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Assignment Answers

1. **Discussion On Ovulation:**

Ovulation involves the release of secondary oocyte from the ovarian follicle. The secondary/vesicular follicle grows rapidly to a diameter of about 25mm to become mature vesicular/ mature secondary or Graafian follicle. This is as a result of rise in levels of follicle stimulating hormone which stimulates development of ovarian follicles and production of estrogen by the follicular cells and luteinizing hormone which is responsible for final stages of maturation of mature vesicular/Graafian follicle and serves as the trigger for release of secondary oocyte (ovulation). The surge in luteinizing hormone results in the primary oocyte completing meiosis I and the follicle to enter the preovulatory mature vesicular stage, Meiosis II also begins but the secondary oocyte is arrested in metaphase approximately 3 hours before ovulation. Meanwhile, at the apex of the ovary, an avascular spot, the stigma, appears. Two events facilitated by the luteinizing hormone must take place for the oocyte to be released. They include:

- **Increase in collagenase activity, which results in digestion of collagen fibers surrounding the follicle.**
- **Increase in prostaglandin levels which cause local muscular contractions in the ovarian wall. These contractions extrude the oocyte, together with its surrounding follicular cells from the region of the cumulus oophorus, this results in ovulation. Some cumulus oophorus cells then rearrange themselves around the zona pellucida to form the corona radiata.**

Clinical Correlates

During ovulation, body produces more estrogen, causing cervical mucus to become stretchy and clear, like egg white, which helps sperm swim to the egg that's released during ovulation. Cervical mucus changes happen in most women. Mild ache or pain in the lower abdomen, usually on one side or the other might also be experienced. This ovulation pain, called Mittelschmerz, can last between a few minutes and a few hours and might also be accompanied with light vaginal bleeding or discharge.

2. **Differentiate between meiosis I and meiosis II:**

DIFFERENCES	
Starts as diploid; ends as haploid	**Starts as haploid; ends as haploid**
Reductive division	**Equational division**
Homologous chromosome pairs separate	**Sister chromatids separate**
Crossing over happens	**Crossing over does not happen**
It is preceded by interphase	**No interphase takes place**
It takes a long duration	**It takes a short duration**
Preceded by S-phase and G-phase	**Preceded only by G-phase**
Sister chromatids in prophase have convergent arms	**Sister chromatids in prophase have divergent arms**
Equatorial plane is centered	**Equatorial plane is rotated 90°**
Prophase is split into 5 sub-phases	**Prophase does not have sub-phases**
Ends with 2 daughter cells	**Ends with 4 daughter cells**
Chromosomal cross over occurs during prophase I	**No chromosomal cross over occurs during prophase II**

3. Discuss the stages involved in fertilization:

Fertilization is the union of the sperm and oocyte usually in the ampulla of the uterine tube. The fertilization process takes approximately 24 hours. It is a sequence of events which involves the following stage:

I. Passage of sperm through the corona radiata
II. Penetration of zona pellucida
III. Fusion of plasma membrane of the spermatocyte
IV. Conclusion of the second meiotic division and formation of the female pronucleus
V. Formation of the male pronucleus
VI. Formation of the zygote

<u>Passage of sperm through the corona radiata</u>:

For this to occur, sperm must have been capacitated (the removal of the glycoprotein and seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa). Only capacitated sperm can pass through the corona radiate.

<u>Penetration of zona pellucida</u>:

Where acrosome binds with the zona pellucida is called the binding site. There are receptors on the binding site. Acrosome contains a lysing enzyme called acrosin. With the aid of acrosin, sperm can penetrate the zona pellucida hereby 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, lysosomal enzymes are released from cortical granules lining the plasma membrane of the oocyte.

<u>Fusion of plasma membrane of the spermatocyte</u>:

The plasma membrane of the oocyte and sperm fuse and break down at the area of fusion. The head and tail of the sperm enter the cytoplasm of the oocyte, but the sperm's plasma membrane remains behind.

Completion of the second meiotic division and formation of the female pronucleus:

Penetration of the oocyte by a sperm activates the oocyte into completing the second meiotic division and forming a mature oocyte and a second polar body. The nucleus of the mature ovum/oocyte is called the female pronucleus.

Formation of male pronucleus:

The tail of the sperm degenerates, left with the nucleus. The female is the one that produces all the energy it will use. In the cytoplasm of the oocyte, the nucleus of the sperm enlarges to become the male pronucleus.

Formation of Zygote:

The male and female pronucleus will undergo fusion to form an ootid thereby giving rise to a zygote.

4. **Differentiate between monozygotic and dizygotic twins:**

ASPECT	MONOZYGOTIC	DIZYGOTIC
FERTILIZATION	**One sperm and one ovum**	**Two Separate eggs and two separate spermatozoa**
FORMATION OF ZYGOTE	**Eggs divide into two embryo**	**Each egg divide into one embryo respectively**
GENETIC CONSTITUTION (CHROMOSOMES)	**They are exactly the same**	**They are different**
NUMBER OF PLACENTAS	**One or two placentas**	**Two**
NUMBER OF AMNIOTIC SACS	**One or two amniotic sacs**	**Two**
SEX	**Same sex**	**They can be same or different sex**
PHYSICAL APPERANCE	**They look alike**	**They do not look alike**