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# CONCEPT TUTORIALS



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## Ch-3 HUMAN REPRODUCTION

Codes

Reproduction :- The ability of living organisms to produce a new generation of living organisms similar to themselves.

Types of Reproduction :- Reproduction is of two types

(i) Asexual (ii) Sexual

Gametes :- The reproductive units in sexual reproduction are specialised cells called gametes. Gametes are of two types :- (i) In male, they are called spermatogonia

(ii) In female, they are called ova or egg.

Spermatogenesis :- The formation of sperms in males

is called spermatogenesis.

Oogenesis :- The formation of egg from ovaries in females is called oogenesis.

### HUMAN REPRODUCTIVE SYSTEM

Male reproductive System      Female reproductive system

Male Reproductive System :- It consists of a scrotum, a pair of testes, a pair of epididymis, a pair of ejaculatory ducts, a urethra, a penis and certain glands.

1. Scrotum:- The scrotum is a pouch of skin and hangs between the legs. Scrotum is filled with a fluid called hydrocoel. Scrotum is divided into right and left sacs by septum. Scrotal Testes are suspended in the scrotal sac by spermatic

Inguinal hernia :- Tearing of inguinal tissue by sac. Sac may lead to bulging out of test of intestine into the scrotum is called inguinal hernia.

Scrotum acts as thermoregulator :- It containing the testes at a temp.  $2^{\circ}\text{C}$  to  $3.5^{\circ}\text{C}$  lower than that of the body. Thus protects the sperms against high body temp.

Testes :- These are soft, smooth, pinkish, oval organs. Testes has two layers, tunica albuginea

(i) Tunica vaginalis.

The inner layer, Tunica albuginea divides the testes into 200-300 lobules. These lobules are called testicular lobules. Each testicular lobule contains 1-4 seminiferous tubules. The ends of the seminiferous tubules joined to form short straight tubules called tubuli recti. The tube of recti opens into Rete testis.

Seminiferous Tubules :- Small groups of large, polygonal cells, termed interstitial or Leydig's cells present between the seminiferous tubules. Leydig's Sertoli cells or nurse cells are also present in seminiferous tubules.

Function of Leydig's cells :- They secrete Androgen, the male sex hormone (testosterone) into the blood.

Functions of Sertoli cells / nurse cells :- (i) They provide nourishment to the developing spermatogonia. (ii) Sertoli cells secrete ABP (Androgen Binding Protein)

(iii) Sertoli cells also secrete inhibin protein which

suppresses FSH secretion and thus plays a role in the regulation of spermatogenesis.

(3) Vasa Effervescentia :- These are fine and vary from 15 - 20 in number. These are fine and coiled and carry spermatoga from testis and pass to Caput epididymides.

(4) Epididymis :- It is a long tube, greatly coiled. It shows three regions (1) Caput epididymis (head) (2) Body (Corpus epididymis) (3) Tail (Cauda epididymis). From here, spermatoga passes into vasa deferens.

(5) Vasa Deferentia :- It arise from Cauda epididymis. They are only 2 in number. It is slightly larger and carry spermatozoa from Cauda epididymis to ejaculatory ducts.

(6) Ejaculatory Ducts :- These are thin tubes, pass through the prostate gland and open into the urethra.

(7) Urethra :- It is the urinary duct leading from the bladder. It also receives secretions of the prostate and coagulating glands. Urethra is long and passes through the penis. Urethra has 3 regions :-

(1) Prostatic urethra  
(2) Membranous urethra  
(3) Penile urethra

(8) Penis :- Penis is also called urogenital tract. Because in male, sperm and urine passes out from penis. Penis contains 3 columns of spongy tissue :- (1) 2 corpora cavernosa

(2) Corpus spongiosum  
Tip of the penis is very sensitive, and is called glans penis. It is covered by foreskin.

### Accessory Sex Glands of Male

These include Seminal vesicle, a prostate gland and a pair of Coopers' glands.

Seminal Vesicles :- These are located near the ampulla of the vasa deferentia. They do not store sperms. They contribute yellowish, slightly alkaline, fluid that contains fructose and coagulating enzyme, Ascorbic acid and a hormone prostaglandin. Fructose provides energy to sperms for swimming. Prostaglandins stimulate contractions in the female reproductive tract.

Prostate Gland :- This gland surrounds the first portion of the urethra. It secretes a thin, milky, slightly acidic fluid. This fluid nourishes and activates the spermatozoa to swim.

Cooper's Glands :- This gland lies below the prostate gland. They are about the size of pea seeds. They secrete alkaline mucus, which serves to neutralize any acidic urine remaining in the urethra.

SEmen :- The secretions of accessory sex glands and mucus are added to the sperm to form Seminal fluid / Semen / Seminal plasma.

Functions of Semen :-

- 1) It is rich in fructose, calcium and certain enzymes.
- 2) They provide fluid medium to sperms.
- 3) They nourish and activate the sperms.
- 4) They neutralize the acidity of urine.
- 5) They facilitate the sexual act by lubricating the reproductive tract of the female.

## Hormonal Control of Male

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→ Hypothalamus  
↓ CRH → Gonadotrophin Releasing Hormone

Follicle Stimulating Hormone  
FSH  
Leydig's Cells

Ant. lobe of Pit. gland  
ICSH → Interstitial cells Stimulating Hormone

Spermatogenesis  
Secondary Sex Organs

Inhibin / ABP  
Androgen Binding Protein  
accessory glands

Onset of Puberty in the Male :-  
Puberty is the period when reproductive organs become functional. It is attained between the age of 13-16 years. It is triggered by the secretion of the hormone testosterone in testes.

During the onset of puberty :-

1. Enlargement of penis and scrotum.
2. Broadening of the shoulders
3. Growth of the body and facial hair.
4. Deepening of voice due to enlargement of larynx
5. Increase in height
6. Increased development of bones.

Structure of sperm :-

Sperm consists of four parts :- Head, neck, middle piece and tail.

Head :- It contains nucleus and acrosome. The nucleus consists of DNA and basic proteins. The acrosome is formed from glycogen bodies. It contains hydrolytic enzymes which is used to penetrate the egg in fertilization.

Neck :- Neck contains two centrioles. So, sperm provides off centriole to

Middle Piece :- It contains microtubule tightly coiled around the axon filament. This provides energy for the movement of sperm.

Tail :- It helps the sperm to swim.

## Disorders of Male Reproductive System

1. Prostatitis :- This is the enlargement of prostate gland. It often occurs in old age. The enlarged gland may block the urethra, causing frequent night urination or difficult or painful urination. It is treated surgically or by drugs.

2. Impotence :- This is the inability of the male to achieve or maintain erection of the penis.

3. Sterility :- Inability of the male's sperm to fertilize the ovum.

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~~Productive System~~

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**Female Reproductive System**  
The female reproductive system consists of the female reproductive organs. It includes the ovaries, a pair of fallopian tubes, a uterus, a vagina, external genitalia and breasts.

**Ovaries** :- The ovaries are the primary sex organs. These are about the size and shape of an orange. They lie in the lower part of the abdomen. The ovaries have both an exocrine function (production of eggs) and an endocrine role (secretion of female sex hormones, estrogen and progesterone).

The ovaries are solid organs and are composed of connective tissue, the stroma. The stroma contains outer ovarian cortex and central ovarian medulla. The ovarian medulla contains many graafian

function Each ovarian follicle contains a large fluid surrounded by many layers of follicle cells. Follicle containing egg releases hormone estrogen. Once a month, the most mature ovum from one ovary is released. This empty follicle fills with yellow fluid named lutein. Now the ovarian follicle is called corpus luteum. And this releases a hormone progesterone.

When the fertilization does not take place, the corpus luteum degenerates and white scar remains. This white scar is called corpus albicans.

It releases a hormone progesterone.

When the fertilization does not takes place, the Corpus luteum degenerates and white scar remains. This white scar is called Corpus albicans.

Fallopian Tubes (Oviducts):- It conveys egg from the ovary to the uterus. It has four parts:-

Infundibulum - Ampulla, Isthmus, uterine part  
Infundibulum bears finger like processes called  
fimbriae.

- 1) upper wide, dome shaped fundus
- 2) cornua, the upper cornues
- 3) middle large body or corpus
- 4) lower narrow cervix, has internal os and

external os The cavity between the both of os is called cervical or canal.

Vagina:- The Vagina is a large, muscular tube. It receives the male's penis during copulation. It allows menstrual flow. It serves as the birth canal during parturition.

External Genitalia :- It consists of labia minora and labia majora. The vaginal orifice is covered by the membrane called Hymen.

Breast :- Breast contains lactiferous ducts. Breast help the new born baby by nourishing and providing milk. Milk producer inside breast with the help of hormone prolactin and releases with the help of hormone oxytocin.

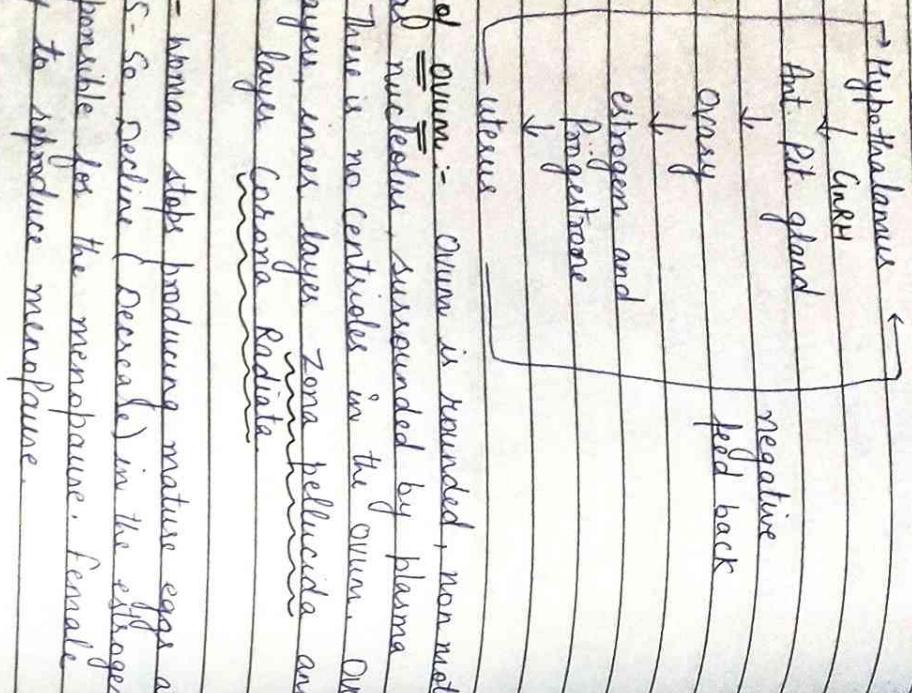
Onset of puberty in the female:—Woman attains puberty about the age of 13. It is triggered by production of hormone FSH (Follicle Stimulating Hormone).

LH promotes growth of the ovarian follicles which secrete estrogen.

During the onset of puberty:-

1. growth of breasts and external genitalia
2. broadening of pelvis
3. growth of pubic and axillary hair
4. increase in the subcutaneous fat in thighs, should
5. initiation of menstruation and ovulation

### Hormonal Control During Puberty



### Disorders of Female reproductive System

1. Sterility :- Inability of the female to conceive or carry a child
2. Menstrual Irregularity :- This may be (1) amenorrhoea (absence of menstruation) (2) excessive or prolonged bleeding of uterus (hypermenorrhoea) (3) dysmenorrhea (Painful menstruation).
3. Breast cancer :- It occurs after 30 years of age. It can be removed treated by removal of breast.
4. Ovarian cyst :- These are the fluid filled tumours of the ovary. It can be surgically removed.
5. Cervical cancer :- It is a slow growing cancer. It can be treated by radiation or surgery.

### GAMETOGENESIS

The process of the formation of haploid gametes from the undifferentiated, diploid germ cells in the gonads for sexual reproduction is called gametogenesis.

Spermatogenesis :- The process of formation of sperms is called spermatogenesis. This process takes place in seminiferous tubules.

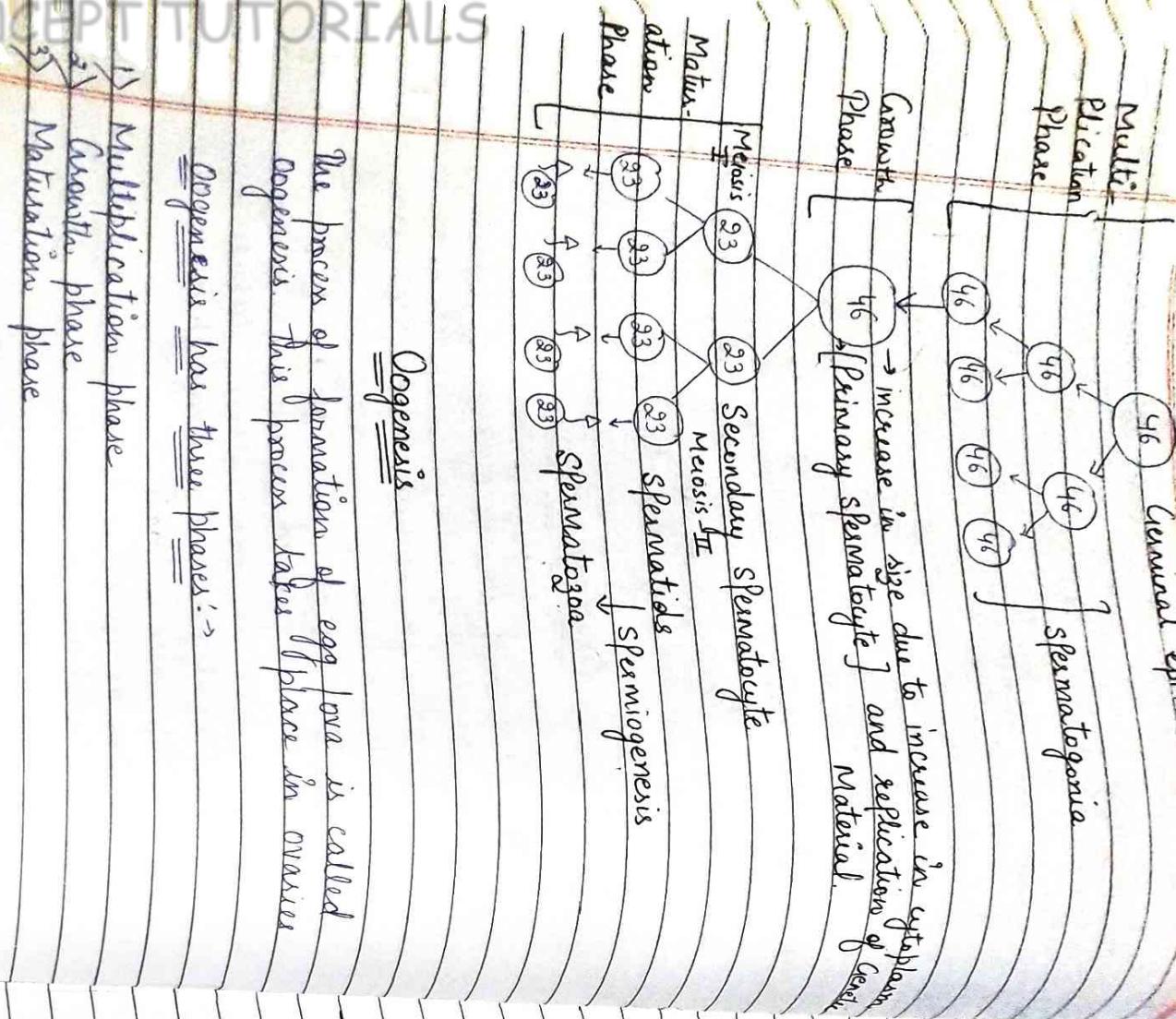
Spermatogenesis has three phases:-

- 1) Multiplication phase
- 2) Growth phase
- 3) Maturation phase

Menopause :- woman stops producing mature eggs at the age of 45-50. Decline (Decrease) in the estrogen level is responsible for the menopause. Female loses ability to reproduce menopause.

## Spermatogenesis

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## Oogenesis

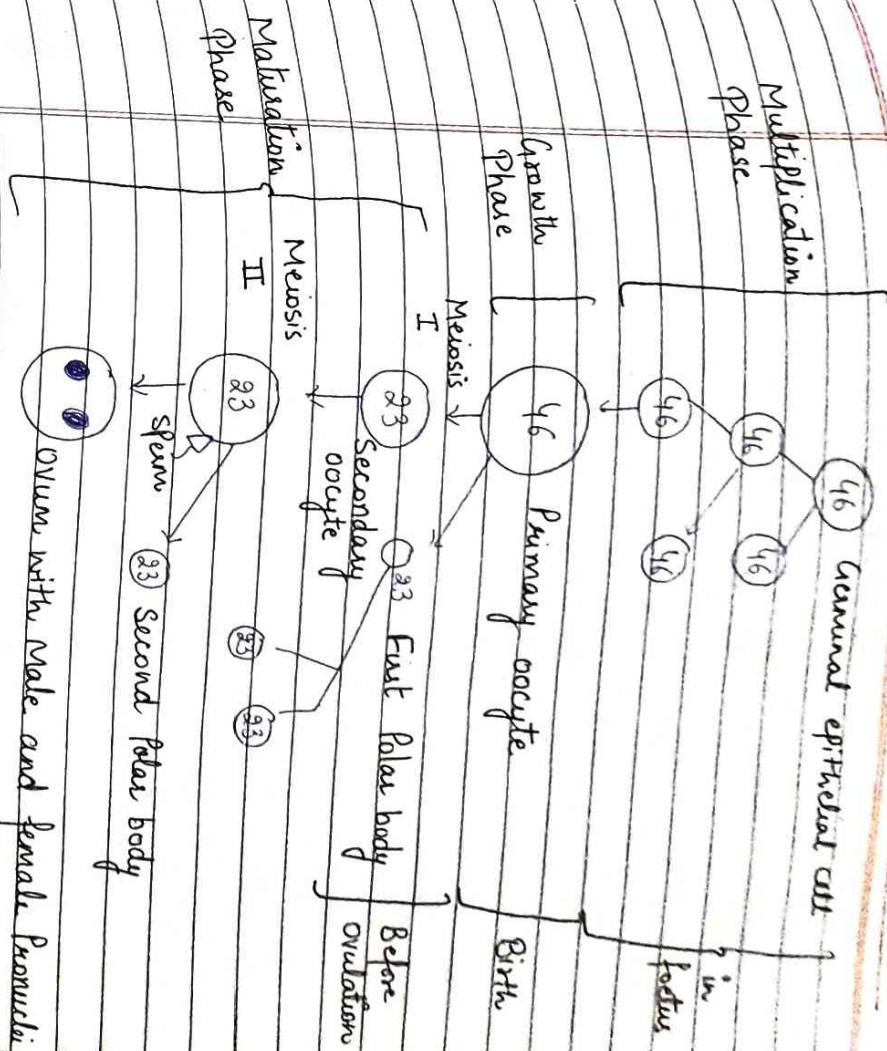
Ovum with Male and female pronuclei

## Oogenesis

The process of formation of egg ovule is called oogenesis. This process takes place in ovaries.

Oogenesis has three phases

Multiplication phase  
Growth phase  
Maturational phase



## Menstrual cycle

Menstrual cycle  
The gamete formation in female is a cyclic activity and takes about 28/29 days. There are some changes takes place in reproductive system of female. These changes are called Menstrual cycle.

Menarche: The first menstruation begins at puberty. It is called menarche.

Phases of Menstrual cycle :- It consists of three phases

Phases of Menstrual cycle :- It consists of three phases  
follicular or proliferating phase  
luteal or secretory phase

## (2) Menstrual or bleeding phase

- (1) Follicular Phase :- This phase lasts for 14 days. It causes the following events:-
- (a) Anterior lobe of pituitary gland secretes FSH
  - (b) This FSH stimulates the growth of the selected ovarian follicle
  - (c) This ovarian follicle or Graafian follicle secretes the hormone 'Estrogen'
  - (d) Due to Estrogen, the secretion of FSH decreases and there is increase in the secretion of LH
  - (e) The increased secretion of LH (Luteinising Hormone) induces the mature Graafian follicle to burst and release its egg.
  - (f) At the release of the egg, the walls of uterus (endometrium) becomes thick due to the storage of glycogen and fat. Along with uterus, the walls of the follicular tubes also becomes thick.
  - (2) Luteal or Secretory phase :- This phase lasts for 10 days. It involves following events.
  - (a) The Graafian follicle which becomes empty due to release of egg, filled with a yellow fluid called Lutein.
  - (b) Now, this Graafian follicle is named as Corpus Luteum.
  - (c) This Corpus Luteum helps in the secretion of another hormone Progesterone
  - (d) Progesterone is also called Pregnancy hormone, as it is necessary for the implantation of the foetus
  - (e) Uterine walls secrete a thin fluid called mucous plug.

## Uterine milk

- [3] Menstrual or Bleeding Phase :- This phase lasts for four (4) days. If fertilization does not occur, the secondary tube breaks down.
- (a) Progesterone inhibits the secondary tube.
  - (b) Reduction in LH cause corpus luteum regression.
  - (c) There is decrease in level of progesterone because tube breaks down.
  - (d) The walls of uterus (endometrium) and fallopian tube break down.
  - (e) The bleeding passes out through the vaginal opening.
  - (f) This is called Menstrual cycle / flow.

Fertilization :- Fusion of a haploid male gamete (Sperm) and a haploid female gamete (Ovum) to form a diploid cell, the zygote, is called fertilization.

Insemination :- Male discharges semen high up in the female's vagina close to the cervix during coitus (copulation) is known as insemination.

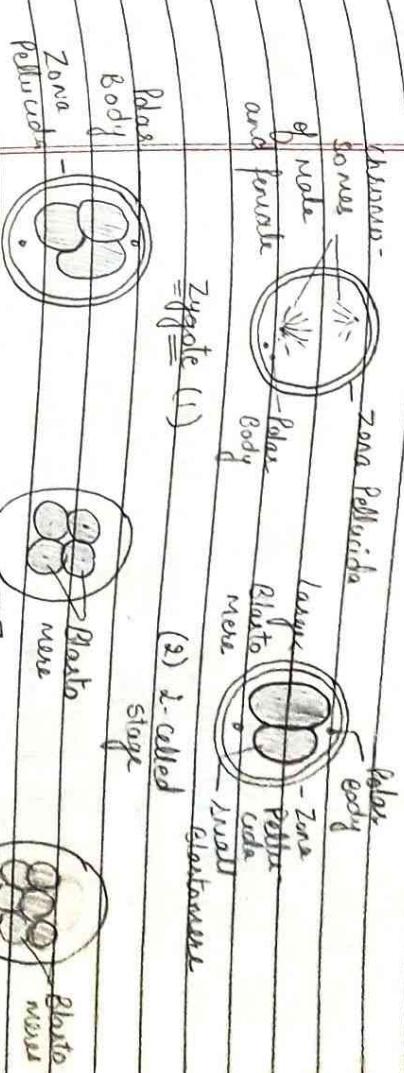
- (a) Sperm's effect - There are 200 - 400 million sperms that enter into female. Only 100 sperms reach the fallopian tube.
- (b) Role of uterus in sperm transport :- Uterus helps the sperm to reach to egg. Uterus shows contractions and aspirates the sperm from vagina.
- (c) Capacitation of sperms :- Removal of certain molecules deposited on the surface of sperm is called capacitation. It takes 6 hours.

(e) Acosome Reactions :- The secondary oocyte is surrounded by Zona pellucida. The fallopian tube is surrounded by Zona pellucida and corona radiata. When sperm reaches near the egg, the acrosome releases hydrolytic enzymes. These enzymes penetrate the layer of egg and break the layers of egg without acrosome, it is impossible for sperm to break the layer of egg and enter into it.

(f) Cortical Reactions :- When the sperm enters into the egg, the cortical granules present on egg's plasma membrane fuses with plasma membrane and hardens the Zona pellucida. This blockage prevents the entry of other sperms.

(g) Karyogamy (Amphimixis) :- Mixing of chromosomes of a sperm and an ovum is called karyogamy. The ovum is now a diploid cell having 46 pairs of chromosomes and termed as zygote.

Effect of fertilization :- When the fertilization takes place, the fetus is implanted in the endometrium of the trophoblast cells and secrete a hormone named Chorionic Gonadotrophin. During pregnancy, HCG is released in urine or in blood and pregnancy can be detected.



Cleavage (Segmentation) :- The term cleavage refers to a series of rapid mitotic divisions of the zygote following fertilization, forming a many cell blastula.

Cleavage in Human Zygote :- The zygote divides into

daughter cells. The first cleavage takes place after 24 hours of fertilization. Second cleavage later takes place after 60 hrs and third cleavage takes place after 72 hrs. During first cleavage, the cell (3 cells) divided into 2 unequal daughter cells. After that immediately the 2 daughter cells divided into three and then four daughter cells. Then there is rapid division of the cells.

The blastomeres from 16 - 32 cell stage is called Morula. It is not larger than the zygote. The cells of the Morula divided into two layers. Outer flattened layer named trophoblast and inner blastomeres. Then there is rapid division of the

The cells of the trophoblast become flattened. The rounded blastocyst enters into the cavity and the cell mass settle at one side.

The syncytial cells that come in contact with all mass are called cells of Rauber.

The embryo at animal pole and the opposite is called embryonic pole

Zone pallida becomes thinner and finally disappears.

IMPLANTATION :- It is the attachment of the blastocyst to the uterine wall. It takes place about seven days after fertilization.

The portion of the blastocyst where the embryonal knob is located lies against the endometrium. The blastocyst sinks into a pit formed in the endometrium and gets completely buried in the endometrium.

Human chorionic gonadotrophin :- The trophoblast develops cells named chorionic cells. These cells secrete a hormone human chorionic gonadotrophin (hCG). This hormone helps the corpus luteum to secrete progesterone.

Morning sickness :- There are some changes take place during implantation. There are some hormonal changes occurring and tenderness of breasts, and temporary occurrence of morning sickness.

Gastrulation or Formation of Germ Layers :- Formation of three germ layers from blastula is known as gastrulation. The three germ layers

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are Ectoderm, Mesoderm, Endoderm.

Formation of Endoderm :- Some cells covering the free surface of the embryonal knob increase different from others. They become flat and form the first endodermal cell. They first cover the free surface of the embryonal knob and rapidly multiply and spread out in all directions.

Formation of Embryonic Disc :- The blastocyst continues to grow in size by absorbing uterine fluid through the trophoblast. After the formation of its cells become columnar and is known as Embryonic cells disc.

Embryonic disc consists of 3 regions :-

(1) Cephalic Margin (2) Embryonic disc proper (3) Caudal margin.

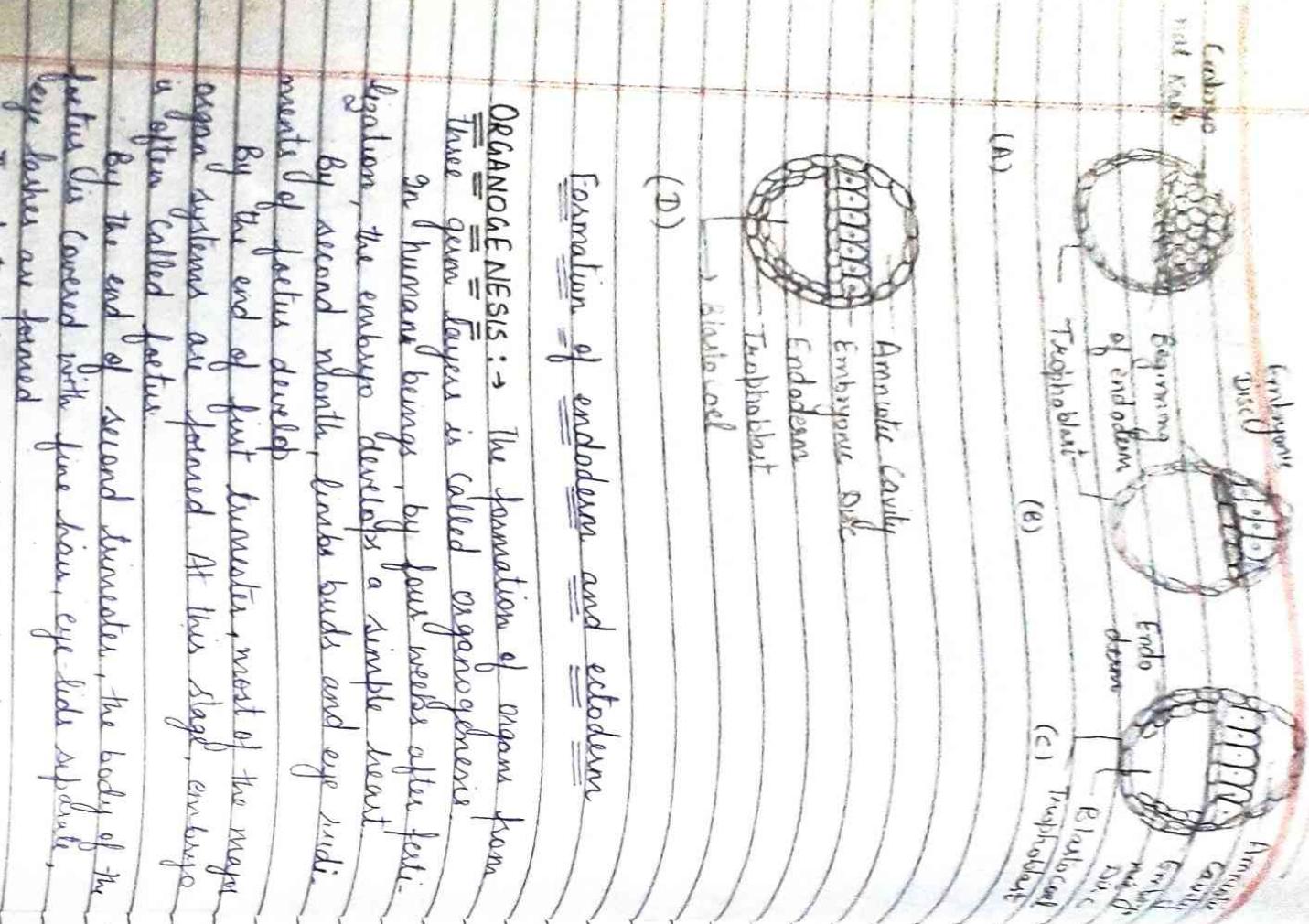
Formation of Amniotic cavity :- A space appears between the embryonal disc and the trophoblast. This is called amniotic cavity. It is filled with amniotic fluid.

Formation of Mesoderm :- At the caudal margin of the embryonic disc, the cells start proliferation.

The proliferated cells later detach from the embryonic disc and spread between the trophoblast and the endoderm. This new layer is known as mesoderm.

Formation of Ectoderm :- After the formation of the mesoderm, the remaining cells of the embryonic disc get arranged in a layer called ectoderm.

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**Placenta** :- The Endothelial cells formed by the chorion produces chorionic cells...and these chorionic cells produce placenta.  
**Placenta** :- The Endothelial cells formed by the chorion produces chorionic cells...and these chorionic cells produce placenta.  
as there is intimate as haemochorial placenta  
the foetal membrane and connection established between

(A-7)

(8)

(c) frequency

(2) Material placenta

(i) Nutritive organ :-

Nutritive oxygen: Food material pass from the mother's blood into the foetal blood through the placenta.

(2) **Bilobate Urogenital**:—The mesophoblast of the placenta digests protoplasm before passing them into it.

## Formation of endoderm and ectoderm

ORGANOGENESIS : → The formation of organs  
in multicellular organisms.

seen your signs so soon  
on humane beings, by four weeks after first  
lost in the world, for a time he went

By second month, limb buds and eye rudiments of testes developed

By the end of first trimester, most of the major organ systems are formed. At this stage, embryo

A softer called *faetus*.

by the end of April.

*H. l. v.* Covered with fine hair, eye-lids separate,

*My tasks are planned*

The fetus becomes fully developed and ready for delivery by the end of nine months of pregnancy.

Ans: Reasons behind this are:-

- (1) Blood between two may be incompatible.
- (2) The pressure of the maternal blood is too high.

for the foetal blood vessels  
(3) There must be a check on the passage of harmful substances into the foetal blood.

Parturition :- It is the act of expelling the full grown young one from the mother's uterus at the end of gestation.

Process :- Pregnancy is completed in about 8-10 months. Progesterone causes the secretion of oxytocin hormone which causes uterine contractions. Oxytocin stimulates the secretion of another hormone named prostaglandins. These hormones (oxytocin and prostaglandins) trigger strong uterine contractions to expel the baby out.

Labour :- The forceful muscular contractions of the uterine wall leading to parturition is called labour.

First stage of labour :- It lasts for 12 hours. Regular contraction of uterus pushes the baby downward. The amniotic fluid passes out.

Second stage of labour :- It lasts for 20 mins. The uterine contraction becomes more powerful. Due to these contractions, baby is finally delivered.

Third stage of labour :- It lasts for just 10-45 min after infant birth, the uterus begins to shrink thus frees the placenta from its site. The placenta umbilical cord expelled out from the body. This is called after-birth.

After about 28-35 days, the uterus returns to its normal position.

Lactation :- Production of milk in the female's

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breast following the birth of a young one in mammals is called lactation.

Hormones :- The synthesis (Production) of the milk in mammary glands is taken place by prolactin. The release of milk takes place by hormone oxytocin. Colostrum :- After birth, the breasts first secrete not milk but colostrum for 2 or 3 days. This is a thin, yellowish, fluid often called foremilk. This is important for foetus because it contains antibodies which protect the baby from infection.

Twins :- One of the two young are produced at the same birth is termed as twin.

Twins arise in two ways :-

1. From one egg :- Of one spine and one egg fuses, the early embryo never separate before their fate is fixed. They are always of same sex. They are called identical twins.

Some times, the twins joined together, at certain places. These twins are called conjoined twins.

2. From two eggs :- At some times, two eggs from each ovary may be released simultaneously. Both are separately fertilized by different (two) sperms. These twins are known as non-identical twins.

Polyembryony :- In some mammals, a single fertilized egg may give rise to four or even eight identical embryos. This condition is known as polyembryony. Eg in dogs, cats etc.

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Teratogeny :- Production of malformed infant due to use of tobacco, alcohol and drugs by pregnant mother is called teratogeny.

## IMPORTANT DIFFERENCES

<u>Primary sex organs</u>	<u>Secondary sex organs</u>
(1) These include the gonads i.e. testes and ovaries	(1) These include reproductive ducts and reproductive glands
(2) They produce gametes - spermatozoa and ova	(2) They carry gametes to the site of fertilization, may also provide space for embryonic development.
(3) They secrete sex hormones	(3) They secrete useful materials other than hormones.
<u>Vasa Efferentia</u>	<u>Vasa Diferentia</u>
1. Arise from the rete testes	1. Arise from the cauda epididymis.
2. Vary from 15-30 in numbers	2. Are only 2 in number.
3. Are fine and convoluted	3. Are thick, coiled.
4. Carry spermatozoa from testes to caput epididymides	4. Carry spermatozoa from cauda epididymis to ejaculatory ducts.
<u>Male Urethra</u>	<u>Female Urethra</u>
1. It is much longer	1. It is short
2. It is differentiated into	2. It is not differentiated
	(5) Spermatogenesis
	It occurs in testes
	(1) It occurs in the ovaries
	(2) Smooth phase is short
	(3) A primary spermatocyte divides equally to form two similar secondary spermatocytes
	(4) Spermatocytes are minute, streamlined, yolkless and rounded, often with yolk
	and non-motile
	(5) Oogenesis is completed in the reproductive tract of

## Spermatogenesis

## Oogenesis

## Menstrual Cycle

## Typical Mitosis

- (6) Spermatogenesis is often a continuous process  
 (7) In man, sperm mother cells continue to multiply throughout life

- (8) A spermatogonium produces four functional spermatozoa

- (9) Oogenesis has long "resting" periods

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# CONCEPT TUTORIALS

Topic: Short Questions

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Date: 21/10/2016

Ques: Name the pouch in which the human testes are present?

Ans: Sertoli

(12) Q: From which cells, the sperms are produced?

Ans: Spermatogonia cells

(13) Q: The stroma of an ovary in female reproductive system is divided into two zones, which are the peripheral cortex and inner medulla.

(14) Q: The process of forming the sperms called as spermatogenesis, starts at:-

Ans: Puberty

(15) Q: The mammary ampulla is connected to the duct from which the young one sucks milk is:-

Ans: Lactiferous ducts.

(16) Q: Name the embryonic stage that gets implanted in the uterine wall of human female

Ans: Blastocyst

(17) Q: During entry into the ovum, the sperm induces changes in the layer of ovum which is this layer?

Ans: Zona pellucida

(18) Q: The foetus is attached to the maternal body with the help of :-

Ans: Placenta

(19) Q: The stem cells are present in the:-

Ans: Inner cell mass

(20) Q: What is semen?

Ans: The mixture of spermatogonia and accessory fluids is called semen.

(21) Q: Name the part of female genital tract where foetus develops?

Ans: Uterus.

(22) Q: Name the membrane that covers the vaginal opening in the virgin.

Ans: Hymen

(23) Q: Where are the sperms stored in the male?

Ans: Epididymis.

(24) Q: Name some extraembryonic membranes.

Ans: Yolk sac, amnion, chorion, allantois and yolk sac.

(25) Q: From which germ layer are nervous system and receptors formed?

Ans: Ectoderm.

(26) Q: Which foetal membrane takes part in the formation of placenta in man? Human?

Ans: Chorion.

(27) Q: What is colostrum?

Ans: It is a thin, yellowish fluid released after birth from the breasts of mother for 2 or 3 days. It is also called foremilk.

(28) Q: Which germ layer gives rise to pancreas, liver, thymus?

Ans: Endoderm.

(29) Q: Name the accessory genital glands in male.

Ans: Seminal vesicles, prostate gland, Cowper's gland.

(30) Q: What isrete testes?

Ans: It is one of the component of intratesticular genital duct system which connects the seminiferous tubules to vasa efferentia.

(31) Q: What is cortical reaction?

Ans: It is exhibited by egg during egg sperm binding which makes the egg impenetrable to any second sperm.

(32) Q: What is follicular atresia?

Ans: Regression and disappearance of most of the follicles due to death and dislodgement by phagocytes.