

## Course: Anatomy (Embryology-ANA 203)

### Assignment

1. Discuss ovulation
2. Differentiate between meiosis 1 and meiosis 2
3. Discuss the stages involved in fertilization
4. Differentiate between monozygotic and dizygotic twins.

### Answers

#### **Question 1**

Ovulation: This can be described as the period (usually between days 11-21) in the menstrual cycle whereby an ovum is released from the ovaries into the fallopian tube. Ovulation marks the end of the follicular phase of the ovarian cycle and the start of the luteal phase. This event occurs when the ovarian follicles rupture and release the secondary oocyte ovarian cells. After ovulation, during the luteal phase, the egg will be available for fertilization by the sperm and the endometrium will thicken so as to allow for the reception of the egg and if no conception occurs, the uterine lining will be shed along with blood during menstruation.

#### **Question 2**

<b>MEOSIS I</b>	<b>MEOISIS II</b>
1. Heterotypic division occurs	Homotypic division occurs
2. Chromosome number reduces in daughter cells	Chromosome number in both parent and daughter cells is equal
3. Homologous chromosomes	Sister chromatids separate

separate	
4. Cohesin protein at the centromeres do not split	Cohesin proteins at the centromere split to separate the two sister chromatids
5. It is a complex division and takes more time	It is comparatively less complex and takes less time
6. It is preceded by interphase	Interphase does not takes place
7. Chromosomal crossing over occurs in prophase 1	No crossing over in prophase 2
8. Individual chromosomes are present in daughter nuclei	Sister chromosomes are present in daughter nuclei
9. The ploidy changes from 4N to 2N	It is haploid (N) throughout
10. The product is 2 diploid daughter cells	The product is 4 haploid daughter cells

### Question 3

The stages involved in fertilization are;

- Fertilization
  - Cleavage
  - Formation of blastomeres
  - Blastocyst Formation
  - Implantation
1. Fertilization: This is the union of the sperm and oocyte. The usual site of fertilization is the ampulla of the uterine tube and the whole process takes approximately 24 hours. It is a sequence of coordinated events which include the following stages
    - For sperms to pass through the corona radiata, they must have been capacitated (removal of the glycoprotein coat and

seminal plasma proteins from the plasma membrane that overlies the acrosomal region of the spermatozoa). The zona is a glycoprotein shell surrounding the egg that facilitates and maintains sperm binding and induces the acrosome reaction

The intact acrosome of the sperm binds with a zona glycoprotein on the zona pellucida and release of acrosomal enzymes (acrosin) allows sperm to penetrate it thereby coming in contact with the plasma membrane of 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. The plasma or cell membranes 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. 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 now called the female pronucleus. Inside the cytoplasm of the oocyte, the nucleus of the sperm enlarges to form the male pronucleus and the tail of the sperm degenerates.

2. Cleavage: This is a series of repeated mitotic divisions of the zygote resulting in a rapid increase in the number of embryonic cells called blastomeres. These blastomeres become smaller with each successive cleavage division and division of the zygote into blastomeres begins approximately 30 hours after fertilization. the 1st cleavage is the division of the zygote into a two-cell stage.
3. Blastomere formation: the 2nd cleavage forms the two-cell stage into a four-cell stage, the 3rd cleavage is from the four-cell stage into an eight-cell stage then approximately three days after fertilization, cells of the compacted embryo divide again to form a 16-cell stage called morula stage, so when there are 16 to 32 blastomeres, the developing human is called a morula.

4. Blastocyst formation: Shortly after the morula enters the uterus (approx. 4 days after fertilization), a fluid-filled space called the blastocystic cavity appears inside the morula. As fluid increases in the blastocystic cavity, it separates the blastomeres into two parts; an inner cell mass of cells called the embryoblast, which is surrounded by an outer cell mass of cells called the trophoblast.
5. Implantation: The wall of the uterus consists of 3 layers:
- (a) endometrium - or mucosa lining the inside wall
  - (b) myometrium - a thick layer of smooth muscle
  - (c) perimetrium - the peritoneal covering lining the outside wall
- Approximately 6 days after fertilization (day 20 of a 28-day menstrual cycle), the blastocyst attaches to the endometrial epithelium. As soon as it attaches to the endometrial epithelium, the trophoblast starts to proliferate rapidly and gradually differentiates into two layers; An inner layer of cytotrophoblast and an outer layer of syncytiotrophoblast.

#### Question 4

<b>Monozygotic twins</b>	<b>Dizygotic twins</b>
1. One sperm fertilizes one egg	Two sperms fertilize two eggs
2. They are identical genetically	They are non-identical genetically
3. They share a placenta	They don't share placenta
4. They look alike	They don't look alike
5. They are always the same sex	Different sexes could occur
6. They are also known as maternal twins	They are also known as fraternal twins