Human Reproduction

Reproduction

It is ability to reproduce individuals of same species. The main events in reproduction include-

Gametogenesis-------> Insemination -------> fertilsation-----> implanation----> gestation----> delivery/Parturition.

- **Gametogenesis=** it is the formation of gametes. Male gametes are sperms and female gametes are egg/ovum. Formation of sperm is called **spermatogenesis** and formation of egg is called **oogenesis**
- **Insemination=** it is the transfer of sperms into the female genital tract
- **Fertilisation=** it is the **fusion** of male and female gamete. It result in the formation of zygote
- **Implantation=** Attachment of **Blastocyst** on the inner wall of uterus (**Endometrium**) is called implantation
- **Gestation=** Embryonic development within the uterus of mother is called gestation.Human gestation period is **9 month.**

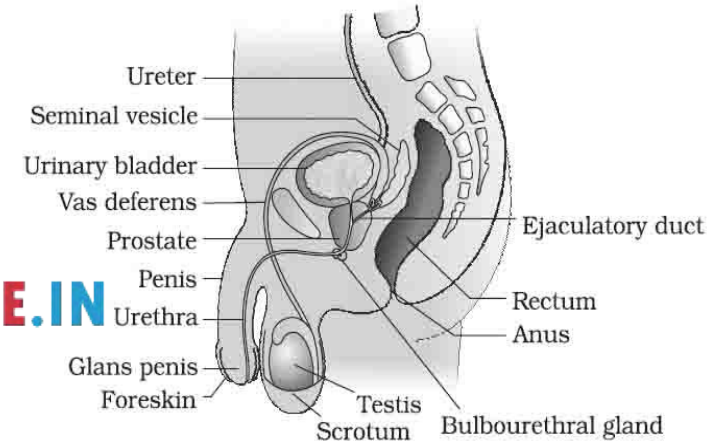
  Or

  The duration **between fertilization and parturition is** called gestation.
- **Parturition=** delivery of the baby is the parturition
- All these reproductive events occur **only after puberty.**

✓ Humans are sexually reproducing and viviparous organisms.

✓ There are remarkable differences between the reproductive events in the male and in the female, The sperm formation (Spermatogenesis) continues in old men, but formation of ovum (Oogenesis) ceases in women around the **age of 50 years.**

The Male Reproductive System



The male reproductive system is located in the **pelvis region**. It consists of

a) A pair of testis
b) Accessory ducts
c) Glands
d) External genitalia.

a)Testes

✓ The testes are situated outside the abdominal cavity (Extra abdominal) within a pouch called **scrotum**.

✓ **The scrotum helps in maintaining the low temperature of the testes (2–2.5^{o} C lower than the normal internal body temperature) necessary for spermatogenesis**.

✓ In adults, each testis is **oval in shape**, with a length of about **4 to 5 cm** and a width of about **2 to 3 cm**.

✓ The testis is covered by a dense covering.

✓ Each testis has about **250 compartments called testicular lobules.**

✓ Each Testicular lobule contains **one to three** highly coiled **seminiferous tubules** in which sperms are produced.

✓ Each seminiferous tubule is lined on its inside by two types of cells called male **germ cells (spermatogonia) and Sertoli cells.** The male germ cells undergo **meiotic divisions** finally leading to sperm formation, while **Sertoli cells (Nursing cells) provide nutrition to the germ cells**.

✓ The regions outside the seminiferous tubules called interstitial spaces, contain small blood vessels and **interstitial cells or Leydig cell**).

- ✓ Leydig cells synthesise and secrete testicular hormones called **androgens**. Other immunologically competent cells are also present.

b)Accessory Duct

- ✓ The male sex accessory ducts include **rete testis, vasa efferentia, epididymis and vas deferens.**
- ✓ The seminiferous tubules of the testis open into the **vasa efferentia** through **rete testis (They are irregular cavities present in testes**).
- ✓ The vasa efferentia leave the testis and open into **epididymis.**
- ✓ The epididymis leads to **vas deferens**.Vas deferens receives a duct from seminal vesicle and opens into urethra as the **ejaculatory duct** .
- ✓ These ducts store and transport the sperms from the testis to the outside through **urethra**.
- ✓ The urethra originates from the urinary bladder and extends through the penis to its external opening called **urethral meatus.**

c)External Genitalia

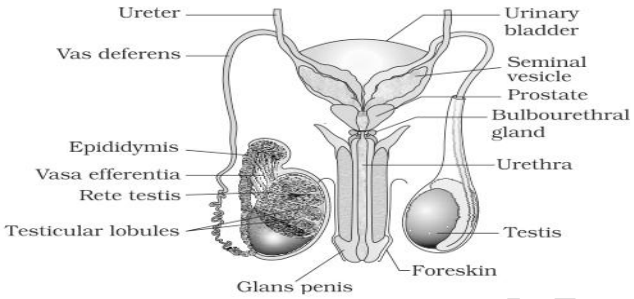
- ✓ The **penis** is the male external genitalia . It is made up of **special tissue** (Spongy erectile tissue) that helps in erection of the penis to facilitate insemination.
- ✓ The enlarged end of penis called the **glans penis** is covered by a loose fold of skin called **foreskin.**

d) Accessory Glands

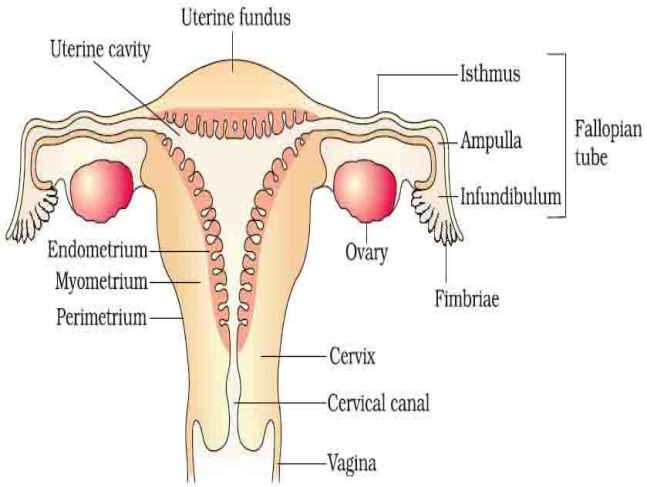
- ✓ It include **paired seminal vesicles, a prostate and paired bulbourethral glands (Cowper's gland)**.
- ✓ Secretions of all these glands constitute the **seminal plasma** which is rich in **fructose, calcium and certain enzymes**.

- ✓ **The secretions of bulbourethral glands also helps in the lubrication of the penis**.

- ✓ **Seminal plasma along with sperm is called Semen**



The Female Reproductive System



The female reproductive system is located **in pelvic region** and it consists of

a)**a pair of ovaries,**
b)**accessory ducts and**
c)the external genitalia

These parts of the system along with **a pair of the mammary glands** are integrated structurally and functionally to support the processes of ovulation, fertilisation, pregnancy, birth and child care.

a)Ovary

- Ovaries are the primary female sex organs that produce **the female gamete (ovum)** and **several steroid hormones** (ovarian hormones-Estrogen and progesteron).
- The ovaries are located one on each side of **the lower abdomen**). Each ovary is about **2 to 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 – a peripheral cortex and an inner medulla

b) Accessory ducts

- **The oviducts (fallopian tubes), uterus and vagina** constitute the female accessory ducts.

Oviduct :

- Each fallopian tube is about **10-12 cm** long), 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 **ampull**a. The last part of the oviduct, **isthmus** has a **narrow lumen** and it joins the uterus

Uterus (Womb) ;

- The shape of the uterus is like an **inverted pear**.
- The uterus opens into **vagina through a narrow cervix**.
- The cavity of the cervix is called **cervical canal** which along with vagina forms the **birth canal**.

The wall of the uterus has three layers of tissue.

i)The external thin membranous perimetrium,
ii)middle thick layer of smooth muscle, myometrium
iii) inner glandular layer called endometrium

- The Endometrium undergoes cyclical changes during menstrual cycle
- the **myometrium** exhibits strong contraction during delivery of the baby.

c) External genitalia

The female external genitalia include
i)mons pubis,
ii)labia majora,
iii)labia minora,
iv)hymen and v)clitoris

i)Mons pubis:

It is a cushion of fatty tissue covered by skin and pubic hair.

ii)The labia majora:

They are fleshy folds of tissue, which extend down from the mons pubis and surround the vaginal opening.

iii)**The labia minora:**

They are paired folds of tissue under the labia majora.

iv)Hymen :

The opening of the vagina is often covered partially by a membrane called **hymen**.

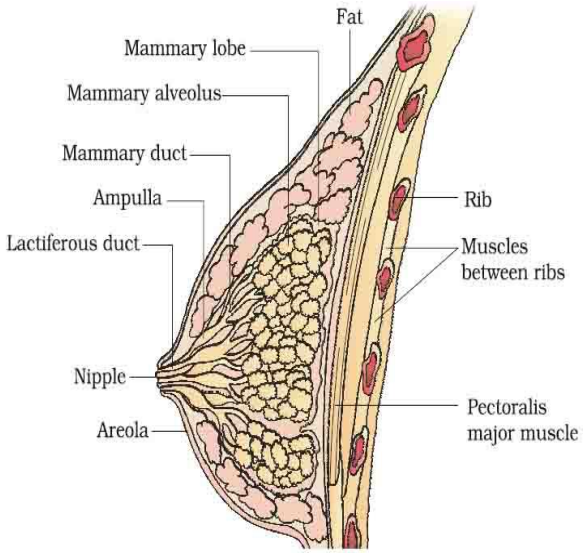
[The hymen is **often torn during the first coitus** (intercourse). *However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, etc. In some women the hymen persists even after coitus. In fact,* ***the presence or absence of hymen is not a reliable indicator of virginity or sexual experience]***

v)Clitoris :

The clitoris is **a tiny finger-like** structure which lies at the upper junction of the two labia minora above the urethral opening.

Mammary Gland

- The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat.
- The glandular tissue of each breast is divided into **15-20 mammary lobes** containing clusters of cells called **alveoli** The cells of alveoli **secrete milk**, which is **stored in the cavities (lumens) of alveoli**.
- The alveoli open into mammary tubules.
- The mammary tubules of each lobe join to form a mammary duct.
- Several mammary ducts join to form a wider mammary ampulla which is connected to lactiferous duct through which milk is sucked out.

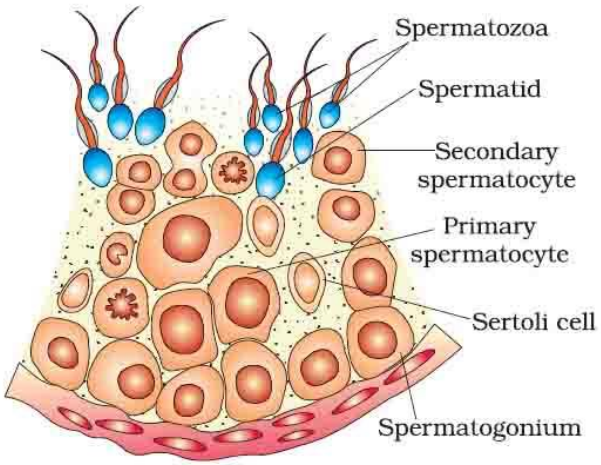


GAMETOGENESIS

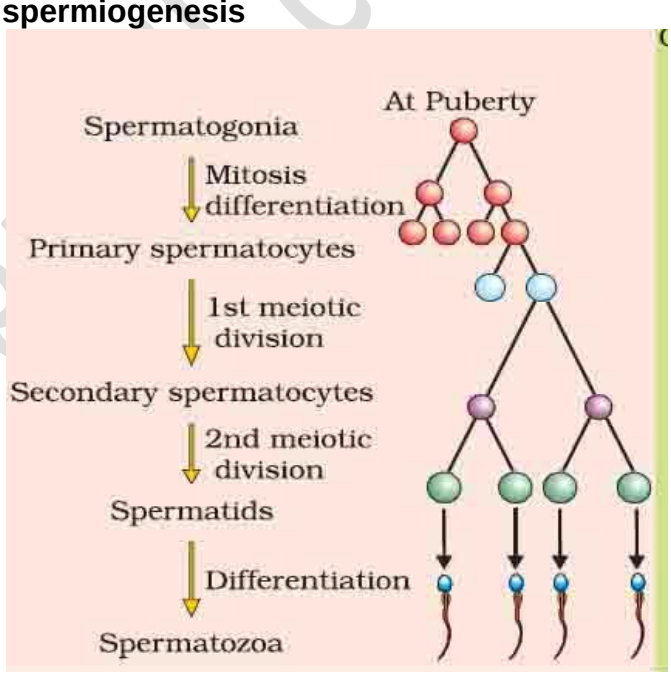
The process of formation of gamete is called **gametogenesis**. The process of formation of sperm is called **spermatogenesis**. The process of formaton of egg/Ovum is called **Oogenesis.**

a)Spermatogenesis

- The process of formation of sperm is called spermatogenesis. It takes place at testis.
- Each testis has about **250 compartments called testicular lobules.** Each Testicular lobule contains **one to three** highly coiled **seminiferous tubules** in which sperms are produced.
- Each seminiferous tubule is lined on its inside by two types of cells called male **germ cells (spermatogonia) and Sertoli cells**



- Each spermatogonium is **diploid** and contains 46 chromosomes. Some of the spermatogonia called **primary spermatocytes** periodically undergo **meiosis.**
- A primary spermatocyte completes the **first meiotic** division (reduction division) leading to formation of two **equal**, haploid cells called **secondary spermatocytes,** which have only **23 chromosomes** each.
- The secondary spermatocytes undergo the **second meiotic division** to produce **four equal, haploid spermatids**
- The spermatids are transformed into spermatozoa (sperms) by the process called **spermiogenesis**. Ie: **conversion of spermatid into sperm is called spermiogenesis**



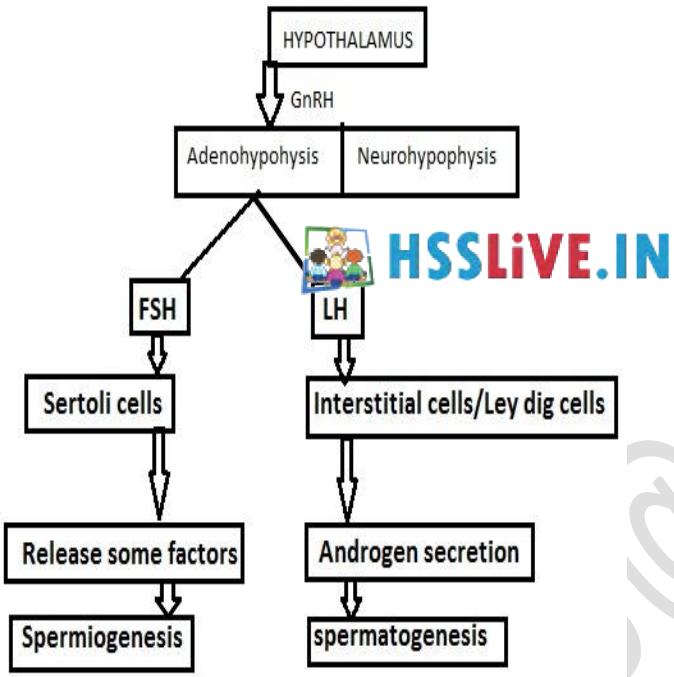
- After spermiogenesis, sperm heads become embedded in the **Sertoli cells**, and are finally released from the seminiferous tubules by the process called **spermiation**.
- **The release of sperm after spermatogenesis from seminiferous tubule is called spermiation**

- From a single Primary spermatocyte 4 sperms are produced
- From a single secondary Spermatocyte 2 sperms are produced

Q. How many sperms are produced from 100 primary spermatocyte ?
Ans: 400 sperms

Q. Which of the following is haploid cell/s ?
Spermatogonia, Primary spermatocyte, secondary spermatocyte, spermatid, Sperm
Ans: secondary spermatocyte, spermatid, Sperm

Hormonal Control of Spermatogenesis / Male reproductive system



- Spermatogenesis starts at the age of **puberty due to significant** increase in the secretion of **gonadotropin releasing hormone** (GnRH-GnRH is secreted by Hypothalamus).
- The increased levels of GnRH then acts **at the anterior pituitary gland (Adenohypophysis)** and stimulates secretion of two **gonadotropins** – **luteinising hormone (LH) and follicle stimulating hormone (FSH**).

LH (luteinising hormone)

LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis.

FSH (follicle stimulating hormone)

FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

Structure of sperm

It is a microscopic structure composed of a **head, neck, a middle piece and a tail.** A plasma membrane envelops the whole body of sperm.

The sperm head:

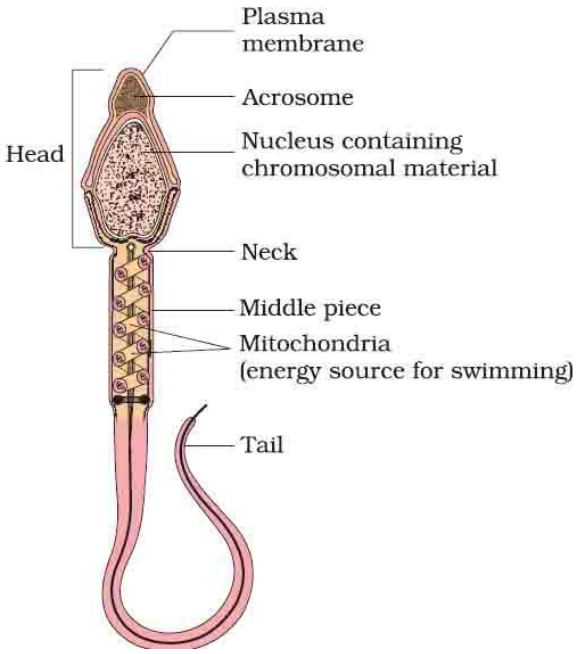
The head contains an elongated haploid nucleus, the anterior portion of which is covered by a cap-like structure**, acrosome**. The acrosome is filled with enzymes (Hyaluronidase) that help fertilisation of the ovum.

The middle piece:

Middle Piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitate sperm motility essential for fertilization

Tail :

it helps in sperm movement



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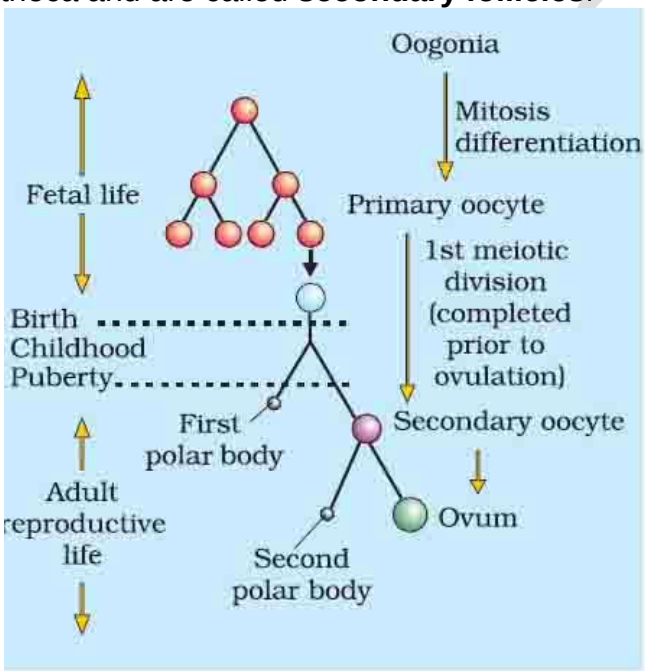
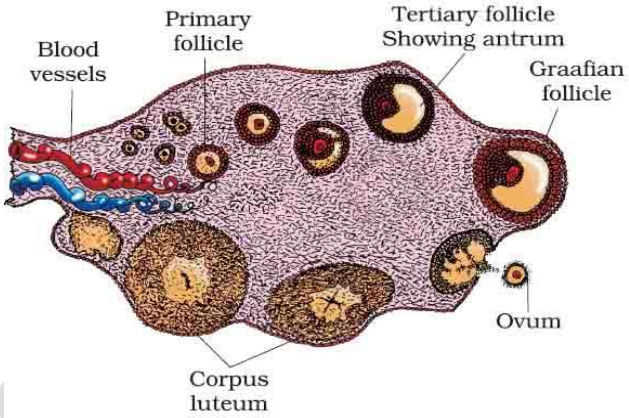
- ✓ The human male ejaculates about **200 to 300** million sperms during a coitus of which, for normal fertility, at least 60 per cent sperms must have normal shape and size and at least 40 per cent of them must show vigorous motility.
- The seminal plasma along with the sperms constitute the **semen**

b)Oogenesis

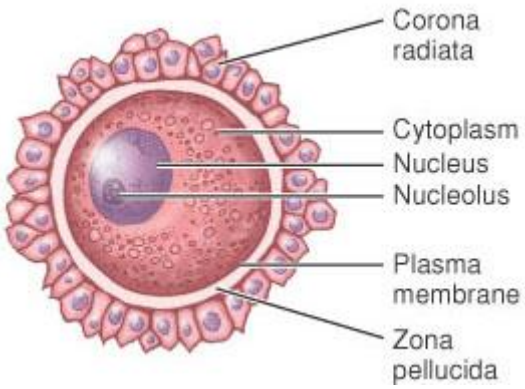
- The process of formation of a mature female gamete is called **Oogenesis**.
- Oogenesis is initiated during the **embryonic development stage** when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary; **no more oogonia are formed and added after birth.**
- **These cells start division and enter into prophase-I of the meiotic division and get temporarily arrested at that stage**,**called primary oocytes**.
- Each primary oocyte then gets surrounded by a layer of granulosa cells and is called the **primary follicle**.
- A large number of these follicles degenerate during the phase from birth to puberty. Therefore, at puberty only **60,000-80,000** primary follicles are left in each ovary.
- The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called **secondary follicles**.



- The secondary follicle soon transforms into **a tertiary follicle** which is characterised by a fluid filled cavity called **antrum**. The theca layer is organised into an inner theca interna and an outer theca externa..
- **First meiotic division an unequal division** resulting in the formation of **a large haploid secondary oocyte and a tiny first polar body**
- The secondary oocyte retains bulk of the nutrient rich cytoplasm of the primary oocyte.
- The tertiary follicle further changes into the **mature follicle or Graafian follicle**.
- The secondary oocyte forms a new membrane called **zona pellucid** surrounding it.
- The Graafian follicle now ruptures to release **the secondary oocyte (ovum**) from the ovary by the process called **ovulation.**



Structure of Human egg/ovum



It is round, non motile, haploid, female gamete. The human egg at ovulation is at the secondary oocyte stage. It has centrally located nucleus and dense cytoplasm. The cytoplasm stores food material required for the entire process of development. The ovum has 4 envelops. They are

a)Plasma membrane-
b)Vitelline membrane
c)Zona pellucida
D)Corona radiata

Menstrual Cycle

The reproductive cycle in the female primates (e.g. monkeys, apes and human beings) is called menstrual cycle.

- The first menstruation begins at puberty and is called **menarche**.
- Menstrual cycles ceases around 50 years of age; that is termed as **menopaus.**
- In human females, menstruation is repeated at an average interval of about **28/29 days,** and the cycle of events starting from one menstruation till the next one is called the **menstrual cycle.**
- The menstrual cycle may e said to be a combination of **ovarian cycle and uterine cycle.**

a)Bleeding phase/Menstrual phase

This phase lasts for **3-5 days**. The menstrual flow results due to **breakdown of endometrial lining of the uterus** and its blood vessels which forms liquid that comes out through vagina. Menstruation only occurs if the released ovum **is not fertilised**.

- **Lack of menstruation may be indicative of pregnancy. However, it may also be caused due to some other underlying causes like stress, poor health etc.**

b)Follicular phase/proliferative phase

The menstrual phase is followed by the follicular phase. During this phase, **the primary follicles in the ovary grow to become a fully mature Graafian follicle** and simultaneously the endometrium of uterus regenerates through proliferation.

- These changes in the ovary and the uterus are induced by changes in the levels of pituitary and ovarian hormones. The secretion of **gonadotropins (LH and FSH) increases gradually during the follicular phase** and stimulates follicular development as well as secretion of estrogens by the growing follicles.
- **FSH** (Follicle stimulating hormone) stimulate the growth of ovarian follicle to become mature ovarian follicle (graffian follicle).During the growth of ovarian follicle, the growing ovarian follicle secrete Steroid hormone called Estrogen.
- Estrogen helps in the proliferation of endometrium. Hence this phase of menstrual cycle is also called Proliferative phase.
- Follicular phase or menstrual phase lasts for about 8-12 days.

c) Ovulatory phase

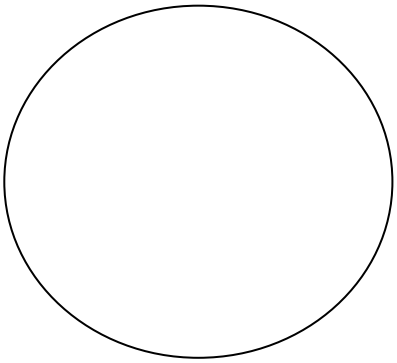
Both LH and FSH attain a peak level in the middle of cycle (about 14th day). Rapid secretion of LH leading to its maximum level during the mid-cycle called **LH surge** induces rupture of Graafian follicle and thereby the release of ovum (ovulation).

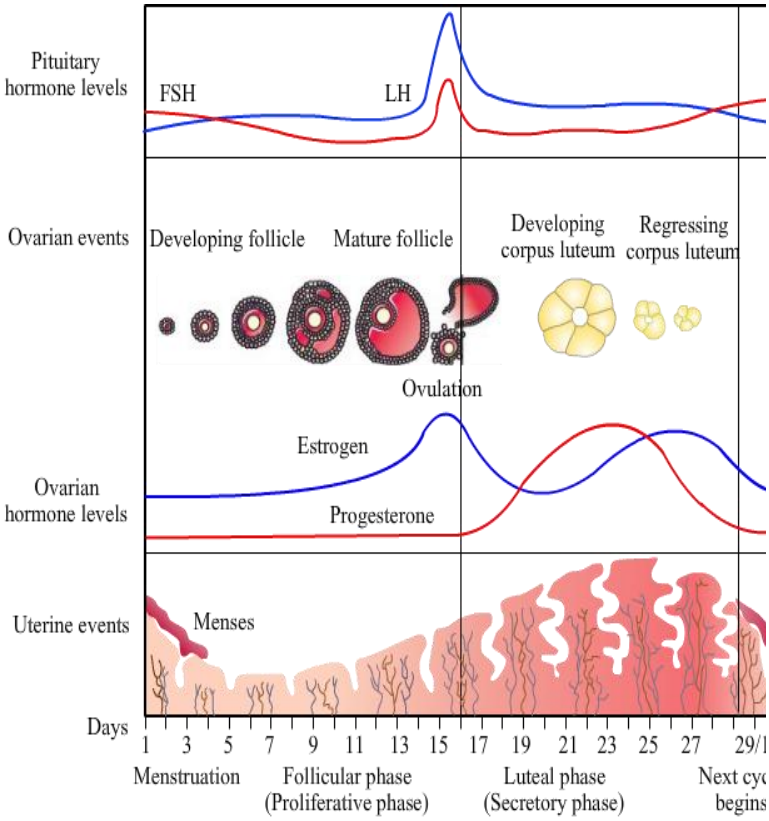
- Ovulatory phase is the **shortest phase** in the menstrual cycle.

d)Luteal phase/Secretory phase

The ovulation (ovulatory phase) is followed by the luteal phase during which the remaining parts of the Graafian follicle transform as the **corpus luteum.** The corpus luteum secretes large amounts of **progesterone** which is essential **for maintenance of the endometrium.** Such an endometrium is necessary for implantation of the fertilized ovum and other events of pregnancy**. During pregnancy all events of the menstrual cycle stop and there is no menstruation**.

- This phase lasts for about 14 days
- In the **absence of fertilisation**, the corpus luteum degenerates (and become corpus albican). This causes disintegration of the endometrium (because level of progesterone decreased) leading to menstruation, marking a new cycle
- **10-17** days of menstrual cycle is called **fertile period** (The remaining days are called **safety period**). because chance of fertilization is very high during this period.





Insemination

- During copulation (coitus) semen is released by the penis into the vagina (insemination).
- The motile sperms swim rapidly, pass through the cervix, enter into the uterus and finally reach **the junction of the isthmus and ampulla (ampullary-isthmic junction) of the fallopian tube**
- The ovum released by the ovary is also transported to the **ampullary-isthmic junction** where **fertilisation takes place**

Fertilisation

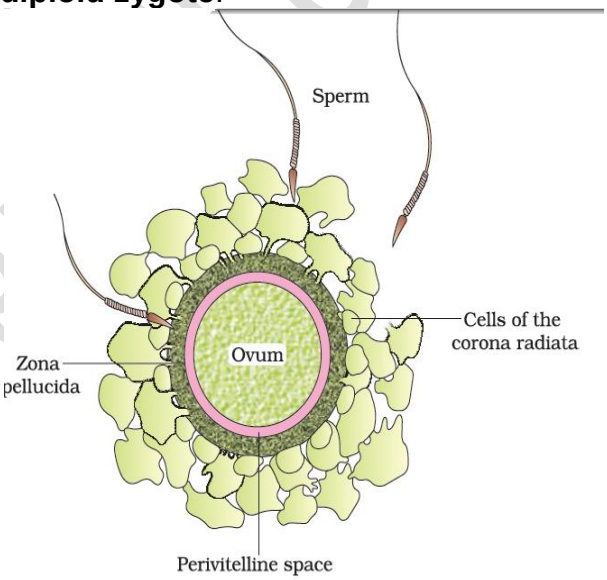
- The process of fusion of a sperm with an ovum is called fertilization.
- **Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary-isthmic junction. This is the reason why not all copulations lead to fertilisation and pregnancy.**

How Polyspermy is prevented ?

❖ 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 additional sperms (Prevent poly spermy).** Thus, it ensures that only one sperm can fertilise an ovum. The secretions of the acrosome help the sperm enter into the cytoplasm of the ovum through the zona pellucida and the plasma membrane.

❖ **This induces the completion of the meiotic division of the secondary oocyte. The second meiotic division is also unequal and result in the formation of a second polar body and a haploid egg.**

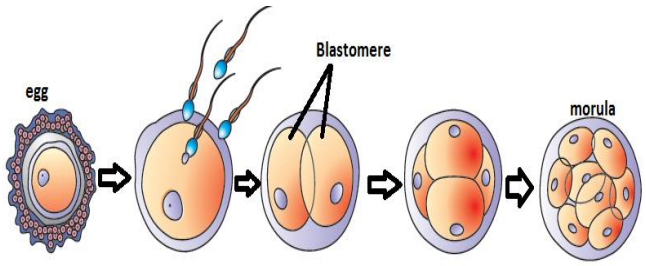
❖ **Soon the haploid nucleus of the sperm and that of ovum fuse together to form diploid zygote**.

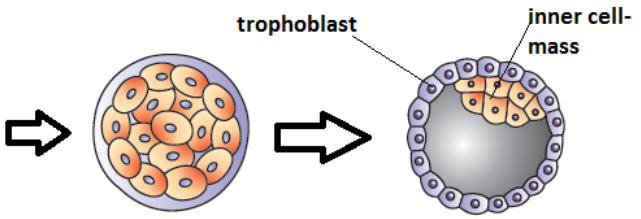


Ovum surrounded by few sperms

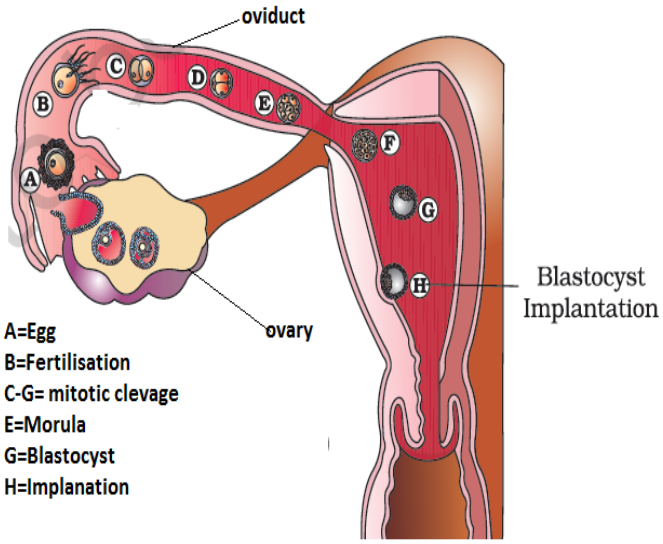
Clevage

- **After fertilzation zygote starts mitotic division . The mitotic division** starts as the zygote moves through the isthmus of the oviduct called cleavage towards the uterus and forms 2, 4, 8, 16 daughter cells called blastomeres.
- **The embryo with 8 to 16 blastomeres is called a morula** .
- The morula continues to divide and transforms into **blastocyst** as it moves further into the uterus.
- **The blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called the inner cell mass.**





- **The trophoblast layer of blastocyst then gets attached to the endometrium and the inner cell mass gets differentiated as the embryo**.
- After attachment, the uterine cells divide rapidly and covers the blastocyst. As a result, the blastocyst becomes embedded in the endometrium of the uterus . This is called **implantation** and it leads to pregnancy**.**
- **Immediately after implantation, the inner cell mass (embryo) differentiates into an outer layer called ectoderm and an inner layer called endoderm. A mesoderm soon appears between the ectoderm and the endoderm. These three layers give rise to all tissues (organs) in adults.**



Placenta

- 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 uterine tissue become interdigitated with each other and jointly form **a structural and functional unit between developing embryo (foetus) and maternal body called placenta**
- The placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo

Functions of placenta

1. The placenta facilitate the supply of oxygen and nutrients to the embryo
2. it helps in the removal of carbon dioxide and excretory/waste materials produced by the embryo.
3.Placenta also acts as an endocrine tissue and produces several hormones **like human chorionic gonadotropin (hCG), human placental lactogen (hPL), estrogens, progestogens, etc.**

- **hCG, hPL and relaxin** are produced in women only during pregnancy.

- In the later phase of pregnancy, a hormone called **relaxin** is also secreted by the **ovary.**

Gestation

The duration between fertilization and parturition is called gestation.

- **1st month** of pregnancy=**Heart** is formed
- 1st sign of growing foetus may be noticed by the listing to the heart sound
- By the end of **second month-Limbs and digits formed**
- By the end of **12 weeks** (1st trimester)= **major organs formed (Limbs and external genital organs formed)**
- **5th month= 1st movement of foetus, appearance of hair on head**

- By the end of **24th week** (2nd trimsester)= **Body covered with fine hairs, eye lids separate, eye lashes formed**
- By the end of **9 months** of pregnancy, =the foetus is fully developed and is **ready for delivery**

Parturition

The average duration of human pregnancy is about **9 months**. 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.

- Parturition is induced by a complex **neuro endocrine** mechanism.
- **The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex**. This triggers release of oxytocin from the **maternal pituitary**.
- **Oxytocin** acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin. The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the **birth canal (Cervical canal along with vagina is called birth canal)** – parturition.
- Soon after the infant is delivered, the placenta is also expelled out of the uterus.

Lactation

The mammary glands of the female undergo differentiation during pregnancy and **starts producing milk** towards the end of pregnancy by the process called **lactation**. This helps the mother in feeding the newborn. The milk produced during the initial few days of lactation is called **colostrum** which contains several antibodies (IgA) absolutely essential **to develop resistance for the new-born babies**. **Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby**.

- Milk synthesizing hormone is =PRL (Prolactin)
- Milk ejecting hormone is =OT(Oxytocin)
- Pregnancy hormone =Progesterone

Chapter 4

REPRODUCTIVE HEALTH

REPRODUCTIVE HEALTH

According to the World Health Organisation (WHO), **reproductive health means a total well-being in all aspects of reproduction, i.e., physical, emotional, behavioural and social**.

- ❖ Therefore, a society with people having physically and functionally normal reproductive organs and normal emotional and behavioural interactions among them in all sex-related aspects might be called reproductively healthy

REPRODUCTIVE HEALTH – PROBLEMS AND STRATEGIES

- **India** was amongst the first countries in the world to initiate action plans **(family planning-initiated in 1951**) and programmes at a national level to attain **total reproductive health as a social goal**
- Improved programmes covering wider reproduction-related areas are currently in operation under the popular name **'Reproductive and Child Health Care (RCH) programmes'.**
- **With the help of audio-visual and the print-media** governmental and non-governmental agencies have taken various steps to create awareness among the people about reproduction-related aspects.
- I**ntroduction of sex education in schools** should also be encouraged to provide right information to the young so as to discourage children from believing in myths and having misconceptions about sex-related aspects
- **Proper information about reproductive organs, adolescence and related changes, safe and hygienic sexual practices, sexually transmitted diseases (STD), AIDS, etc**., would help people, especially those in the adolescent age group to lead a reproductively healthy life.
- **Educating people,** especially fertile couples and those in marriageable age group, about available birth control options, care of pregnant mothers, post-natal care of the mother and child, importance of breast feeding, equal opportunities for the male and the female child, etc., would address the importance of bringing up socially conscious healthy families of desired size
- Awareness of problems due to uncontrolled population growth, social evils like sex-abuse and sex-related crimes, etc., need to be created to enable **people** to think and take up necessary steps to prevent them and thereby build up a socially responsible and healthy society.

Amniocentesis

it is the **prenatal foetal sex** determination test based on the chromosomal pattern in the amniotic fluid surrounding the developing embryo. **misuse** of **amniocentesis to determine the sex** of the unborn child. It is also used in the determining the chromosomal disorder

POPULATION EXPLOSION AND BIRTH CONTROL

- ❖ **The world population which was around 2 billion (2000 million) in 1900 rocketed to about 6 billions by 2000**
- ❖ **Indian population was approximately 350 million at the time of our independence reached close to the billion mark by 2000 and crossed 1 billion in May 2000.**
  Ie: every sixth person in the world is an Indian
- ❖ According to the **2001 census report**, the population growth rate was still around **1.7 per cent, i.e., 17/1000/year**, a rate at which our population could double in 33 years.

Reason for population explosion

1. **A rapid decline in death rate.**
2. **Decline in maternal mortality rate (MMR) .**
3. **Decline in infant mortality rate (IMR) .**
4. **Increase in number of people in reproducible age .**

- **Population growth rate can be checked by**
    1. Motivate smaller families by using various contraceptive methods.
    2. Showing advertisements in the media as well as posters/bills, etc., showing a happy couple with two children with a slogan Hum Do Hamare Do (we two, our two).
    3. Statutory raising of marriageable age of the female to 18 years and that of males to 21 years,
    4. incentives given to couples with small families.

Contraceptive methods

It help prevent unwanted pregnancies.

Quality of a good contraceptive method

An ideal contraceptive should be

1. user-friendly,
2. easily available,
3. effective and
4. reversible
5. no or least side-effects.
6. It should not interfere with the sexual drive, desire and/or the sexual act of the user.

- A wide range of contraceptive methods are presently available which could be broadly grouped into the following categories, namely

A)Natural/Traditional method
B) Barrier method
C) IUDs
D) Oral contraceptives,
E)Injectables
F)Implants
G) Surgical methods

A) Natural methods

Natural methods work on the principle of avoiding chances of ovum and sperms meeting.

i)Periodic abstinence :

- It is one of natural method in which the couples avoid or abstain from coitus from day **10 to 17 (Fertile period-Because chances of fertilization re very high during this period)** of the menstrual cycle when ovulation could be expected.
- Therefore, **by abstaining (Avoiding) from coitus during this period, conception could be prevented**

ii) Withdrawal or coitus interruptus :

- Here the male partner withdraws his penis from the vagina **just before ejaculation** so as to avoid insemination.

Iii)Lactational amenorrhea :(absence of menstruation)

- This method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition.
- Therefore, as long as the mother breast-feeds the child fully, chances of conception are almost nil.
- However, this method has been reported to be effective only upto a maximum period of **six months** following parturition.

1. **Adventages of natural methods :**
   No medicines or devices are used in natural , side effects are almost nil.
2. **Disdventage of natural methods:**
   Chances of failure by this method are also high

B) Barrier method

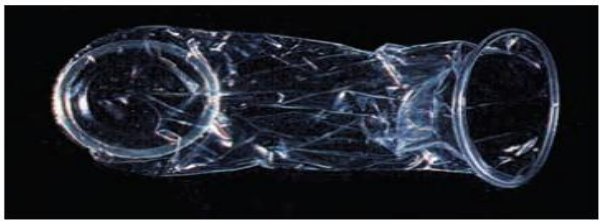
In **barrier** methods, ovum and sperms are prevented from physically meeting with the help of barriers. Such methods are available for both males and females.Barrier methods include

i) Condoms :

- they are barriers made of thin **rubber/ latex sheath**
- It is used to cover the **penis in the male or vagina and cervix in the female**,
- It is used just before coitus so that the ejaculated semen would not enter into the female reproductive tract. This can prevent conception.

‘ Nirodh’ is a popular brand of condom for the male.

Condom for male



Condom for female

Advantages of Condoms

1. Use of condoms protecting the user from contracting STDs and AIDS.
2. Both the male and the female condoms are disposable,
3. It can be self-inserted
4. It gives privacy to the user

ii) Diaphragms, cervical caps and **vaults**

- They are also barriers made of rubber
- They are inserted into the female reproductive tract to cover the cervix during coitus.
- **Mechanism of action :**
- They prevent conception by blocking the entry of sperms through the cervix.
- Spermicidal creams, jellies and foams are usually used alongwith these barriers to increase their contraceptive efficiency
- **They are reusable**.

C) IUDs (Intra Uterine Devices)

- These devices are inserted by doctors or expert nurses in the uterus through vagina.
- IUDs increase phagocytosis of sperms within the uterus
- These Intra Uterine Devices are presently available are

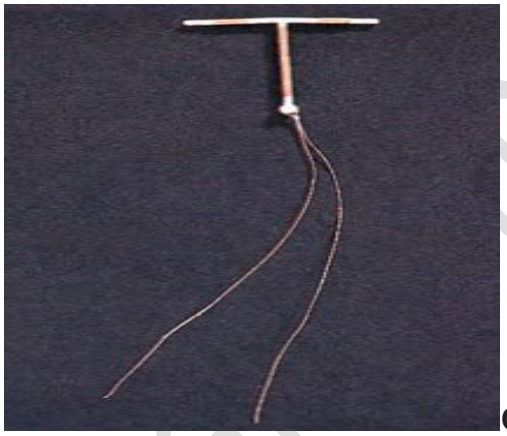
i) non-medicated IUDs

e.g., Lippes loop ,copper releasing IUDs (CuT, Cu7, Multiload 375)

Mechanism of action :

- ✓ Cu ions released suppress **sperm motility and the fertilising capacity of sperms**.

Non medicated IUD either retard the sperm motility or have the spermicidal effect



Cu-T

ii) hormone releasing IUDs

Eg:Progestasert, LNG-20

Mechanism of action :

- ✓ It make the uterus unsuitable for implantation
- ✓ It make and the cervix hostile to the sperms.
- ✓ Medicated IUD release certain hormones that alter the hormonal balance in the female body and prevent conception

IUDs are ideal contraceptives for the females who want to delay pregnancy and/or space children. **It is one of most widely accepted methods of contraception in India.**

D) Oral contraceptive

- Oral administration of small doses of either **progestogens or progestogen–estrogen** combinations is another contraceptive method used by the females.
- They are used in the form of tablets and hence are popularly called the **pills**.
- Pills have to be taken daily for a period of **21 days** starting preferably within the first five days of menstrual cycle. After a gap of 7 days (during which menstruation occurs) it has to be repeated in the same pattern till the female desires to prevent conception.

Mechanism of action:

- They inhibit ovulation and implantation
- It alter the quality of cervical mucus to prevent/ retard entry of sperms.

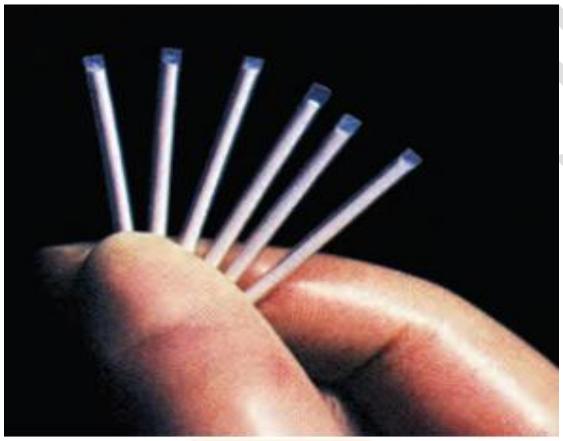
Advantage of pills

- Pills are very effective
- It has lesser side effects
- They are well accepted by the females.

- ***Saheli* –the new oral contraceptive for the females contains a non-steroidal preparation. It is a 'once a week' pill** with very few side effects and high contraceptive value. **'Saheli was developed by scientists at Central Drug Research Institute (CDRI) in Lucknow**

E) Injectabale ad Implants

- **Progestogens alone or in combination with estrogen** can also be used by females as injections or implants **under the skin**
- Their mode of action is **similar to that of pills and their effective periods are much longer.**



Implants

Emergency Contraceptive method

- Administration of progestogens or progestogen-estrogen combinations or IUDs within 72 hours of coitus have been found to be very effective as emergency contraceptives as they could be used to avoid possible pregnancy due to rape or casual unprotected intercourse.

G) Surgical Methods

- Surgical methods, also called **sterilisation,**
- They are generally advised for the male/female partner as a **terminal method to prevent any more pregnancies.**
- Surgical intervention blocks gamete transport and thereby prevent conception.
- The two types of surgical methods are Vasectomy and tuectomy

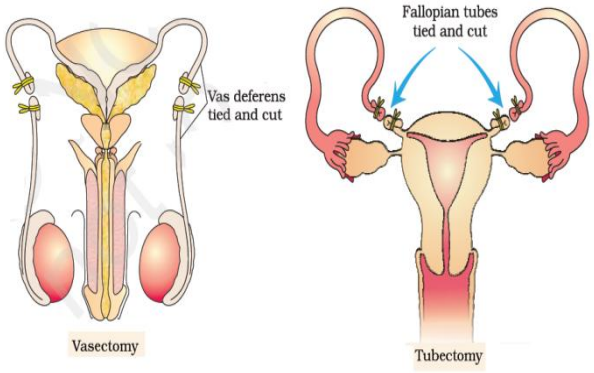
i)Vasectomy :

- Sterilisation procedure in the **male** is called 'vasectomy'.
- In vasectomy, a small part of the vas deferens is removed or tied up through **a small incision on the scrotum.**

ii)Tubectomy

- Sterilisation procedure in the **Female** is called tubectomy.
- in tubectomy, a small part of the fallopian tube is removed or tied up through a small incision in the **abdomen or through vagina.**

These techniques are highly effective but their reversibility is very poor.



ill-Effect of the usage of contraceptive methods

ill-effects like nausea, abdominal pain, breakthrough bleeding, irregular menstrual bleeding or even breast cancer, though not very significant, should not be totally ignored.

MEDICAL TERMINATION OF PREGNANCY (MTP)

- Intentional or voluntary termination of pregnancy before full term is called **medical termination of pregnancy (MTP) or induced abortion.**

- **Nearly 45 to 50 million MTPs are performed in a year all over the world which accounts to 1/5th of the total number of conceived pregnancies in a year.**
- Obviously, MTP has a significant role in decreasing the population though it is not meant for that purpose. Whether to accept /legalise MTP or not is being debated upon in many countries due to emotional, ethical, religious and social issues involved in it.
- **Government of India legalised MTP in 1971** with some strict conditions to avoid its misuse. Such restrictions are all the more important to check indiscriminate and illegal **female foeticides** which are reported to be high in India.

WHY MTP….??

MTP is –

i) to get rid of unwanted pregnancies either due to casual unprotected intercourse or failure of the contraceptive used during coitus or rapes.

ii) MTPs are also essential in certain cases where continuation of the pregnancy could be harmful or even fatal either to the mother or to the foetus or both.

MTPs are considered relatively safe during the **first trimester, i.e., upto 12 weeks of pregnancy**. Second trimester abortions are much more riskier.

Why MTP legalized in India…?

Dangerous trend is the misuse of **amniocentesis to determine the sex** of the unborn child. Frequently, if the foetus is found to be female, it is followed by MTP- this is totally against what is legal. Such practices should be avoided because these are dangerous both for the young mother and the foetus.

SEXUALLY TRANSMITTED DISEASES (STDS)

Diseases or infections which are transmitted through sexual intercourse are collectively called sexually transmitted diseases (STD) or venereal diseases (VD) or reproductive tract infections (RTI).

Eg :**Gonorrhoea (*Nisseria gonorrhea*)**
Syphilis (*Treponema pallidum*)
genital herpes (*Herpes simplex virus*)
chlamydiasis (*Chlamydia trachomatis* **)**
genital warts (*Human pappiloma virus*)
trichomoniasis (*Trichomonas vaginalis* **)**
hepatitis-B (HBV)

- Except for hepatitis-B, genital herpes and HIV infections, other diseases are completely curable if detected early and treated properly.

Hepatitis–B and HIV can also be transmitted by sharing of injection needles, surgical instruments, etc., with infected persons, transfusion of blood, or from an infected mother to the foetus too

Symptoms of STD

Early symptoms of most of these are minor and **include**

- **itching,**
- **fluid discharge,**
- **slight pain,**
- **swellings, etc., in the genital region**.

Infected females may often be asymptomatic and hence, may remain undetected for long.

STD leads to which include

- **Pelvic inflammatory diseases (PID),**
- **Abortions,**
- **Still births,**
- **Ectopic pregnancies (Tubular pregnanacy),**
- **Infertility**
- **Cancer of the reproductive tract**

STD can be prevented by

1. Avoid sex with unknown partners/multiple partners
2. Always use condoms during coitus.
3. In case of doubt, one should go to a qualified doctor for early detection and get complete

treatment if diagnosed with disease.

Infertility

Inability to conceive or produce children even after two years of sexual co-habitation is called infertility.

The reasons for this could be many–

- physical
- congenital,
- diseases,
- drugs,
- immunological
- psychological

- In India, often the female is blamed for the couple being childless, but more often than not, the problem lies in the male partner.
- **Specialised health care units** called **infertility clinics** could help in diagnosis and corrective treatment of some of these disorders and enable these couples to have children. However, where such corrections are not possible, the couples could be assisted to have children through certain special techniques commonly known as **assisted reproductive technologies (ART).** The ART includes the following

a) ***In vitro* fertilization and Embryo transfer (IVF-ET)-**

- Fertilisation outside the body is called Invitro fertilisation.
- Invitrofetilisation is done in almost similar conditions (as that in the body) followed by **embryo transfer.** This method is popularly known as **test tube baby** programme.

Steps/Procedure in IVF-ET

- Ova/Egg from the wife/donor (female) and sperms from the husband/donor (male) are collected
- Oth sperm and egg are induced to form zygote under simulated conditions in the laboratory (**This step is called IVF)**
- The zygote or early embryos thus formed (**with upto 8 blastomeres**) could then be transferred into the fallopian tube (ZIFT**– zygote intra fallopian transfer**) and embryos with **more than 8 blastomeres**, into the uterus (IUT **– intra uterine transfer**), to complete its further development. (This step is called Embryo transfer)
- Embryos formed by **in-vivo fertilisation** (fusion of gametes within the female) also could be used for such transfer to assist those females who cannot conceive

b) GIFT

Transfer of an ovum collected from a donor into the fallopian tube (GIFT – **gamete intra fallopian transfer**) of another female who cannot produce one, but can provide suitable environment for fertilisation and further development is another method attempted.

c) Intra cytoplasmic sperm injection (ICSI)

it is another specialised procedure to form an embryo in the laboratory in which a sperm is directly injected into the ovum.

d)AI (Artificial insemination):

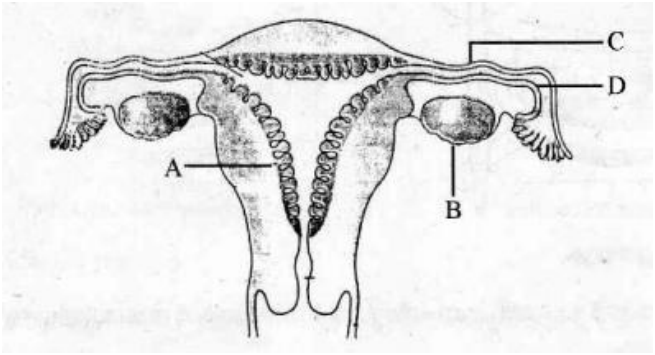
infertility cases either due to **inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates**, could be corrected by **artificial insemination** (AI) technique.

In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI – **intra-uterine insemination**) of the female.

Previous year question paper

HSE-March-2019

1. The milk produced during the initial few days of lactation is called…….. (1)
2. "The sex of the baby is determined by the father and not by the mother."
   Do you agree with this statement? Substantiate your answer. (2)



3. A wide range of contraceptive methods are presently available. If so, (2)
   (a) Name one contraceptive method having least side effect.
   (b) Which contraceptive method is generally advised for females as a termination method to prevent any more pregnancies ?
   (c) List out any two possible ill-effects of the usage of contraceptive methods.
4. (a) Expand STDs.
   (b) Cite any two examples for STD.
   (c) Suggest any two methods for the prevention of STDs. (3)

HSE-Model-2019

5. Name the loose pouch of skin which suspended testis outside the abdominal cavity ? (1)
6. Note the relationship between the first two words and suggest a suitable word for the 4th place,
   a) Female: Tubectomy, male:……(1/2)
7. Mothers milk is considered as very essential for a new born baby.
   a) Name the first milk released from the mother just after birth. (1)
   b) What is its importance? (1)
8. Suggest any 3 methods to assist infertile couple to-have children (3)

HSE-March-2018

9. Name the cells in testis which synthesize and secrete androgens? (1)
10. Different contraceptive methods are given below. Pick out the odd one (1)
    a)Cu T b)Saheli
    c)Multiload 375 d)Lippes loop
11. In a class room discussion, a student said that sex of the baby is determined by the father. Analyse the statement and give reason for it ? (2)
12. Different contraceptive methods are used to control population explosion. Summarise the natural method and barrier method of contraception ? (2)
13. Sexually transmitted disease (STD) are mainly transmitted through sexual contact (3)
    a)Name any two examples of STD?
    b)Explain any two methods adopted to prevent STD ?

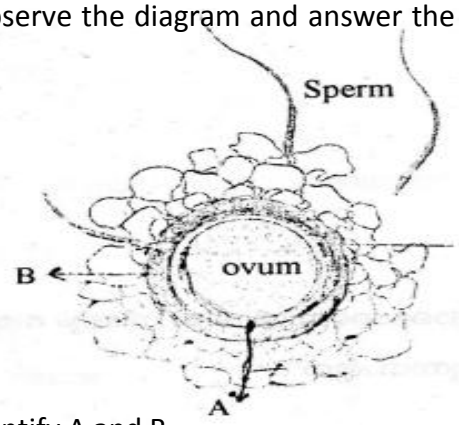
HSE-March-2018 Model Exam

14. The middle layer of uterus is called…… (1)
15. Vasectomy and tubectomy are said to be effective and irreversible contraceptive methods. Differentiate between these two methods. (2)
16. From an infertility clinic a doctor advised a childless couple to undergo GIFT.
    l. Expand GIFT
    2. Mention the steps involved in this procedure (2)

HSE-JUNE-2017

17. Human female possess 44+XX chromosome number. The chromosome number of secondary oocyte is (1)
    a)44+XX b)22+X c)44+XX d)22+XX

18. Observe the diagram and answer the question (2)



a) Identify A and B
b) Write the function of B

19. Prepare a brief notes to be presented in an awareness programme for adolescent about AIDS, their causes and preventive measures? (3)

HSE-March-2017

20. Which of the following pairs of STDs is completely curable ? (1)
    a)HIV, Hepatitis B
    b)Hepatitis B, Gonorrhoea
    c)Symphils, Gonorrhoea
    d)Chlamydomonas, Genital Herpes
21. Feeding.....in the first few days is essential for preventing infection in a newly born baby (1)
22. LH and FSH are gonadotrophins. Distinguish their roles in male and female? (2)
23. What is ART ? Categorize the following ART's based on their application in male sterility and female sterility:
    GIFT, AI

HSE-SAY-2016

24. The process of fusion of sperm with ovum is called..... (1)
25. Match the column A and B (2)

A	B
Ovulation	Sperm
Luteal Phase	Oogenesis
Acrosome	Blasto cyst
Inner cell mass	LH
	Progesterone

26. Select the odd one and justify your selection?
    Malaria, Gonorrhoea ,Amoebiasis, filariasis (1)
27. Diagnostic report of two couples having infertility problem are given below : (2)
    1) The Women cannot produce ovum
    2) The man has very low sperm count in semen.
    Suggest a suitable assisted reproductive technology (ART) for each problem in expanded form.

HSE-March-2016

28. Breast feeding during initial period of infant growth is necessary to develop immunity of new born babies. Why ? (1)
29. Categorise the given birth control methods into three groups with proper heads.
    (Cervical caps, Vasectomy, Cu T, Tubectomy, Diaphragms, Condoms, Lippes Loop) (3)
30. match the columns A and B (2)

A	B
Corpus Luteum	Embryo
Leydig cells	Implantation
Blastocyst	Progesterone
Inner cell mass	Androgens
	Prolactin

HSE-June-2015

31. Choose the odd one from the following and write common features of others. (1)
    a)Estrogen b)Anrogen c)Relaxin
    d)Progesterone

32. Some techniques commonly used for infertility treatment are given below. Read them carefully and answer the question (3)

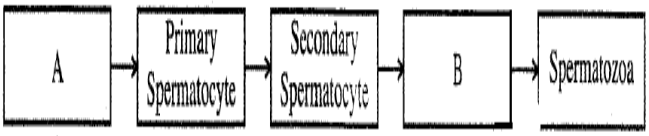
ZIFT,GIFT,ICSI,IUI,IVF

a)which of the above techniques is used for the collection of sperm from the husband or a healthy donor and artificially introduced into the vagina or uterus of the female?

b)Distinguish between ZIFT and GIFT

c)Write the common term used to denote the techniques given below ?

33. Complete the flow chart showing spermatogenesis by filling A and B and answer the question (2)



a)what is the chromosome number of primary spermatocyte?

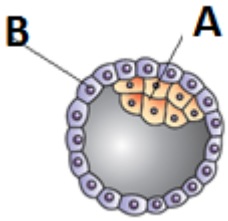
b)what is the significance of reduction division in spermatognenesis?

HSE-March-2015

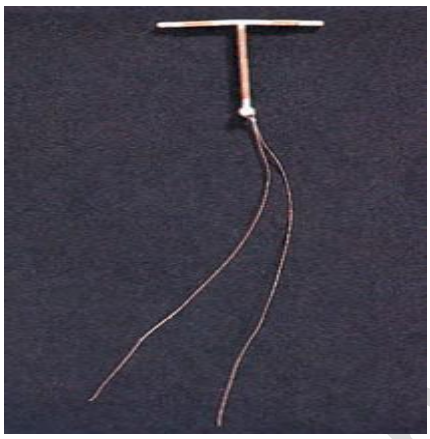
34. 1)In which part of human reproductive system the following events occur? (2)

a)Fertilisation b)Implantation

2)Diagram of a Human blastocyst is given below .Identify A and B



35. It is evident that, it is the genetic makeup of the sperm that determine the sex of the child in human being. Substantiate. (2)
36. Identify the diagram and write how it acts (1)



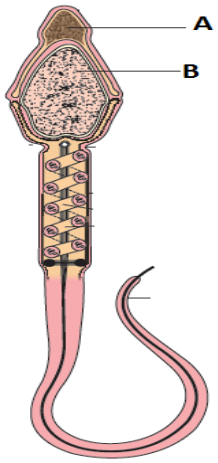
37. Mothers milk is considered essential for new born infants (1)

a)Name the fluid secreted by mother from breast during the initial days of lactation

b)What type of immunity it provides

HSE-SAY-2014

38. ..... and .....are two surgical contraceptive methods in male and female respectively (1)
39. Diagram of mammalian sperm is given below. Label the parts marked (1)



40. Sex of the bay is determined by the father, not by the mother. Substatntiate? (2)
41. Amniocentesis for sex determination is banned in our country? Is this Ban necessary? Comment one use of amniocentesis? (2)

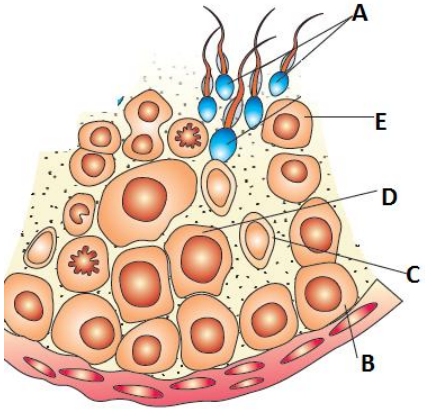
HSE-MARCH-2014

42. Observe the diagram and answer the question (3)

a) Identify A and B

b) What is the function of C

c) In which of the marked part reduction division takes place? What is the significance of it?



43. One of our neighbour is suffering from itching, fluid discharge, slight pain and swelling in the genital region (2)
a)What do you think the disease he is suffering from?
b)What measures are to be taken to prevent such disease

44. Expand the following abbreviations which are commonly used in reproductive health (1)
a)ART b)ZIFT

HSE-SAY-2013

45. Though one ovum is produced from a primary oocyte it can result into a male or female child after fertilisation. But in these case of spermatocyte though 4 sperms are produced only two of the can result to a female child after fertilisation justify? (1)

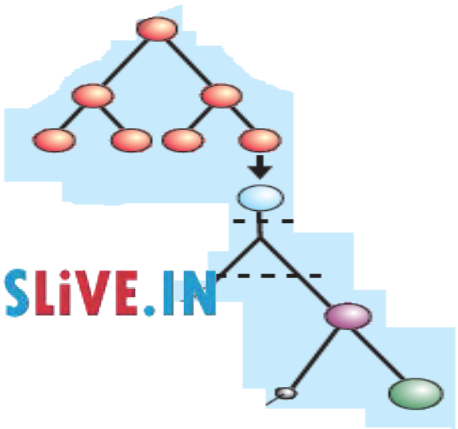
46. Sterilization and IUDs are effective birth control measures, but lactational amenorrhoea may not be so effective
a)How the sterilization procedure of male differ from that of female in preventing pregnancy? (2)
b) Which part of the female reproductive organ is utilized for the IUD procedure? How this procedure prevents pregnancy? (2)
c)Why the lactational amenrrhoea is not so effective? (1)

HSE-MARCH-2013

47. The following statements compare the process of Oogenesis and spermatogenesis. Which one is not true
a)Production of ovum ceases at certain age, but sperm production continues even in old men
b)Oogenesis begins in the embryonic stages, but spermatogenesis starts at the oneset of puberty.
c)Meiotic arrest occurs both in Oogenesis and spermatogenesis.
d)Polar bodies are formed in Oogenesis (1)

48. Suggest the ART which may be successful in the following conditions (3)
a)A female cannot produce an ovum, but can provide suitable environment for fertilization and further development
b)Male partner is unable to inseminate the female or has very poor sperm count
c)Fusion of gamete and zygote formation doesnot occur within the body of female

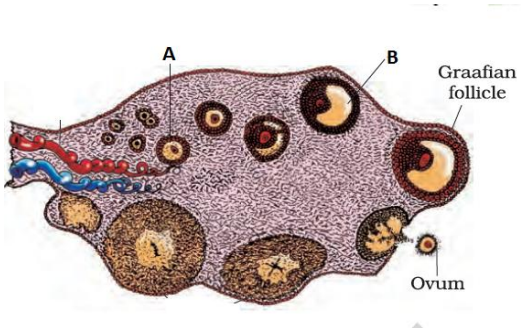
49. The diagram represents a process of gametogenesis. Closely observe it and answer the following (2)
a)Is it spermatogenesis or Oogenesis?
b)What does smaller shaded circle represent?
c)Write down two significance of production of same?



HSE-SAY-2012

50. Find out the odd one from the following, write the reason (1)
a)Cu T, b)Cu 7 c)LNG-20 d)Multiload-375

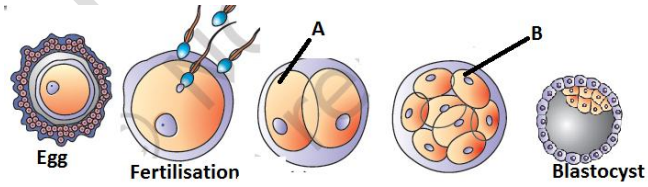
51. One couple came to know that they have a girl child during fourth month of pregnancy and they decided to do MTP (2)
    a)What is MTP?
    b)At which stage of pregnancy MTP relatively safe?
    c)How will you respond to the decision of female foeticide by the couple?
52. Observe the diagram provided (do not copy the picture) (3)



    a)Label A and B
    b)On which day of menstrual cycle Graffian follicle rupture?
    c)Name the process induces the rupture of graffian follicle
    d)Write the name and function of the structure forming inside the ovary after rupture of Graffian follicle?

HSE-March-2012

53. "STDs present a major health concern in both industrialization and developing countries"(3)
    a) What you meant by STD?
    b) Name two STDs?
    c) Suggest two preventive measures?
54. Some stages of embryonic development are given below. Observe these diagram and answer the question (3)



    a)What is A and B?
    b)Name the two types of cells found in the Blastocyst?
    c)Which layer of blastocyst is attached to the endometrium? And Name the process?

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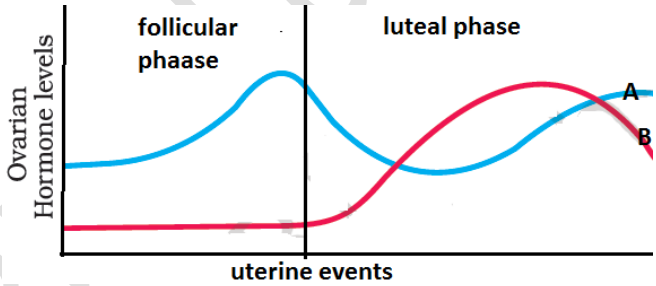
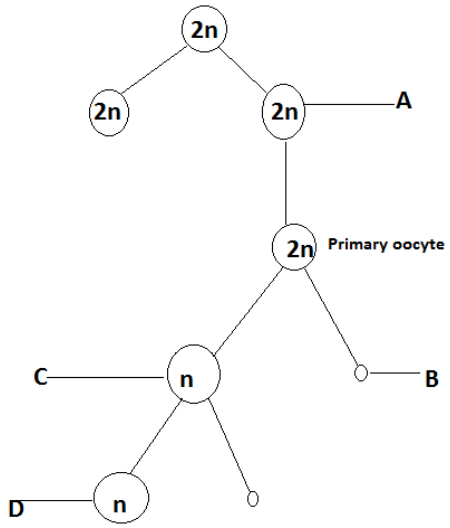
55. Note the relationship between first two terms and suggest a suitable terms for the fourth place (1)
    a)Progesteron : Corpus luteum
    HCG : .....
    b)GIFT : Gamete
    ZIFT : .....
56. Observe the Graph provided



    a)What do A and B stands for? (1)
57. Nalini is four month pregnant at the insistence of her mother in law, she underwent an illegal diagnostic procedure by which the sex of the baby was determined to be female . Nalini's mother in law cursed her for conceiving a girl child.
    a)What is the diagnostic procedure used here?
    b) "scientifically, Nalini is not responsible for conceiving a girl child". How will you substantiate this statement? (1)
58. Observe the diagram provided and identify the process: (2)



a)Label; A,B,C and D

b)Why the gametes produced are haploid even though the gamete mother cells are diploid?

59. Raju has lost his mother at birth. He is unhealthy and contract diseases easily. In his Doctor's opinion, Raju's ill health is due to his not drinking mother's milk.
How will you justify the doctor's opinion in the light of your knowledge of immunity? (2)

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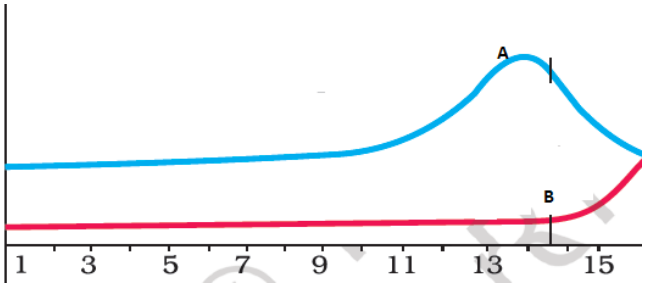
60. One among the contraceptive method is peculiar. Find the odd one and what is the common among others? (1)
a)Periodic abstinence
b)coitus interruptus
c)Lactational amenorrhea
d)IUDs

61. The treatment facility advertised on the brochure of a private clinic is shown below
a)Can you suggest what type of clinic is?
b)Make a brief note on any three of the treatment procedure? (2)

IVF	ZIFT	GIFT	IUI

62.



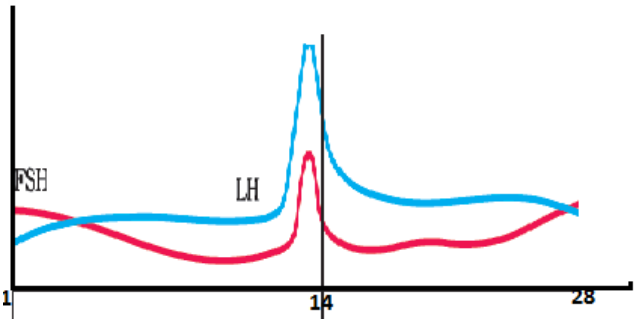
The above graph shows the level of ovarian hormones in a normally menstruating women during follicular phase (3)
a)Name A and B
b)Mention the role of pituitary hormones in maintaining this condition
c)Reconstruct the graph for luteal phase?

HSE-SAY-2010

63. Select the ART that uses an early embryo with upto 8 blastomeres (1)
a)ZIFT)IUT c)GIFT d)IUI

64. The total population in India is alarmingly increased to 1 billion according to 2001 censes. The population growth rate was still around 1.7%, a rate at which our population could be double in 33 years
Cite the probable reasons for such an increase in population growth rate? (2)

65. The graph shown below shows the levels of LH and FSH at various stages of menstrual cycle. (3)



a)Name the source of LH and FSH
b)The level of LH is maximum during the middle day of cycle. Mention its effect?
c)Note the function of LH in male?

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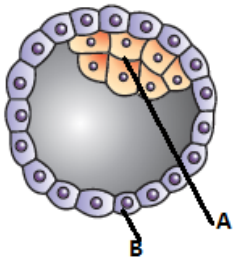
66. Given below is the diagrammatic representation of Human blastocyst. Observe the diagram and answer the following questions. (2)



a)Identify A and B

b)Write the function of A and B

67. When the urine sample of a lady is tested, presence of Human chorionic gonadotropin (HCG) was detected (2)

a)What does the presence of HCG indicate?

b)Which is the source of HCG?

68. Diagram shown below is a surgical method used for female sterilization (2)

a) What is the method shown in the diagram?

b) Mention any two IUDs to prevent conception?

c)what is surgical method of male sterilization called?