Name: Bodunwa Kayode

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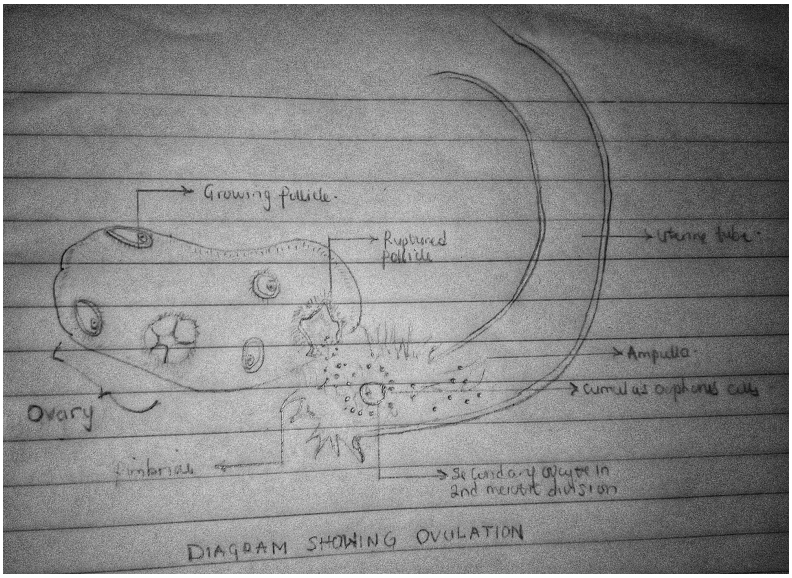
1. Discuss Ovulation.

Ovulation can be described as the release of a mature secondary oocyte from an ovarian follicle. Normally this happens once every month in women although it may differ in women who have their menstrual cycles less than approximately 28 days. Ovulation usually occurs at the middle of the menstrual cycle usually 12 to 24 hours following a spike in the luteinizing hormone which is caused by high estrogen levels in the blood. This in turn stimulates the anterior pituitary gland to release more luteinizing hormone. The luteinizing hormone thus causes major reactions involved both in the final maturation of the ovarian follicle and in the release of the secondary oocyte from it. For the maturation of the ovarian follicle, the luteinizing hormone causes the primary oocyte to complete meiosis I and for the ovarian follicle to enter a preovulatory mature vesicular stage. While for the oocyte to be released, the luteinizing hormone causes the increase in collagenase activity causing the digestion of collagen fibers around the follicle and an increase in prostaglandin levels which causes local muscular contractions around the ovarian wall. It is important to note that after the completion of meiosis I, the secondary oocyte is arrested in metaphase II of meiosis II in preparation for ovulation approximately 3 hours before it and the surface of the ovary begins to bulge locally and at the Apex of the bulge an avascular spot called the stigma appears. Further muscular contractions caused by increased prostaglandin levels thereby cause the extrusion of the secondary oocyte and its surrounding follicular cells, the cumulus oophorus from the stigma of the ovary. This phenomenon is ovulation, whereby the secondary oocyte and its surrounding granulosa cells float out of the ovary. The surrounding granulosa cells soon reorganize around the zona pellucida themselves to form the corona radiata surrounding the oocyte. While the theca cells and connective tissue cells that formed the follicle are thrown into folds to form the corpus luteum.

Sometimes, during ovulation some women may experience a characteristic pain called the mittleschmer which is caused by slight bleeding into the peritoneal cavity.

Some women may also not be able to ovulate as a result of low levels of gonadotropins, this is corrected by administration of an agent to stimulate ovulation. It is also noteworthy that women who have these drugs administered to them are 10 times more likely to have multiple ovulations.



2. Differentiate Between Meiosis I and Meiosis II

Meiosis I	**Meiosis II**
Pairing of homologous chromosomes occurs	Pairing of homologous chromosomes doesn’t occur
Chiasma formation occurs	No chiasma forms
Crossing over occurs	Crossing over doesn’t occur
Chromatids do not separate i.e. centromere doesn't split	Chromatids separate i.e. centromere splits
Starts with 46 Homologous Duplicated chromosomes.	Ends with 23 Duplicated Chromosomes
Ends with 23 Duplicated Chromosomes	Ends with 23 Single Chromosomes

3. Discuss The Stages Involved In Fertilization.

Fertilization involves the union the male and female gametes or the sperm and the ovum to form a zygote. It takes usually 24 hours and marks beginning of human development and is associated with six crucial stages which includes:

I. Passage of a sperm through corona radiata

II. Penetration of the zona pellucida

III. Fusion of the plasma membrane of the sperm and the oocyte

IV. Completion of second meiotic division and formation of female pronucleus

V. Formation of male pronucleus.

VI. Union of the male and female pronucleus to form a diploid aggregation of chromosomes and ootid forms a zygote.

I. Passage of a sperm through corona radiata

Once ejaculated sperms swim through the vagina to get to the ampulla of uterine tubes where fertilization usually occurs. On getting there for a single sperm to penetrate the ovum it must undergo capacitation. This involves the removal of glycoprotein coat and seminal plasma proteins from the plasma membrane on the acrosomal side of sperm. This reaction enables sperm to disperse corona radiata cells and pass through to the zona pellucida.

II. Penetration of the zona pellucida.

Once sperm has been capacitated, it passes through the corona radiata but for it to penetrate the zona pellucida it must undergo acrosome reaction induced by the zona pellucida.

The zona pellucida is a glycoprotein shell surrounding the oocyte that maintains and facilitates sperm binding and acrosome reaction. The acrosome reaction involves the intact acrosome of the sperm bind to a zona glycoprotein called zona protein 3/ZP 3 on the zona pellucida. Once this happens acrosin (acrosomal enzymes) is released from the acrosome which enables the sperm to penetrate the zona pellucida and come in contact with plasma membrane of the oocyte. Once this happens the permeability of the oocyte changes and lysosomal enzymes are released from the cortical granules ling the plasma membrane of the oocyte. These enzymes help to alter the properties of zona pellucida to prevent further sperm penetration and to inactive the sites for spermatozoa on the zona pellucida.

III. Fusion of plasma membrane of sperm and oocyte.

After the sperm has penetrated the zona pellucida the plasma membranes of it and the oocyte then fuse and breakdown at point of fusion. The head and tail of the sperm then enter the cytoplasm of the oocyte leaving the plasma membrane behind.

IV. Completion of the second meiotic division and formation of female pronucleus.

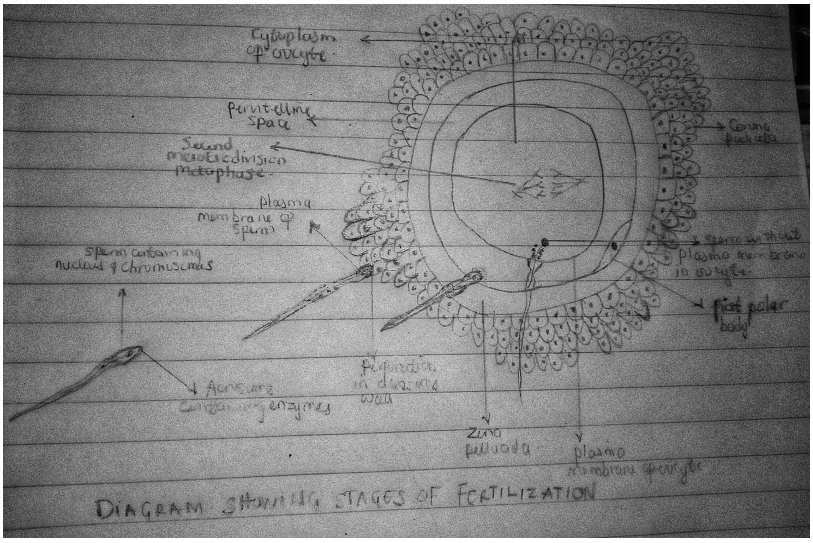
Penetration of the oocyte by the sperm induces the completion of the second meiotic division and the forming of a mature oocyte and second polar body. The nucleus of the mature ovum and oocyte is called the female pronucleus.

V. Formation of male pronucleus

Within the cytoplasm of the oocyte the nucleus of the sperm increases in size to form the male pronucleus and the tail degenerates. As a result of the degeneration of most of the parts of the sperm, the mitochondria of the zygote is of maternal origin. The male and female pronuclei are also indistinguishable and an oocyte bearing two pronuclei each having haploid number of chromosomes is called an ootid.

VI. Union of male and female pronucleus to form an aggregate of chromosome and ootid forms zygote

After fusion of the male and female pronuclei, the chromosomes in the zygote become arranged in cleavage spindle in preparation for cleavage of zygote. This marks the end of fertilization and the beginning of cleavage.



4. Differentiate Between Monozygotic and Dizygotic Twins

Monozygotic twins.	**Dizygotic twins**
They form from a single zygote	They form from two zygotes
Incidence is more common	They form from two zygotes
They are genetically identical	Not genetically identical
Resemblance is similar	Resemblance is not similar
Have one chorion and placenta and are diamniotic	Have two chorions and placenta and are diamniotic
Usually seen as conjoined twins	Not seen as conjoined twins
Usually of the same sex	Can be of the same or different sex