The Reproductive System

Reproduction is the formation of new individuals by sexual or asexual means which can repeat the process on their own.

Patterns of Reproduction

Asexual Reproduction	Sexual Reproduction
• Involves reproduction through any part of the body. Male and female gametes are absent.	• Involves the fusion of male and female gametes.
• It is a simple process of cell division.	• The fusion of male and female gametes forms a zygote from which develops a new individual. This process is known as **fertilisation**.
• Examples: Binary fission in amoeba, budding in hydra	• Example: Reproduction in multi-cellular organisms

Secondary Sexual Characters

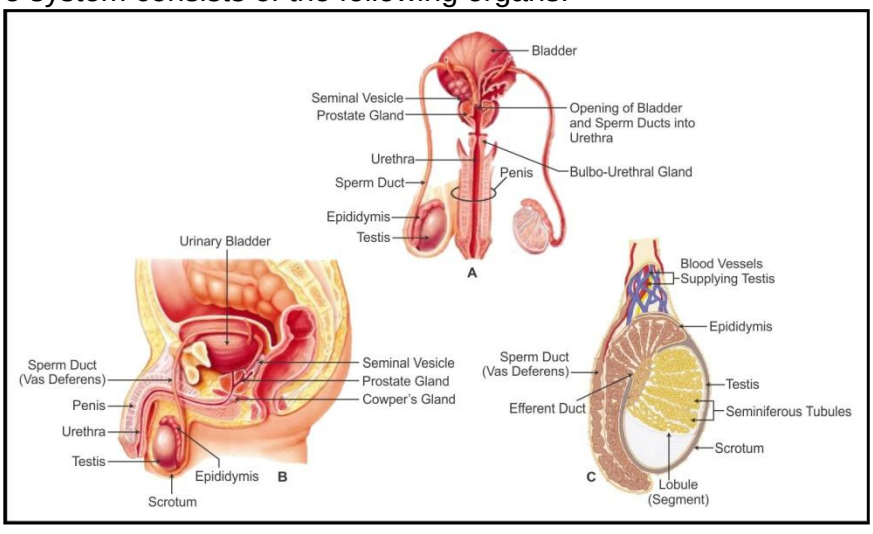
Males and females show outwardly differentiating features called secondary sexual characters.

In Males	In Females
• Distribution of hair on the body and face (beard and moustache)	• Breasts in females
• Muscularity and strong built	• Femininity and larger hips
• Deep voice	• High-pitch voice

Reproduction in Humans

Male Reproductive System

The male reproductive system consists of the following organs:



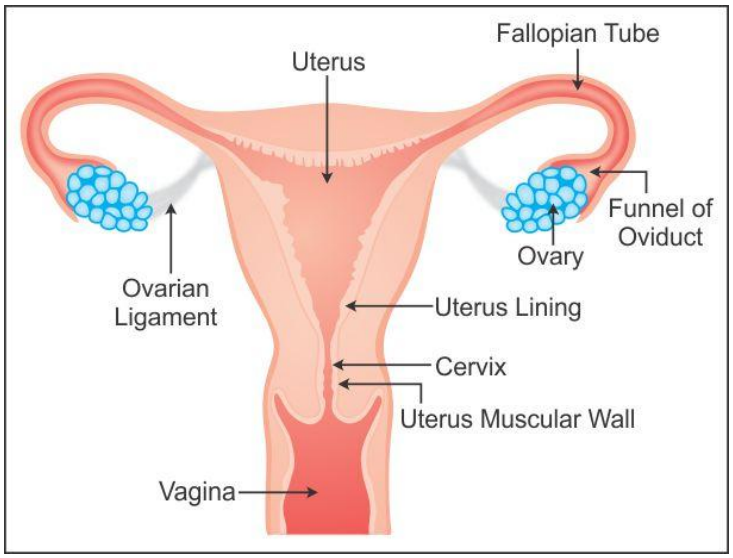
1. Testes (Testicles)	**Location of Testes**	• Pair of oval glands located in a thin-walled sac called scrotum located outside the body cavity.
		• The scrotal sac is suspended outside the body. Its temperature is 2–3°C lower than the body temperature.
		• In abnormal conditions when the testes do not descend into the scrotum, it results in sterility, i.e. incapability of producing sperms.
	Structure of Testes	• Each testis is encased in a capsule. The capsule is internally divided into 15–20 lobules. Each lobule contains seminiferous tubules.
	• Seminiferous Tubules	• Sperms are produced in the seminiferous tubules by the process of **spermatogenesis**.
	• Interstitial Cells (Leydig Cells)	• They produce the male hormone **testosterone**.
	• Epididymis	• The sperms from the seminiferous tubules pass into 12–14 **efferent ducts**. • These ducts further join to form the **epididymis**. • The epididymis stores the sperms when they mature.
	• Vas deferens (sperm duct)	• It is about 45 cm long. • The two vas deferens loop over the ureters and join the urethra.
		Hernia: Due to pressure of the abdomen, the intestines bulge into the scrotum through the inguinal canal.
	• Ejaculatory Duct	• The vas deferens and the seminal vesicles unite to form the ejaculatory duct. • It ejects sperms into the urethra just before ejaculation.
2. Accessory Glands	• Seminal Vesicles	• A pair of lobulated glands. • Produce an alkaline fluid. It constitutes about 60% of the total volume of the semen.
	• Prostate Gland	• It is a bilobed structure. • It pours an alkaline secretion into the semen. This secretion constitutes about 13–33% of the semen.
	• Bulbo-urethral Gland (Cowper's Gland)	• Two small ovoid glands. • Its secretion serves as a lubricant.

3. Penis		• It is the passage for both urine and semen. • It is a highly vascular organ with erectile tissues and vascular spaces. • Under the influence of sexual stimulation, blood flows in large amounts into the vascular spaces of the penis, which makes it erect. Such a condition is called **erection**.

Semen: It is the mixture of sperms and secretions from the prostate and Cowper's glands. It is a milky fluid.

Female Reproductive System

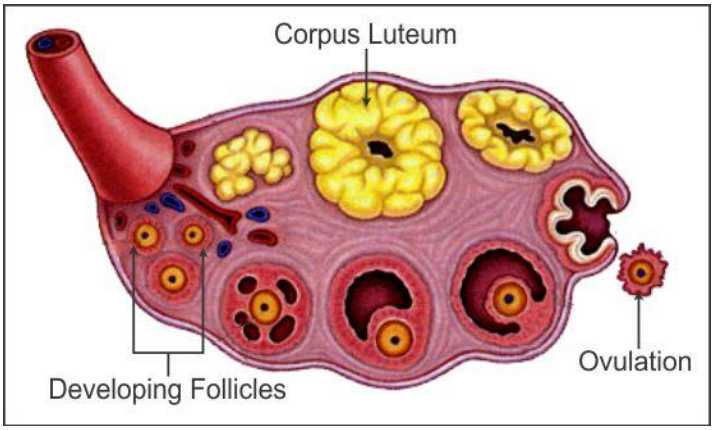
The female reproductive system consists of the following parts:



1. Ovaries	• Two ovaries are present in the pelvic cavity, one on each side of the uterus. • Ovaries produce ova by the process of oogenesis.
2. Oviducts	• The two oviducts or fallopian tubes are about 12 cm long and attached to the lateral ends of the ovaries. • The open distal end of the ducts is funnel-shaped and called **oviduct funnel, infundibulum** or **ostium**. • The infundibulum has finger-like projections called **fimbriae** which help to push the released ovum into the oviduct.
3. Uterus	• Hollow pear-shaped, muscular organ. • The internal wall of the uterus is lined by tissue layers. The innermost layer is called the **endothelium** which is lined by the ciliated epithelium. • It protects and nourishes the developing embryo.
4. Vagina	• It is a muscular tube about 10–15 cm long. • It extends from the cervix to the outside. • It receives the male penis during copulation. • It also serves as the passage during childbirth.
5. Vulva	• It is the external female genitalia. • It contains independent openings of urethra and vagina.

Ovulation

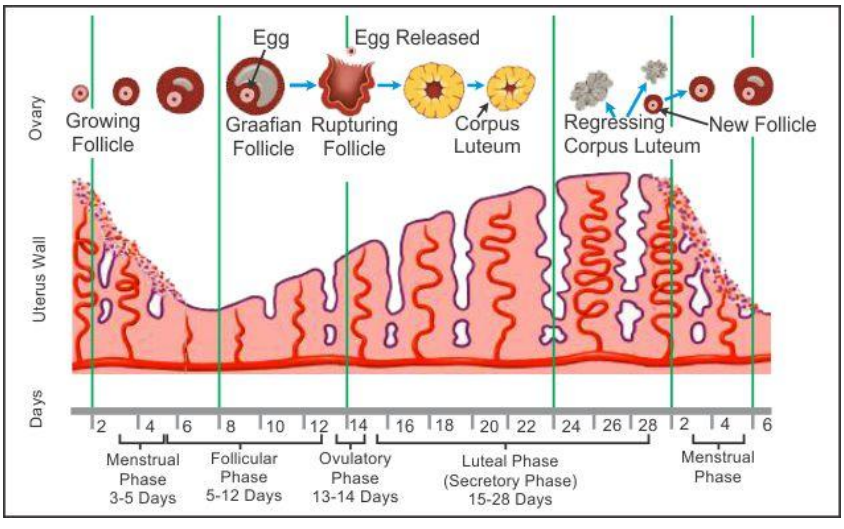
- Ovulation is the release of the mature ovum by the rupture of the Graafian follicle.



- The Graafian follicle bursts and releases the ovum into the infundibulum of the fallopian tubes.
- The remnant of the follicle persists for some time and converts into a yellow mass called the **corpus luteum**.
- The corpus luteum is an endocrine tissue. It secrets two hormones:
- **Oestrogen:** This hormone is secreted by the follicle before ovulation.
- **Progesterone:** It prepares the uterus for the implantation of the embryo.

Menstrual Cycle

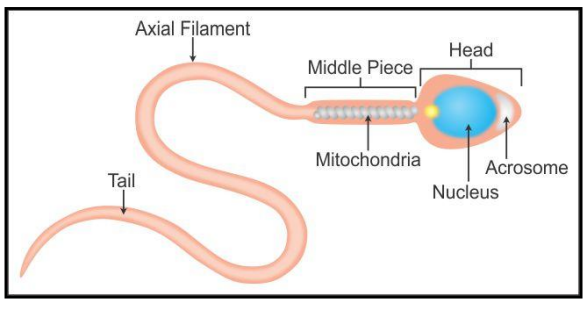
- The reproductive period of the human female starts from about 13 years and continues till about 45–50 years.
- This period is marked by a characteristic event repeated almost every month. It is called the **menstrual cycle**.



1. Menstrual Phase	• Lasts for 3–5 days. • During this phase, the blood is discharged.
2. Follicular Phase	• As the follicle grows, it finally matures into the Graafian follicle. • Oestrogen stimulates the thickening of the uterine endometrium.
3. Ovulatory Phase	• On about the 13th or 14th day, the follicle ruptures, and the released ovum travels down the fallopian tube.
4. Luteal Phase	• It lasts for 15–28 days. • The uterus lining thickens further. • Empty follicle turns into the corpus luteum. • The corpus luteum secretes oestrogen and progesterone. • If fertilisation does not occur, then the ovum disintegrates, and the endometrial lining starts shedding on the 28th day. • If fertilisation occurs, then the embryo gets implanted in the uterine wall and there is no menstrual flow.
Menarche and Menopause **Menarch** is the onset of menstruation in a young female at about the age of 13 years. **Menopause** is the permanent stoppage of menstruation at about the age of 45 years.	
Puberty The period during which the immature reproductive system in boys and girls matures and becomes capable of reproduction.	

Fertilisation

- **Fertilisation** is the fusion of the male gamete (sperm) and the female gamete (ovum) to form a zygote.
- During copulation, the sperms are released into the vagina near the cervix of the uterus.
- These sperms actively pass through the passage of the cervix into the uterine cavity.
- Of the millions of sperms released into the vagina, very few are able to reach the upper parts of the oviducts. The rest die on the way and are absorbed.



A. Acrosome
- It is located in the head region of the sperm.
- The enzyme present in the acrosome facilitates the entry of the sperm into the ovum by dissolving its wall.

B. Nucleus
- The nucleus of sperms contains genetic material (22 + X/22 + Y chromosomes).

C. Mitochondria
- The mitochondria are contained in the middle piece.
- It provides energy (ATP) for the swimming activity of the sperm.

D. Tail
- The tail part helps the sperm in its forward movement while crossing the passage of the cervix.

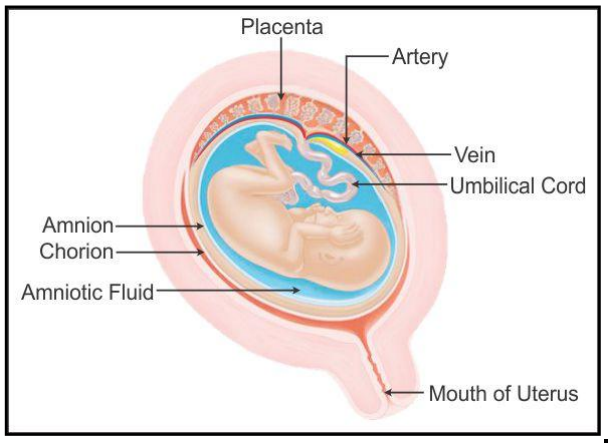
Implantation

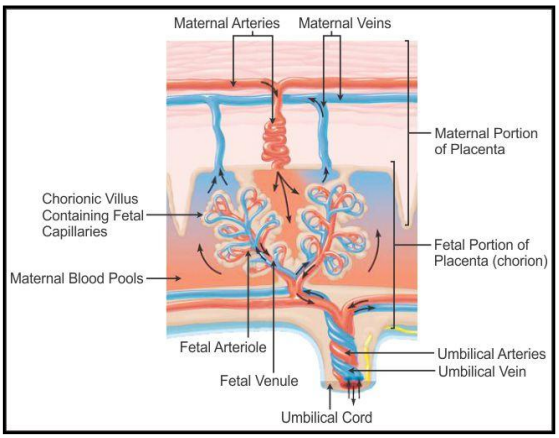
It is the process during which the developing embryo adheres itself to the endometrial lining of the uterus.

The **embryo** is a growing egg after fertilisation until the main parts of the body and the internal organs have started to take shape.

The **foetus** is the stage when the embryo starts looking like a baby, usually from 7 weeks of gestation.

Placenta





- It is a tissue which supplies oxygen and nutrients to the developing foetus and carries away nitrogenous wastes and carbon dioxide.
- It is a disc-like structure attached to the uterine wall.
- The umbilical cord containing blood vessels connects the placenta with the foetus.
- The placenta does not allow the entry of germs from the mother to the foetus, but viruses (e.g. HIV) can pass through the placenta if the mother is already infected.
- The placenta secretes the hormones oestrogen and progesterone.

Functions of Placenta

From Mother to Foetus	Oxygen
	Amino acids
	Glucose
	Vitamins
	Minerals
	Fats and lipids
From Foetus to Mother	Carbon dioxide
	Urea
	Waste products

Amnion

- It is a sac which develops around the embryo even before the formation of allantois.
- The amniotic fluid fills the space between the amnion and embryo.
- The amniotic fluid protects the embryo from physical damage by jerks and mechanical shocks.

Parturition

- The full term of the development of an embryo in the uterus is called **gestation**.
- In humans, it lasts for about 280 days.
- At the time of birth, the baby is pushed out by contractions of the muscles of the uterus.
- After some time, the umbilical cord shrinks and can be tied and cut.
- After about 15 minutes, the placenta breaks from the uterus and is expelled out after birth.
- The newborn announces its arrival with a sharp cry. This cry indicates the clearing process of the baby's respiratory passage.

Fraternal Twins

Two eggs are released from the ovaries at a time and both may get fertilised, resulting in the birth of fraternal twins.

Identical Twins

A single fertilised egg may split during the early stages of cell division, resulting in the birth of both boys or both girls.

Triplets

Three babies are born from a single zygote, or sometimes, two eggs are fertilised—one zygote is split, producing identical twins, and the other zygote develops into a normal baby.

Quadruplets

Four babies are produced as two pairs of identical twins or in combination of identical and fraternal twins.