

**NAME: MAKINDE AKINTUNDE OPEMIPO**

**DEPARTMENT: MEDICINE AND SURGERY**

**MATRIC NUMBER: 18/MHS01/208**

**COURSE: EMBRYOLOGY**

**EMBRYOLOGY ASSIGNMENT**

1) Discuss ovulation

Ovulation is the release of ovum/egg/oocyte from the ovaries. It occurs midway through the ovarian cycle and during the luteal phase of the menstrual cycle. Before ovulation, the ovarian follicle, under the influence of Follicle stimulating hormone (FSH) and Luteinizing hormone (LH), grows largely in size and develops a small hole at its apex called the stigma. The mature ovarian follicle is in direct contact with the inner epithelia of the ovary. A spike in the amount of FSH and LH levels lasting 24-36 hours due to increased amounts of estrogen secreted from the ovary triggers the stigma to rupture, expelling the primary oocyte along with some follicular cells which later become the corona radiata into the peritoneal cavity, where it is picked up by the fimbriae of the uterine tube. From the fimbriae, the secondary oocyte which is surrounded by zona pellucida and follicular cells, diffuses into the uterine tube and is moved by cilia to the isthmus of the uterine tube, where it is fertilized, and the uterine cavity, where the zygote develops.

2) Differentiate between meiosis 1 and meiosis 2

| MEIOSIS 1   | MEIOSIS 2  |
|---|--|
| Crossing over and chiasma formation occur                 | Crossing over and chiasma formation cease                |
| Homologous chromosomes separate                           | Sister chromatids separate                               |
| Produces 2 diploid daughter cells                         | Produces 4 haploid daughter cells                        |
| Two sets of chromosomes are present in each daughter cell | One set of chromosomes are present in each daughter cell |
| DNA replication occurs before meiosis 1                   | DNA has already been replicated, thus                    |

|  |   |
|--|---|
|  | DNA replication does not occur before meiosis 2                 |
| Daughter cells form intermediates to begin meiosis 2                   | Daughter cells form gametes which fuse to form a diploid zygote |
| Begins in gamete progenitor cells such as oogonia, spermatogonia, etc. | Begins in the diploid daughter cells produced from meiosis 1    |

### 3) Discuss the stages involved in fertilization

- Passage of a sperm through the corona radiata: As the sperm comes in contact with the corona radiata, its acrosome releases proteolytic enzymes which break down the cells of the corona radiata as the sperm swims towards the oocyte.
- Penetration of the zona pellucida: When the sperm comes in contact with the zona pellucida of the oocyte, its acrosome releases proteolytic enzymes, especially acrosin, esterase and neuraminidase which cause lysis (dissolution or loosening) of the zona pellucida. This creates a path for the sperm to pass through to the oocyte. As the sperm penetrates to the oocyte, cortical granules containing lysosomal enzymes are released into the perivitelline space (space in-between the oocyte plasma membrane and the zona pellucida) which change the glycoprotein composition of the zona pellucida, making it impenetrable to other sperms.
- Fusion of plasma membrane of sperm and oocyte: When the sperm comes in contact with the oocyte, its plasma membrane fuses with the oocyte plasma membrane. The sperm head and tail enter the oocyte, leaving the sperm's plasma membrane, mitochondria and acrosome behind.
- Completion of second meiotic division of oocyte and formation of female pro-nucleus: As the sperm penetrates the oocyte, the second meiotic division of the oocyte is completed, forming a mature oocyte and a second polar body. Following decondensation of the maternal chromosomes, the nucleus of the mature oocyte becomes the female pro-nucleus.
- Formation of male pro-nucleus: As the sperm enters the cytoplasm of the oocyte, its nucleus enlarges to form the male pro-nucleus. The tail of the sperm degenerates and both the female and male pro-nucleus undergo

mitosis to become haploid pro-nuclei. The oocyte that contains the male and female pro-nuclei is called an ootid.

- Formation of zygote: The male and female pro-nuclei fuse to form a single diploid aggregation of chromosomes, transforming the ootid into a zygote.

4) Differentiate between monozygotic and dizygotic twins

|                                | MONOZYGOTIC/IDENTICAL TWINS   | DIZYGOTIC/FRATERNAL TWINS  |
|--------------------------------|---|--|
| Develop from                   | One fertilized oocyte splitting into two                                | Two different oocytes fertilized by two different sperm cells              |
| Genetic code                   | Nearly identical  | Not identical  |
| Gender/Sex                     | Usually the same  | Usually different  |
| Incidence                      | About 3 per 1000 births   | About 6 to over 20 per 1000 births   |
| Appearance                     | Extremely similar   | Look almost totally different  |
| Blood type                     | Always the same   | May be different   |
| During pregnancy               | Share the same amniotic sac, chorionic sac, placenta and umbilical cord | Develop different amniotic sac, chorionic sac, placenta and umbilical cord |
| Risk of twinning abnormalities | High risk   | Low risk   |