Unit: Reproduction and Development
Fertilization and Development Notes

Name:_____ Date:_____

Directions: Closely read the text below. Underline/highlight vocabulary words you think are important in order to understand fertilization and development. Write your thoughts in the margin.

rite your thoughts/connections in the margin:

Every tissue and organ is made up of living cells. Some cells provide protection; some give structural support or assist in locomotion (movement); others offer a means of transporting nutrients. All cells develop and function as part of the organized system -- the organism -- they make up.

First, at the start of our lives, each of us originated as a single, simple-looking cell -- a fertilized egg, or zygote -- so tiny that it can barely be seen without a microscope. (A human egg cell is a bit smaller than the width of a human hair.) Shortly after fertilization occurs, the zygote (combined egg and sperm cells) begins dividing, replicating itself again and again. Before long, a growing mass of dozens, then hundreds, then thousands of cells called stem cells forms; each stem cell is only one-fourth to one-tenth the diameter of the original zygote, but otherwise nearly identical to it. [1]***Why are they nearly identical?***

After 6-7 days following fertilization, the fertilized egg will travel to the uterus where it will attach to the uterine lining. This is known as implantation.

Cell differentiation follows implantation. The majority of organisms consist of many more than one type of cell. About 200 different types of cells -- many highly specialized -- make up the tissues and organs of the human body. The cells that line the retina of your eye, for example, have a structure and function that is very different from those of the muscle cells in your bicep. This is all part of cell differentiation, which is the process by which cells change to specialize in a specific function.

Stem cells begin their transformation into the different types of cells that make up the human body during a phase in the development process called cell differentiation. Like most other developmental processes, differentiation is controlled by genes, the genetic instructions encoded in the DNA of every cell. Genes instruct each cell how and when to build the proteins that allow it to create the structures, and ultimately perform the functions, specific to its type of cell.

The embryo is defined as the developing pregnancy from the time of fertilization until the end of the eighth week of development (following cell differentiation), when it becomes known as a fetus.

Surprisingly, every nucleus of every cell has the same set of genes. A heart cell nucleus contains skin cell genes, as well as the genes that instruct stomach cells how to absorb nutrients. This suggests that in order for cells to differentiate -- to become different from one another -- certain genes must somehow be activated, while others remain inactive. Although scientists have come a long way toward understanding how cells coordinate the well-timed activation and inactivation of their genes, researchers have had little success inducing these changes artificially. Gaining such control over the developmental process, experts believe, may eventually result in cures for a wide variety of diseases, including diabetes and cancer.

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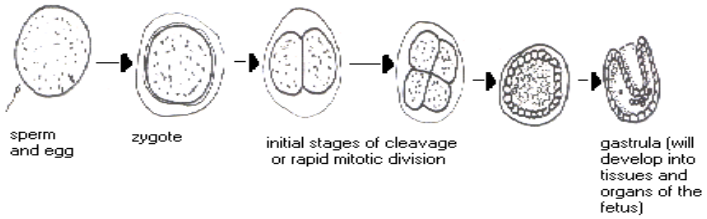
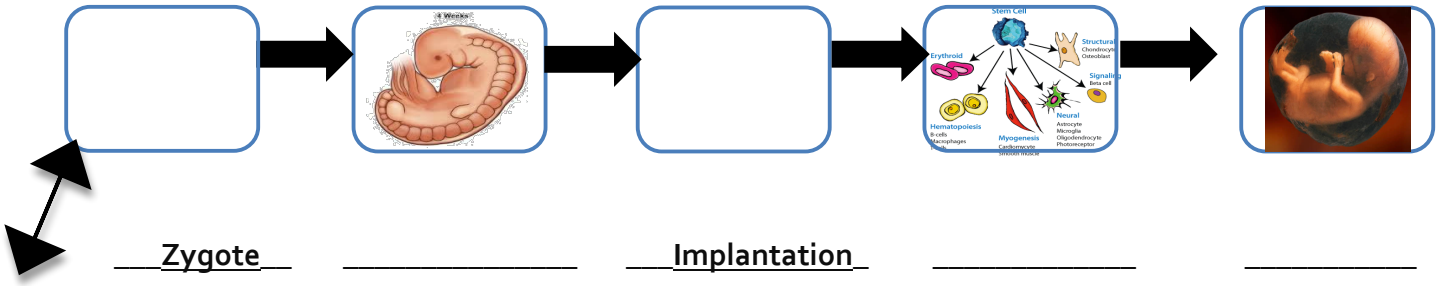


Describe (using a flow chart/timeline) the process of fertilization and development using the following vocabulary words: **zygote, embryo, implantation, cell differentiation, fetus, fertilization**
*Be sure to include what is happening when you draw arrows!



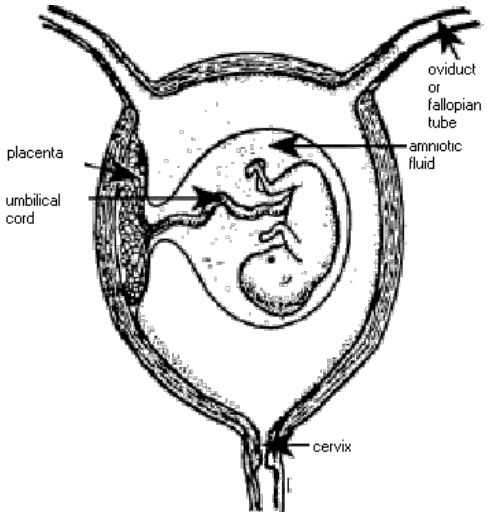
Zygote _____ **Implantation** _____ _____

(By the process of _____)

The **placenta** is a combination of maternal and fetal tissue which allows for the exchange of materials with the fetus and mother. Needed materials such as food and oxygen diffuse through the placenta to the fetus, while wastes from the fetus diffuse to the mother.

The **umbilical cord** is a fetal structure containing blood vessels which allows materials to be carried between the fetus and placenta in both directions.

The **amniotic fluid** surrounds the fetus and helps to provide a shock absorber to protect the fetus against mechanical injury in the event the mother is shaken or injured in some manner.

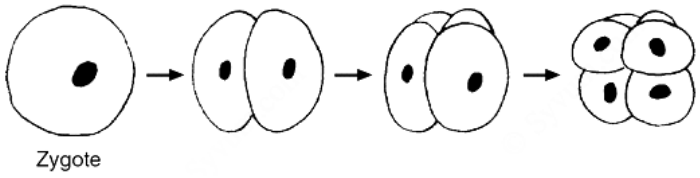


Color:

- The placenta red
- The amniotic fluid yellow
- The umbilical cord blue

REGENTS REVIEW QUESTIONS:

1. The diagram below represents some stages of early embryonic development.

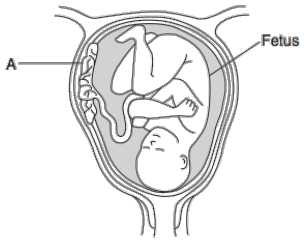


Which process is represented by the arrows in the diagram?
(1) meiosis
(2) fertilization
(3) mitosis
(4) evolution

2. A significant difference between the effects of the genetic information passed on from asexually reproducing parents to their offspring and sexually reproducing parents to their offspring is the
(1) degree of modification of the size of chromosomes
(2) types of DNA subunits
(3) number of chromosomes in the body cells of the offspring
(4) amount of variation between the parents and the offspring

3. A zygote develops into a multicellular organism through
(1) mitosis and specialization
(2) mitosis and meiosis
(3) recombination and communication
(4) genetic engineering and natural selection

4. The diagram below represents one stage during the human reproductive process. A function of structure A is to



(1) remove nutrients from the fetus
(2) provide the fetus with metabolic wastes
(3) remove all toxins from the blood of the mother
(4) provide for the exchange of oxygen and carbon dioxide

5. In an organism, a muscle cell has the same DNA as a nerve cell, yet the cells perform different functions. This is possible because
(1) different mutations occur in each cell type, changing the genetic instructions
(2) temperature variations within the body alter DNA
(3) proteins in each cell type change the structure of DNA
(4) different parts of the genetic instructions are used in each type of cell

6. Which sequence best represents sexual reproduction?
(1) mitosis → gametes → zygote → fertilization
(2) gametes → meiosis → mitosis → fertilization
(3) fertilization → gametes → meiosis → zygote
(4) meiosis → gametes → fertilization → zygote

Fertilization and Development Vocabulary Terms

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____