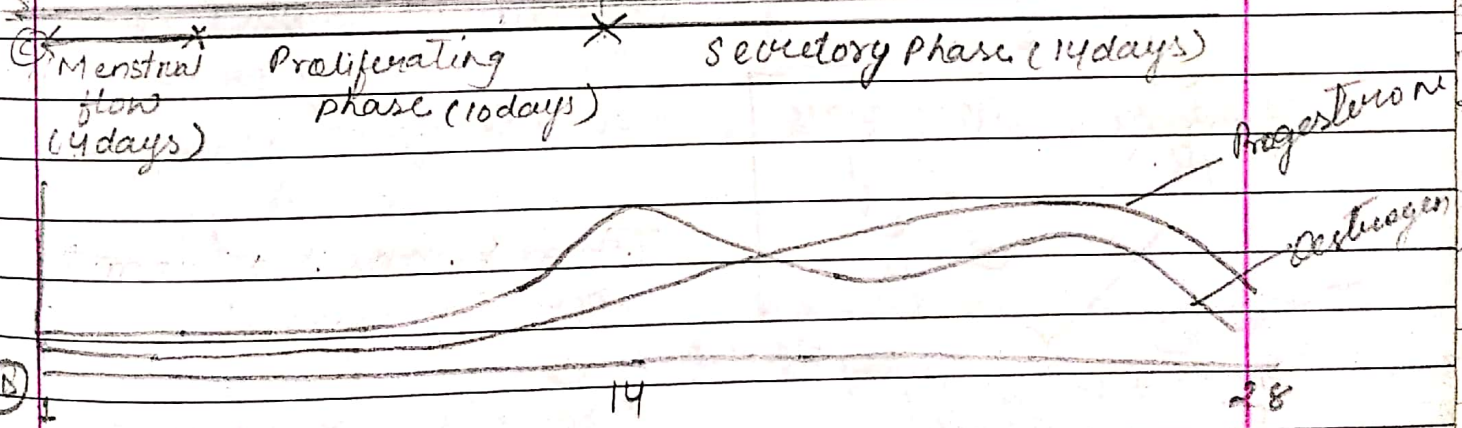
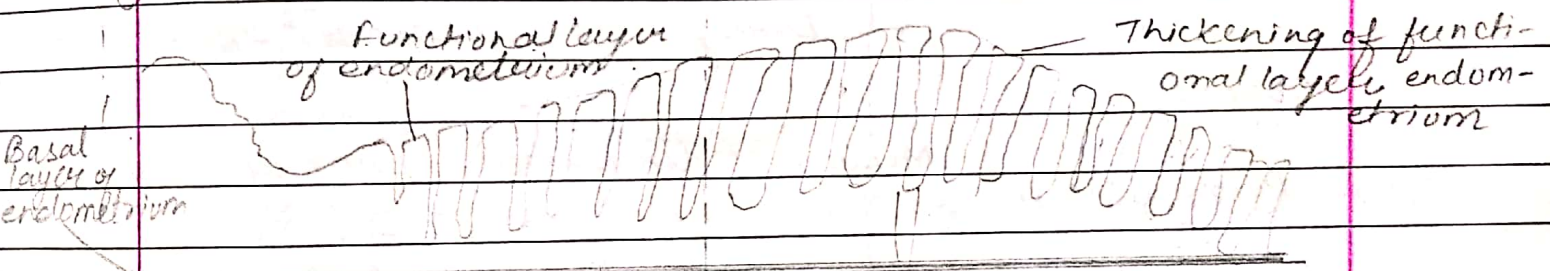
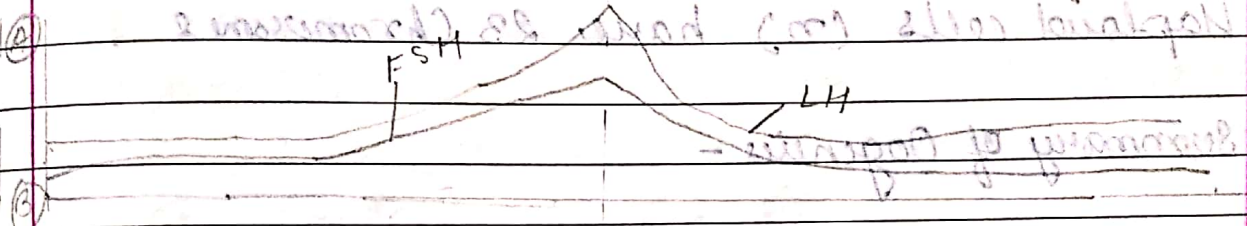
The fertilised ovum (zygote) travels through the uterine tube to the uterus.

During this time the placenta develops & produces estrogen, progesterone & gonadotropins.

New ovarian follicle containing developing ovum
 Corpus luteum
 Degeneration of corpus luteum



ovarian follicle secreting oestrogen
 ovulation
 corpus luteum secreting progesterone



A Summary of female menstrual cycle

- (A) - ovarian cycle: -
 Maturation of follicle & development of corpus luteum.
- (B) - Anterior pituitary cycle: -
 For the level of LH & FSH

- (A) Uterine cycle :-
menstrual, proliferative & secretory phase.
- (B) Ovarian hormone cycle :-
Oestrogen & progesterone.

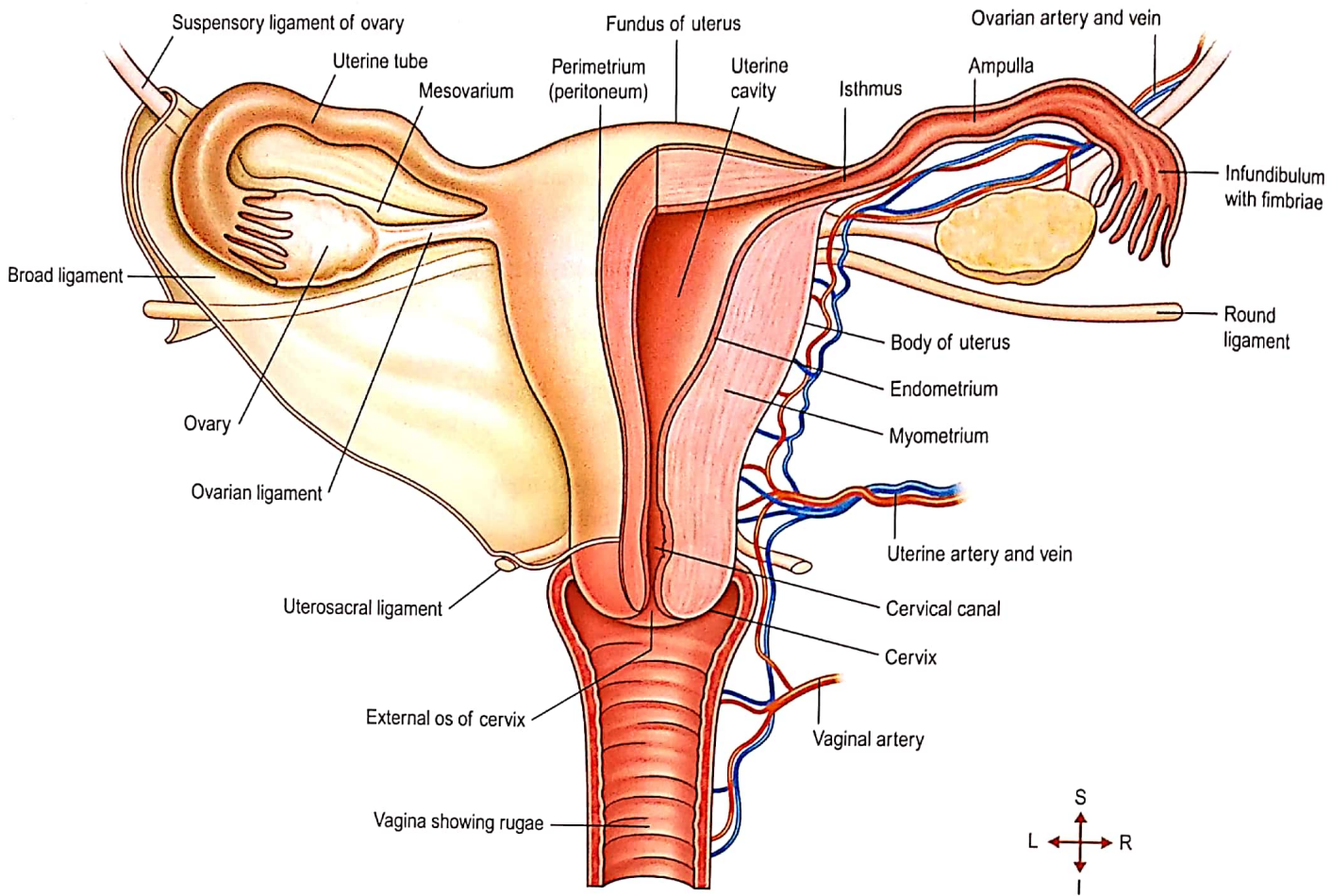
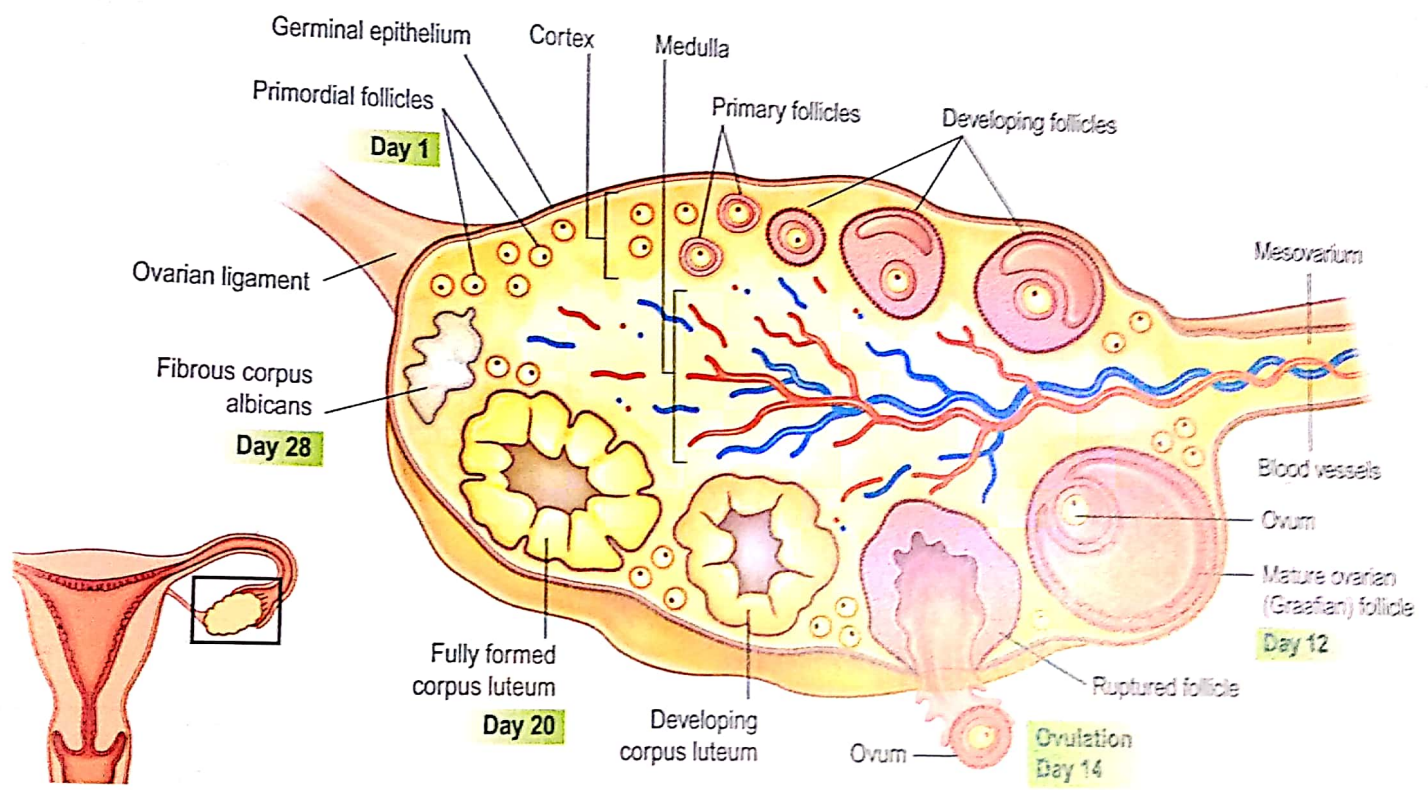


Figure 18.4 The female reproductive organs in the pelvis.

protruding into its proximal end. It runs obliquely upwards



18.7 A section of an ovary showing the stages of development of one ovarian follicle.

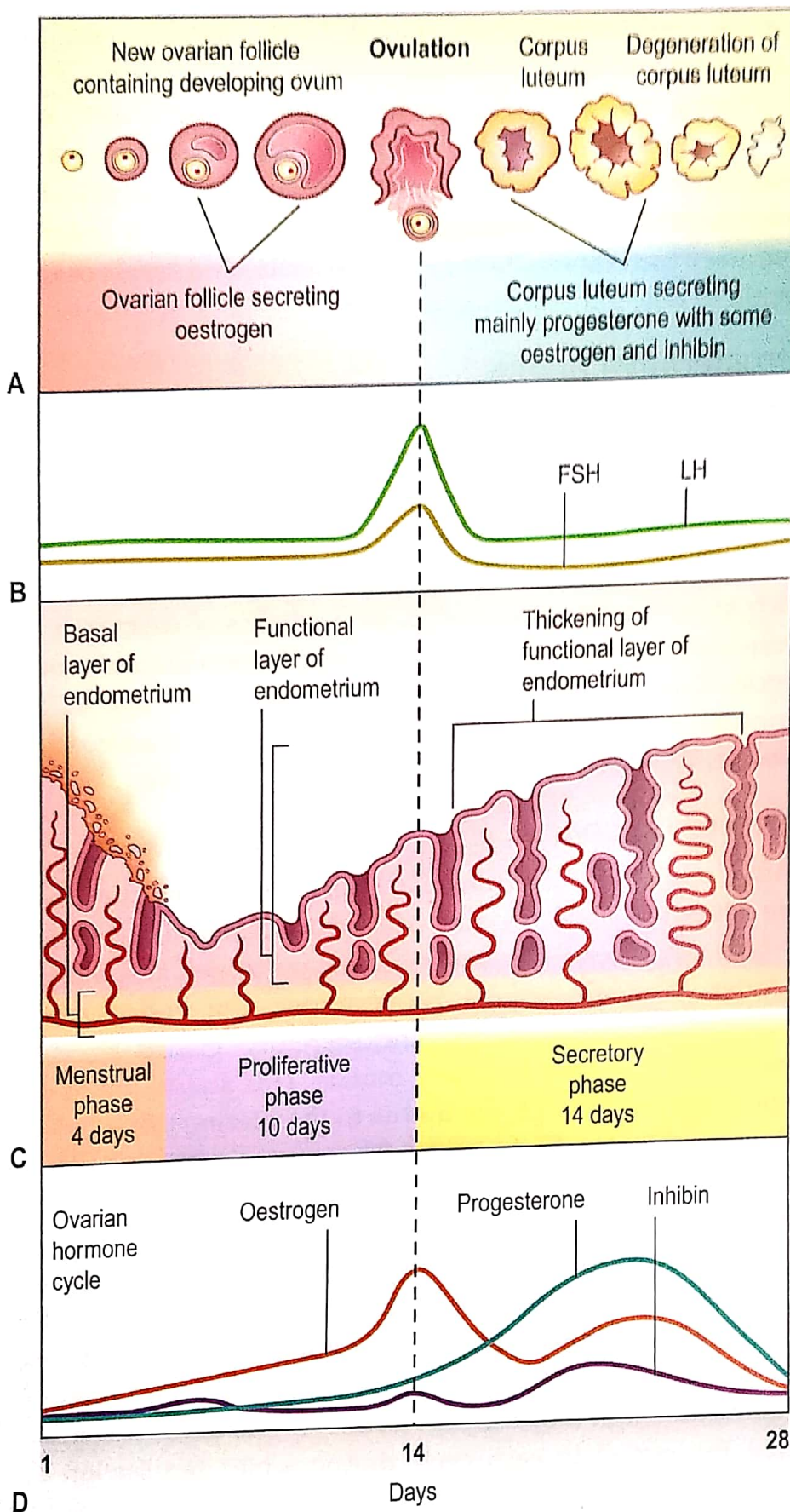


Figure 18.10 Summary of one female reproductive cycle. (A) Ovarian cycle: maturation of follicle and development of corpus luteum. (B) Anterior pituitary cycle: luteinising hormone (LH) and follicle stimulating hormone (FSH) levels. (C) Uterine cycle: menstrual, proliferative and secretory phases. (D) Ovarian hormone cycle: oestrogen, progesterone and inhibin levels.

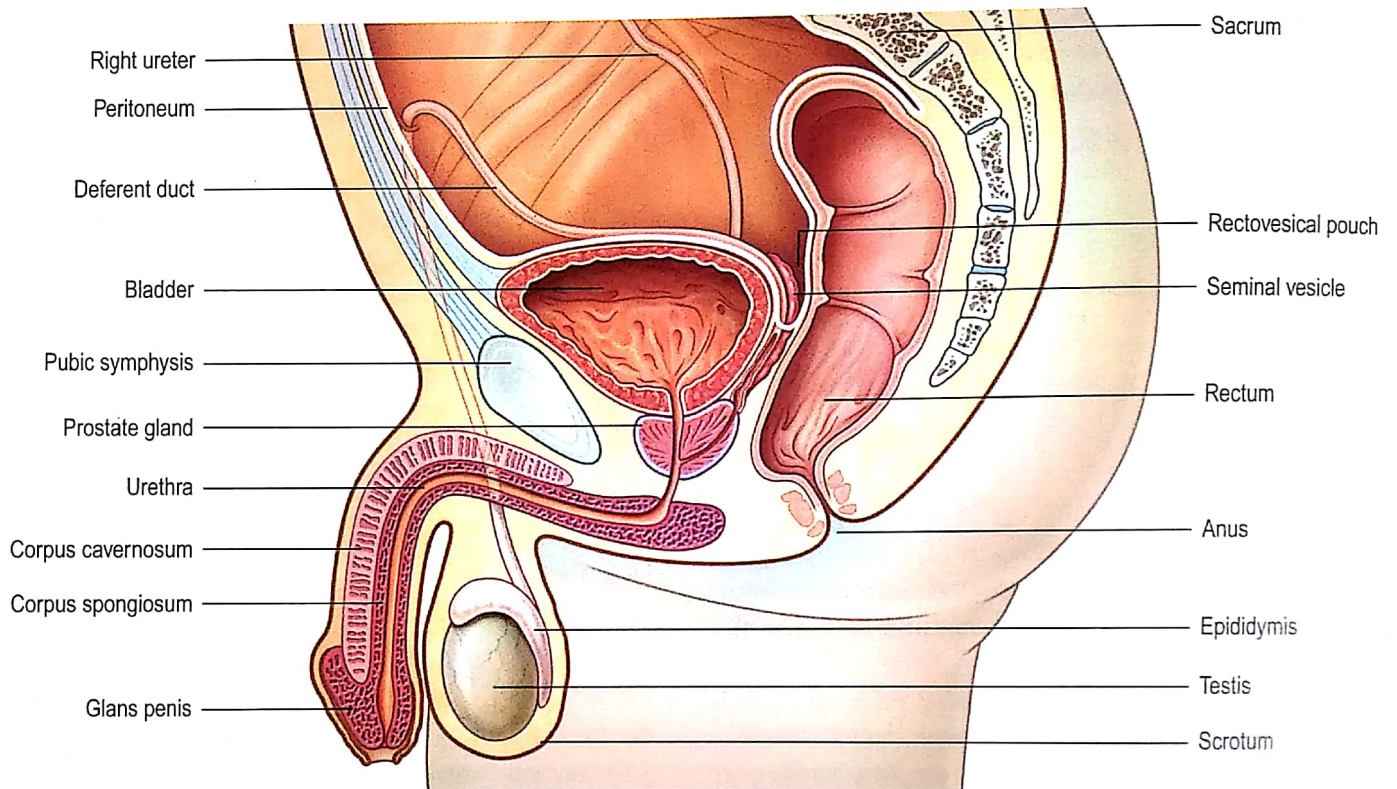


Figure 18.13 The male reproductive organs and their associated structures.