

1. Discuss ovulation

Ovulation is a process whereby mature secondary oocyte is released from the ovarian follicle.

In the days immediately preceding ovulation, under the influence of Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH), the secondary follicle increases rapidly to a diameter of about 25mm to become Mature Vesicular/Mature Secondary or Graafian follicle.

Due to a surge in the production of Luteinizing Hormone, the primary oocyte completes meiosis I and follicle enters the pre- ovulatory mature vesicular stage. After the completion of meiosis I, secondary oocyte and first polar body is formed.

Meiosis II is also initiated, but the oocyte is arrested in metaphase approximately 3 hours before ovulation. In the meantime, the surface of the ovary begins to bulge locally, and at the apex, an avascular spot, the stigma, appears. The high concentration of Luteinizing Hormone increases collagenase activity, resulting in digestion of collagen fibers surrounding the follicle. Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall. Those contractions extrude the oocyte, which together with its surrounding granulosa cells from the region of the cumulus oophorus breaks free (ovulation) and floats out of the ovary. Some of the cumulus oophorus cells then rearrange themselves around the zona pellucida to form the corona radiata.

Clinical correlate.

Mittelschmerz: During ovulation, some women feel a variable amount of abdominal pain called mittelschmerz also known as middle pain because it normally occurs near the middle of the menstrual cycle. In these cases, ovulation results in slight bleeding into the peritoneal cavity, which results in sudden constant pain in the lower abdomen. Mittelschmerz may be used as a symptom of ovulation, but there are better symptoms, such as the slight drop in basal body temperature

Anovulation: Some women fail to ovulate, this is called anovulation, because of a low concentration of gonadotropins. In these cases, administration of an agent to stimulate gonadotropin release and hence ovulation can be employed. Although such drugs are effective, they often produce multiple ovulations, so that the risk of multiple pregnancies is 10 times higher in these women than in the general.

1. Differentiate between meiosis I and meiosis II

MEIOSIS I	MEIOSIS II
Homologous chromosome pairs separate	Sister chromatids separate
Starts as diploid; ends as haploid	Starts as haploid; ends as haploid
Ends with 2 daughter cells	Ends with 4 daughter cells
Reductive division	Equational division
Crossing over happens	Crossing over does not happen
Preceded by S-phase and G-phase	Preceded only by G-phase
Meiosis 1 is a heterotypic division, reducing the chromosome number in the daughter cell by half, compared to the parent cell.	Meiosis 2 is a homotypic division, equalizing the chromosome number of both parent and daughter cells.

2. Discuss the stages involved in fertilization

Fertilization is the union of sperm and oocyte, it takes place in the ampulla of the uterine tube approximately 24 hours after the sperm is introduced into the vagina.

There are six stages of fertilization, they are;

1. Passage of sperm through the corona radiata: only capacitated sperm can pass through the corona radiata. Capacitated sperm are sperm with removed glycoprotein coat and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa)
 2. Penetration through the zona pellucida: The zona pellucida is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces the acrosome reaction the acrosome of the sperm binds with a zona glycoprotein (ZP3/ zona protein 3) on the zona pellucida which causes release of acrosin, which allows sperm to penetrate the zona pellucida, thereby coming in contact with the plasma membrane of the oocyte. As soon as the head of a sperm comes in contact with the oocyte surface, the permeability of the zona pellucida changes. Only one sperm seems to be able to penetrate the oocyte. When a sperm comes in contact with the oocyte surface, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte. These enzymes alter properties of the zona pellucida to prevent sperm penetration and inactivate binding sites for spermatozoa on the zona pellucida surface.
 3. Fusion of plasma membrane of sperm and oocyte: the plasma membrane of the sperm and oocyte fuse and breakdown at the area of fusion. The head and tail of the sperm enters the cytoplasm of the oocyte but the sperm's plasma is left behind
 4. Completion of 2nd meiotic division of oocyte and formation of female pronucleus: once the head and tail of the sperm enters the oocyte, 2nd meiotic division is completed forming a mature oocyte and 2nd polar body. The nucleus of the mature oocyte is called Female Pronucleus.
 5. Formation of male pronucleus: within the cytoplasm, the nucleus of the sperm enlarges to form male pronucleus and the tail degenerates. The oocyte containing two haploid nucleus is called an OOTID.
 6. Formation of zygote: the chromosomes in the zygote become arranged on a cleavage spindle in preparation for cleavage for zygote. Ootid develops to form zygote as the two pronuclei fuse into a single diploid aggregation of chromosomes.
3. Differentiate between monozygotic and dizygotic twins

MONOZYGOTIC TWINS	DIZYGOTIC TWINS
Result from the fertilization of one secondary oocyte by one sperm.	Result from the fertilization of two different secondary oocyte by two different sperm.
They are genetically identical.	They are genetically un-identical
The twins are of the same sex and look alike.	They do not look alike and might be of different sex.
Mostly diamniotic, monochorionic with single placenta.	Mostly have two amnions, two chorions and two placenta.
They are also called identical twins.	They are also called fraternal twins

The resultant zygote forms a blastocyst whose embryoblast splits into two.	The resultant 2 zygotes form 2 blastocysts.
Incidence is more common.	Incidence is less common.

