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MATRIC NO: 18/MHS01/253

DEPT: MBBS

COURSE: EMBRYOLOGY

ANSWERS TO ASSIGNMENT

**1. Discuss Ovulation**

This is the release of an oocyte (secondary oocyte) from the ovarian follicle

Ovulation is triggered by high levels of Luteinizing hormone. Ovulation follows the luteinizing hormone peak by 12 to 24 hours. The high peak causes the primary oocyte to complete meiosis 1 and the follicle to enter a pre-ovulatory vesicular stage.

The secondary oocyte also forms but is held at metaphase 2 for 3 hours before ovulation. In the meantime a bulge is formed on the ovary and a stigma then appears at the apex of the ovary.

For the oocyte to be released, 2 events must occur which are caused by the luteinizing hormone surge which are: increase in collagenase activity and increase in prostaglandin levels which causes muscular contractions in the ovarian wall. These muscular contractions push out the secondary oocyte together with some follicular cells.

## 2. Differentiate between meiosis 1 and 2

Features	Meiosis 1	Meiosis 2
Prophase	Synapsis, crossing over and chiasma formation occurs here	Synapsis, Crossing over and chiasma formation are absent
Anaphase	The homologous chromosomes are separated and centromeres do not split	The 23- duplicated chromosome (sister chromatids) splits and centromeres do split
Telophase	Two daughter cells are formed with 23- duplicated chromosomes each	Four daughter cells are formed with 23- single chromosomes each
Definition	This is a reduction division done to give the diploid number of chromosomes (23- duplicated chromosome)	This division is done to give the haploid number of chromosomes (23- single chromosome)

## 3. Discuss the stages involved in fertilization

Fertilization is the fusion of the sperm and oocyte to form a zygote. It occurs mainly at the ampulla of the uterine tube and takes approximately 24 hours to be completed. Any secondary oocyte that is not fertilized would be degenerated.

Fertilization takes place in approximately 6 stages:

- Penetration of the corona radiata

The sperm undergoes capacitation which is the removal of the glycoprotein coat and seminal plasma proteins from the plasma membrane in order for it to penetrate the corona radiata.

- Penetration of the zona pellucida

The sperm binds to the zona glycoprotein on the zona pellucida through the acrosome which stimulates the release of acrosin from the acrosome which helps the sperm to penetrate the zona pellucida.

- Fusion of the plasma membrane of the oocyte and sperm

The site of fusion of the plasma membrane of the oocyte and sperm break down. The head and tail of the sperm enter without the plasma membrane.

Note that once the sperm touches the surface of the oocyte, lysosomal enzymes are released from the cortical granules lining the surface of the plasma membrane of the oocyte. This helps to inactivate the binding site of the sperm and prevent sperm penetration so that only one sperm would penetrate the oocyte.

- Completion of the second meiotic division and formation of the female pronuclei

Penetration of the oocyte by the sperm activates the completion of the second meiotic division. The oocyte completes meiosis 2 and is now a mature oocyte with a second polar body. The nucleus of the mature oocyte is now referred to as female pronucleus.

- Formation of the male pronuclei

Nucleus of the sperm enlarges to form male pronuclei. The oocyte now has two pronuclei and is referred to as an Ootid.

- Fusion of the two pronuclei into a single diploid aggregation of chromosomes to give rise to a zygote

The ootid now becomes a zygote. Chromosomes in the zygote are arranged on a cleavage spindle in preparation for cleavage in the zygote.

#### 4. Differentiate between monozygotic and dizygotic twins

Monozygotic twins	Dizygotic twins
1. The twins are identical	The twins are not identical
2. The twins are of the same sex	They are not of the same sex
3. The occurrence is more common	The occurrence is less common
4. They are formed from one sperm and one oocyte	They are formed from two sperms and two oocytes
5. They are mostly diamniotic, monochorionic and a single placenta	They are mostly diamniotic, dichorionic and has two placentas
6. They are often called conjoined twins	They are not seen as conjoined twins

