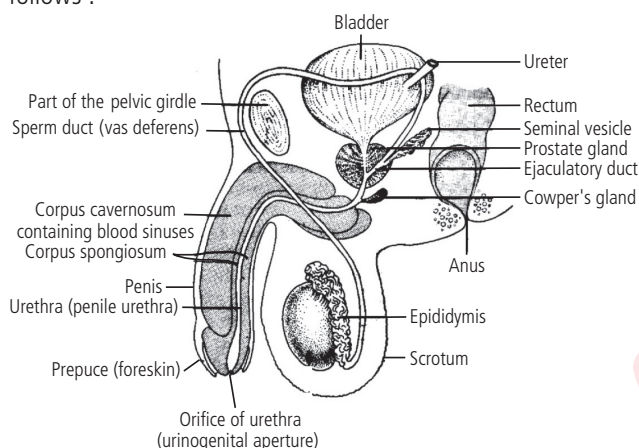


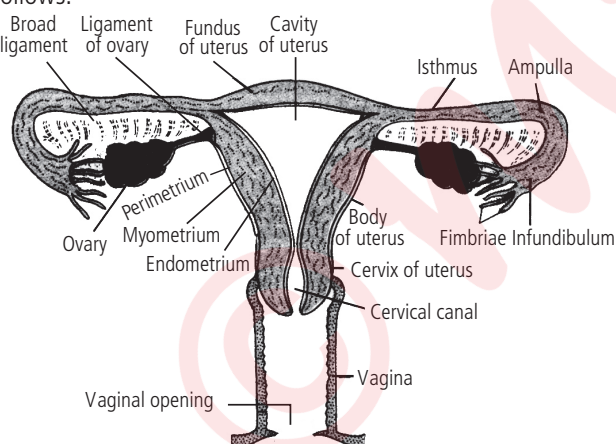
Human Reproduction

Topic 1

1. The labelled diagram of male reproductive system is as follows :



2. The labelled diagram of female reproductive system is as follows:



3. Testes are components of both the reproductive system (being gonads) and the endocrine system (being endocrine glands). The respective functions of the testes are - producing sperm (spermatozoa) by the process of spermatogenesis and producing male sex hormones, of which testosterone is the best-known. Testosterone stimulates development of testes and of male secondary sexual characteristics.

The ovaries have two major functions. One is the production of eggs or ova, and the second is the production of hormones or chemicals which regulate menstruation and other aspects of health and well-being, including sexual well-being. Estrogen and progesterone are the most important hormones which serve many functions like, they induce and maintain the physical changes during puberty and the secondary sexual

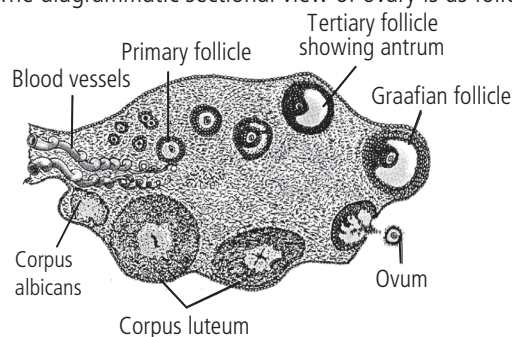
characteristics and they support maturation of the uterine endometrium in preparation for implantation of a fertilised egg, etc.

4. Seminiferous tubules are located in the testicles. The lining of seminiferous tubules called germinal epithelium contains two types of cells - primary germ cells which undergo spermatogenesis to form spermatozoa and columnar cells (derived from coelomic epithelium) which enlarge to form Sertoli cells. Sertoli cells function as nurse cells for providing nourishment to the developing spermatozoa, phagocytose defective sperms and secrete protein hormone inhibin (which inhibits FSH secretion).

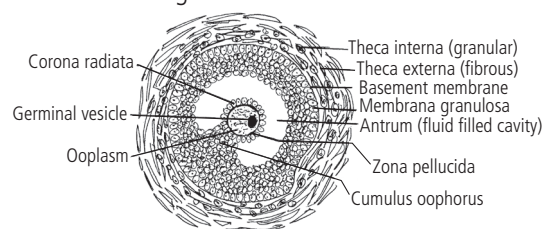
5. Seminal plasma consists of secretions of seminal vesicles, prostate gland and bulbourethral glands. It contains fructose, prostaglandins, citrate, inositol, clotting proteins, (secretions of seminal vesicles), calcium, phosphate, bicarbonate, enzymes, prostaglandins (secretions of prostate gland) and mucus (secretion of bulbourethral glands).

6. Male accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens. These ducts store and transport sperms from the testis to the outside through urethra. The male accessory glands include paired seminal vesicles, a prostate and paired bulbourethral glands. Secretions of these glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. The secretions of bulbourethral glands also help in the lubrication of the penis.

7. The diagrammatic sectional view of ovary is as follows :



8. The labelled diagram of Graafian follicle is as follows :



Topic 2

1. Spermatogenesis is the process by which male spermatogonia develop into mature male gamete, spermatozoa. It starts at puberty and usually continues uninterrupted until death, although a slight decrease can be discerned in the quantity of sperm produced with increase in age. The process of spermatogenesis includes the formation of spermatogonia from germinal epithelium (primordial germ cell) through mitosis (multiplication phase). Finally they stop undergoing mitosis and grow to become primary spermatocytes (growth phase). Each spermatocyte undergoes meiosis (maturation phase). First maturation division is reductional, and produces two secondary spermatocytes. The latter divides by equational division (second maturation division) to form four haploid spermatids. Spermatids receive nourishment from the Sertoli cells to form sperms. This step is called spermiogenesis.

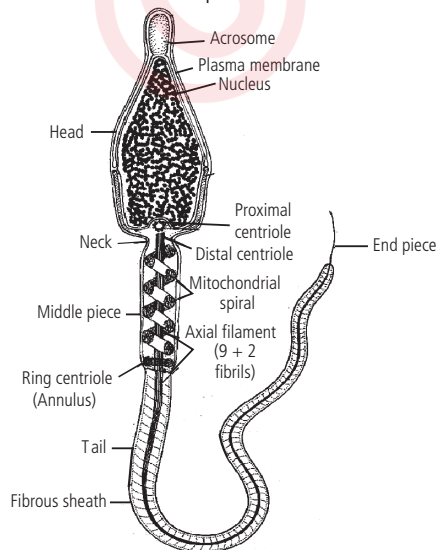
During this process one spermatogonium produces four sperms, having half number of chromosomes.

2. The hormones involved in regulation of spermatogenesis are GnRH, LH, FSH and androgens.

Spermatogenesis starts at the age of puberty due to significant increase in the secretion of gonadotropin releasing hormone (GnRH). The increased levels of GnRH then acts at the anterior pituitary gland and stimulates secretion of two gonadotropins – luteinising hormone (LH) and follicle stimulating hormone (FSH). LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

3. Spermiogenesis is the final stage of spermatogenesis in which there is maturation of spermatids into mature, motile spermatozoa. Spermiation is the release of mature spermatozoa from the surface of the Sertoli cell into the lumen of the seminiferous tubules.

4. The labelled diagram of mammalian spermatozoon as seen under electron microscope is shown below:



5. Oogenesis is the production and growth of the ova (egg cell) in the ovary. It starts only after the female has attained puberty. The process is induced by FSH from the anterior pituitary. It leads to the growth of a single Graafian follicle in one of the two ovaries every month. The developing ovary is colonised by primordial germ cells prior to birth which differentiate into oogonia. These enlarge within the follicle under the influence of mitotic division to form primary oocyte containing diploid number of chromosomes. These undergo reductional division (1st meiotic division) to form a secondary oocyte and first polar body. The secondary oocyte proceeds with meiosis II but the division gets arrested until fertilisation occurs. The 'egg' is released at secondary oocyte stage under the effect of LH. A second polar body is extruded. The first polar body may also divide to form two polar bodies of equal sizes which do not take part in reproduction and ultimately degenerates. During oogenesis one oogonium produces one ovum and three polar bodies. Polar bodies containing small amount of cytoplasm help to retain sufficient amount of cytoplasm in the ovum which is essential for the development of early embryo. Formation of polar bodies maintains the half number of chromosomes in the ovum.

6. (a) Corpus luteum : It secretes the hormone progesterone, which prepares the uterus for implantation. If implantation fails the corpus luteum becomes inactive and degenerates. If an embryo gets implanted, the corpus luteum continues to secrete progesterone until the fourth month of pregnancy, after that the placenta takes over this function.

(b) Endometrium : It is the mucous membrane lining the uterus, which becomes progressively thicker and more glandular and has an increased blood supply in the latter part of the menstrual cycle. This prepares the endometrium for implantation of the embryo, but if this does not occur much of the endometrium breaks down and is lost in menstruation. If pregnancy is established the endometrium becomes the decidua, which is shed after birth.

(c) Acrosome : It is a membranous sac at or near the front of a sperm that assists in penetration of the egg. The acrosome contains enzymes which are released when the sperm contacts the egg prior to fertilisation. The enzymes break down the outer layers of the egg to permit entry of the sperms.

(d) Sperm tail : Tail is a fine vibrating posterior portion of the sperm which helps in swimming. This ability to swim (called motility) is essential for male fertility as the sperm has to swim up the vaginal canal, cervix and cervical canal to reach to the ovum.

(e) Fimbriae : These are finger like structures of fallopian tube that help in collection of ovum after ovulation.

7. The recurring cycle of physiological changes in the uterus, ovaries and other sexual structures that occur from the beginning of one menstrual period through the beginning of the

next is called menstrual cycle. The beginning of menstruation is called menarche. Hormones involved in the regulation of menstrual cycle are pituitary or ovarian hormones. These are LH, FSH, estrogen and progesterone.

Topic 3

1. Blaming women of our society for giving birth to daughters is not correct because the sex of the baby is determined by the father, not by the mother. As we know that the chromosome pattern in the human female is XX and that in the male is XY. Therefore, all the haploid gametes produced by the female (ova) have the sex chromosome X whereas in the male gametes (sperms) the sex chromosome could be either X or Y, hence, 50 per cent of sperms carry the X chromosome while the other 50 per cent carry the Y. After fusion of the male and female gametes the zygote would carry either XX or XY depending on whether the sperm carrying X or Y fertilised the ovum. The zygote carrying XX would develop into a female baby and XY would form a male. Hence, it is the male sperm which determines the sex of the baby and not the female ova.

Topic 5

1. Parturition (or labour) means child birth. Parturition is the sequence of actions by which a baby and the afterbirth (placenta) are expelled from the uterus at childbirth. The

process usually starts spontaneously about 280 days after conception, but it may be started by artificial means.

The process of parturition is induced by a complex neuroendocrine mechanisms involving cortisol, estrogen and oxytocin.

2. Each ovary develops a number of immature eggs associated with groups of other cells called follicles. Normally, in humans, only one egg is released at one time; occasionally, two or more erupt during the menstrual cycle. The egg erupts from the ovary on the 14th to 16th day of the approximately 28 day menstrual cycle. Identical twins occur when a single egg is fertilised to form one zygote (monozygotic) which then divides into two separate embryos. And if the twins were born fraternal two eggs are released. Fraternal twins (commonly known as "non-identical twins") usually occur when two fertilised eggs are implanted in the uterine wall at the same time. The two eggs form two zygotes, and these twins are therefore also known as dizygotic as well as "binovular" twins.

3. Since dogs have multiple births, several eggs mature and are released at the same time. If fertilised, the egg will implant on the uterine wall. Dogs bear their litters roughly 9 weeks after fertilisation, although the length of gestation can vary from 56 to 72 days. An average litter consists of about six puppies, though this number may vary widely based on the breed of dog. On this basis 6 eggs were released by the ovary of a female dog which gave birth to 6 puppies.

