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COURSE CODE:

QUESTION 1

Discuss ovulation

Ovulation is the release of a mature oocyte from the ovarian follicle (during meiosis 2). Ovulation takes place in the middle of the ovarian cycle. A few days before ovulation, the secondary follicle grows rapidly to a diameter of about 25mm under the influence of FSH and LH to become mature vesicular or mature secondary or Graafian follicle. Coinciding with the final development of the vesicular follicle, there is an abrupt increase in LH that causes the following:

1. The primary oocyte to complete meiosis 1.
2. The follicle to enter preovulatory mature vesicular stage.

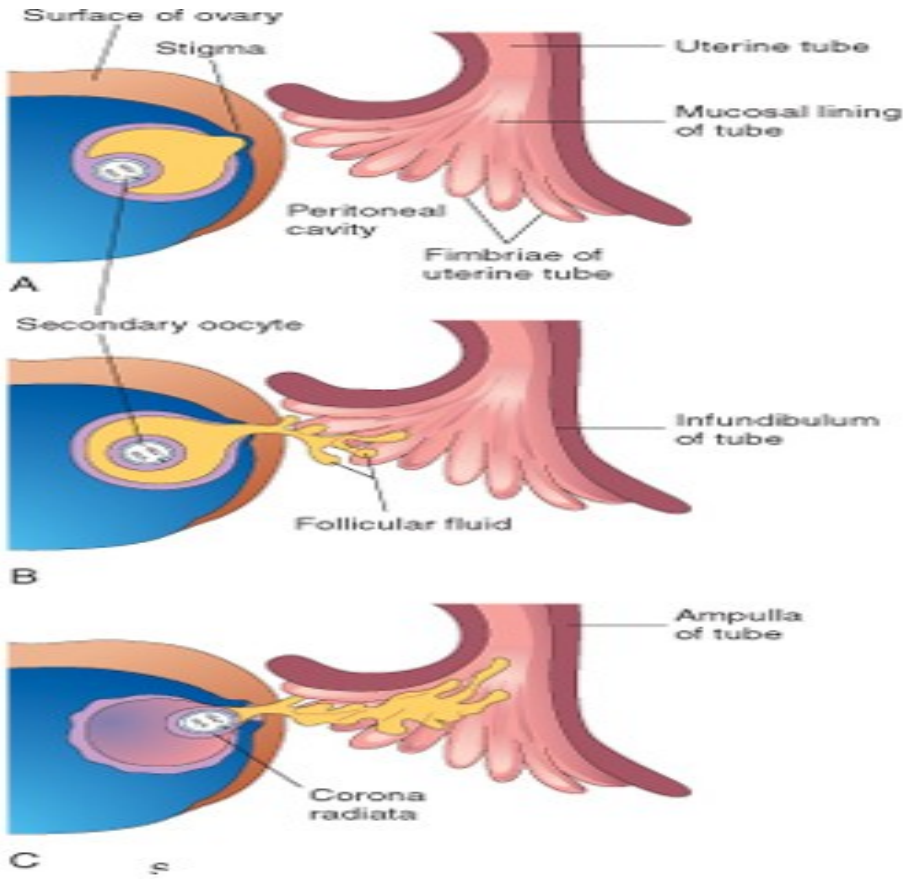
Therefore, LH has to be very active for ovulation to occur. Meiosis 2 is also initiated, but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation. During the arrest, the surface of the ovary begins to bulge locally and then at the apex, an avascular spot, the stigma appears. After the stigma has been formed, all the vesicular fluid leaves the ovary and enters the uterus, then the secondary oocyte is then released from the ovary into the uterus (ovulation).

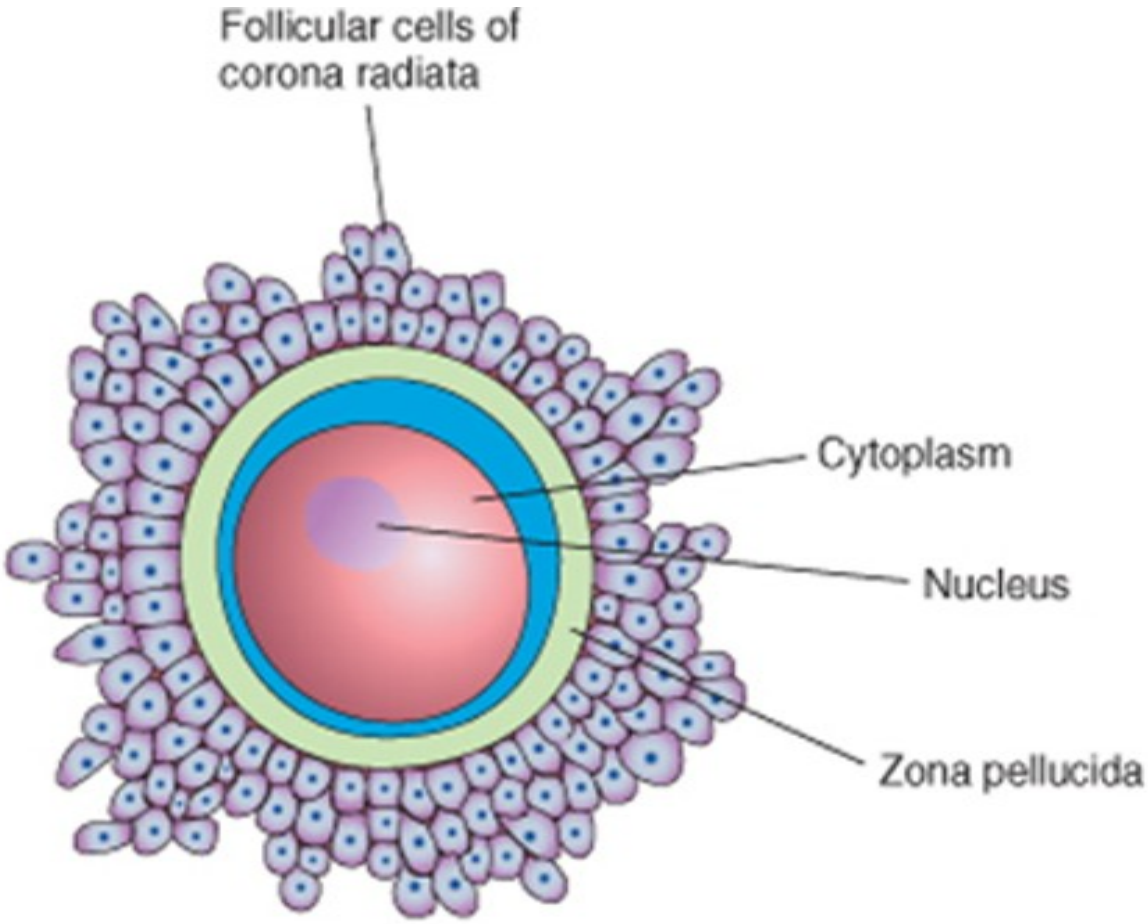
For the oocyte to be released, two events occur which are caused the LH surge:

1. It increases the collagenase activity which results in the digestion of collagen fibres (connective tissue) surrounding the follicle, making the connective tissue weak.

2. Prostaglandin levels also increases in response to the LH surge and then causes muscular contraction in the ovarian wall which causes the opening at the stigma and then the release of the secondary oocyte.

Those contractions release the oocyte together with the surrounding follicular cells from the region of the cumulus oophorus, this causes ovulation in which the oocyte floats out of the ovary. Some of the cumulus oophorus rearrange themselves around the zona pellucida surrounding the secondary oocyte to form the *corona radiata*.





Clinical Correlates

1. During ovulation, women often experience abdominal pain known as mittelschmer or middle pain because it normally occurs near the middle of their menstrual cycle. This may be used a symptom of ovulation whereas there are better symptoms such has a slight drop in basal body temperature(ie lowest temperature when the body is at rest).

2. Some women fail to ovulate and this is known as anovulation because of low concentration of gonadotropin. Here, administration of an agent to stimulate gonadotropin release and hence ovulation can occur. Although, these drugs could often produce multiple ovulations.

QUESTION 2

Differentiate between meiosis 1 and meiosis 2.

MEIOSIS 1	MEIOSIS 2
1. Involves reduction.	Involves division.
2. Reduces ploidy level from 4n to 2n.	Divides the remaining sets of chromosomes from 2n to n
3. Synapsis of 46 homologous duplicated chromosomes occurs at prophase 1	Synapsis does not occur at prophase 2
4. Crossing over occurs at prophase 1	Crossing over does not occur at prophase 2
5. Chiasama is formed	Chiasma is not formed.
6. Centromere does not split.	Centromere splits.
7. Gives rise to two daughter cells at Telophase 1 with 23 duplicate chromosomes, 2N.	Gives rise to four daughter cells at Telophase 2 with 23 single chromosomes, 1N.

QUESTION 3

Discuss the stages involved in fertilization.

Fertilization is the union of the sperm and the oocyte which takes place at the ampulla. There are six stages involved in fertilization;

1. Passage of sperm through corona Radiata.
2. Penetration of sperm through the zona pellucida.

3. Fusion of plasma membranes of the sperm and oocyte.
4. Completion of the second meiotic division and the formation of the male pronucleus.
5. Formation of the female pronucleus.
6. Formation of zygote.

- *Passage of sperm through corona radiate*

For sperm to pass through corona radiate, they must have been capacitated (ie. The removal of glycoprotein material and seminal plasma proteins) from the region of the acromosome of the sperm.

- *Penetration of sperm through the zona pellucida*

The acromosome of the sperm will bind with the zona pellucida. And on the surface of the zona pellucida, there are binding sites which contains receptors. Therefore, the acromosome will bind with these receptor sites on the zona pellucida, the acrosome releases a lysosomal enzyme called acrosin which breaks down the binding sites to be able to pass through the zona pellucida. Once the sperm through the zona pellucida, cortical granules from the plasma membrane transfers information to the zona pellucida to close its binding sites. These granules block the binding sites to prevent polyspermy.

- *Fusion of plasma membranes of sperm and oocyte*

Note that, the acromosome of the sperm has been removed. The cell membrane of the sperm amd oocyte fuse together and break down at the area of fusion. Therefore, the head and the tail of the sperm enter into the cytoplasm of the oocyte but the sperm's cell membrane is left behind.

- *Completion of second meiotic division and formation of pronucleus*

Once the head and tail enters into the cytoplasm of the oocyte, the second meiotic division is then completed forming a mature oocyte and a second polar body. The nucleus of the mature oocyte is now called the female pronucleus.

- *Formation of male pronucleus*

Within the cytoplasm of the oocyte, the nucleus of sperm enlarges to form the male pronucleus while the tail of thesperm degenerates. The oocyte now contains two haploid nucleus and is then called ootid.

- *Formation of zygote*

The female and male pronuclei then fuse to be a single diploid aggregation of chromosomes, the ootid then becomes a zygote.

QUESTION 4

Differentiate between monozygotic twins and dizygotic twins

MONOZYGOTIC TWINS	DIZYGOTIC TWINS
1. Formed from the fusion of sperm and oocyte to form zygote and that zygote divides during blastocyst formation	Formed when two different sperm fertilizes two different oocytes to form two different zygotes.
2. They are genetically	They are genetically unidentical

identical.	
3. They look alike	They do not look alike.
4. They have the same sex.	They can be of different sex
5. They share the same amniotic sac, chorionic sac and placenta	They have separate amniotic sac, chorionic sac and placenta.