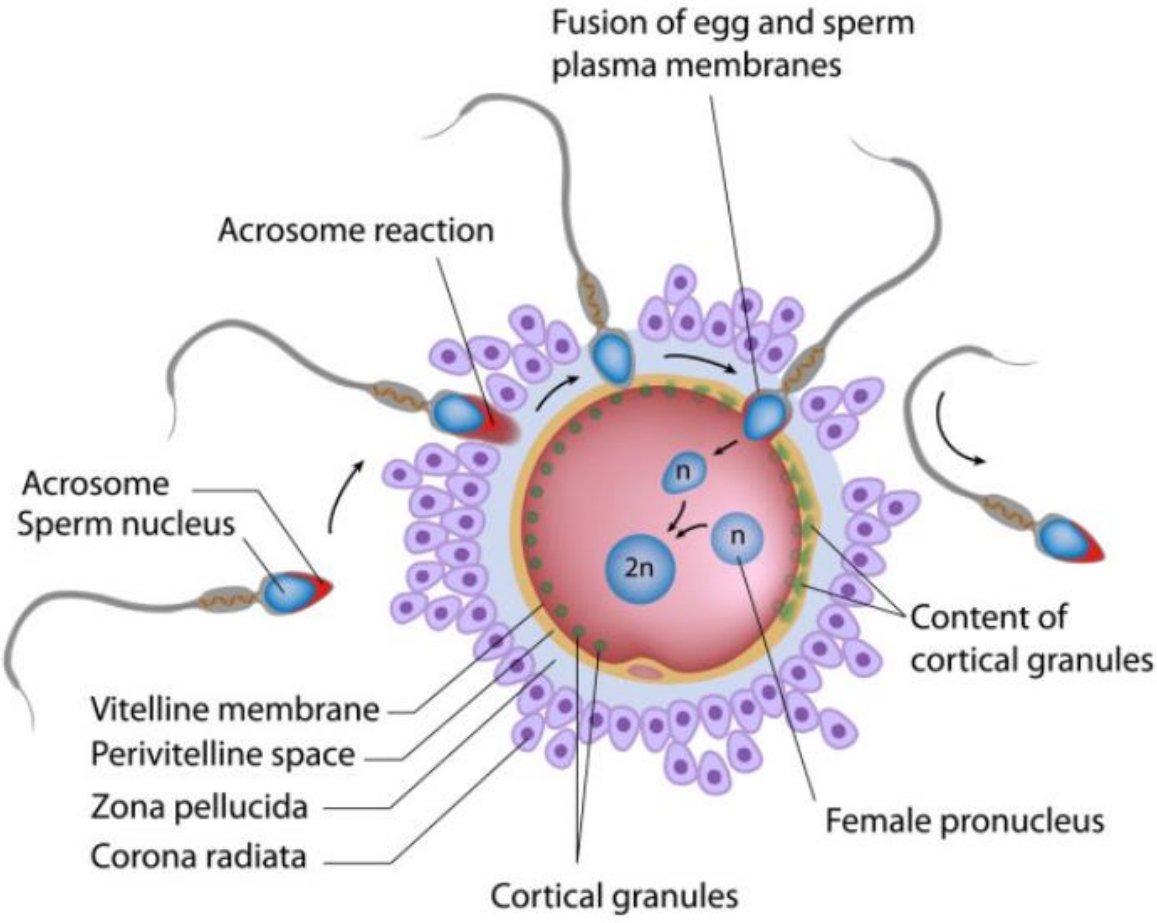
CONCEPT: ANIMAL DEVELOPMENT

- ***Fertilization*** – when sperm and egg fuse to form a zygote
    - □ Occurs in the fallopian tube
    - □ Egg is swept into fallopian tube by cilia
    - □ Fertilization must occur within 24 hours of ovulation
    - □ Acrosome of sperm contains enzymes to breakdown zona pellucida around the egg
    - □ Fusion of sperm with egg changes membrane potential of the egg to prevent additional sperm from fusing
        - Cortical reaction – release of Ca^{2+} depolarizes membrane (change in membrane potential)
        - Signals completion of second meiotic division of egg

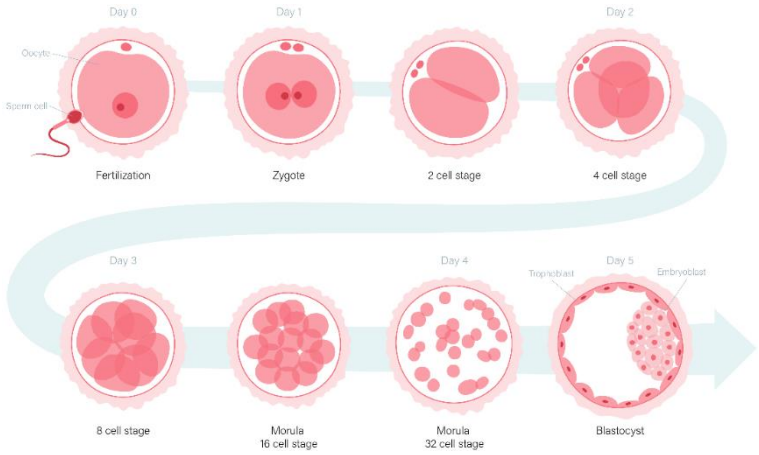
EXAMPLE:



CONCEPT: ANIMAL DEVELOPMENT

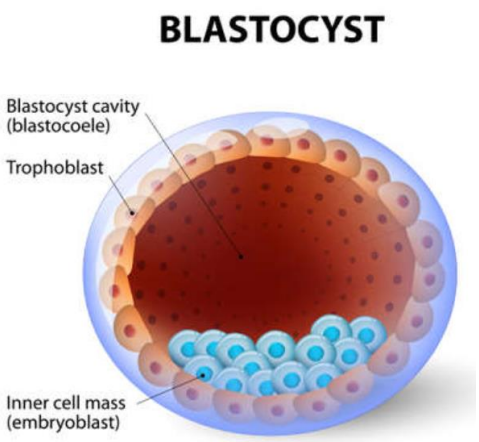
- ***Cleavage*** – rapid mitotic cell divisions occur as the zygote travels to the uterus
  - Zygote ➔ morula, cells divide into smaller cells
  - Indeterminate cleavage – the cells that arise are able to develop into a whole organism
  - Determinate cleavage – the cells that arise are committed to differentiation
  - Cell differentiation – cells differentiate based on differences in transcription
    - ***Induction*** – differentiated cells influence the fate of nearby cells
    - Inducers diffuse from organizing cells to responsive cells
  - ***Blastomere*** – cells created during cleavage
  - ***Morula*** – early stage embryo that consists of a solid ball of cells
- ***Cytoplasmic determinants*** – regulatory molecules located in specific regions of the egg so as to be distributed unevenly
  - Due to uneven distribution, only certain blastomeres will have regulatory cascades triggered by determinants
  - Cytoplasmic determinants play a major role in the formation of an organism's organs

EXAMPLE:



- ***Blastulation*** – the process by which the morula ➔ blastocyst
  - ***Blastula*** – hollow ball of cells (mammalian blastula is called blastocyst)
  - ***Blastocoel*** – the inner fluid-filled cavity
  - ***Trophoblast*** – cells that surround the blastocoel that give rise to the chorion and placenta
  - ***Inner cell mass*** – cells inside blastula that give rise to organism

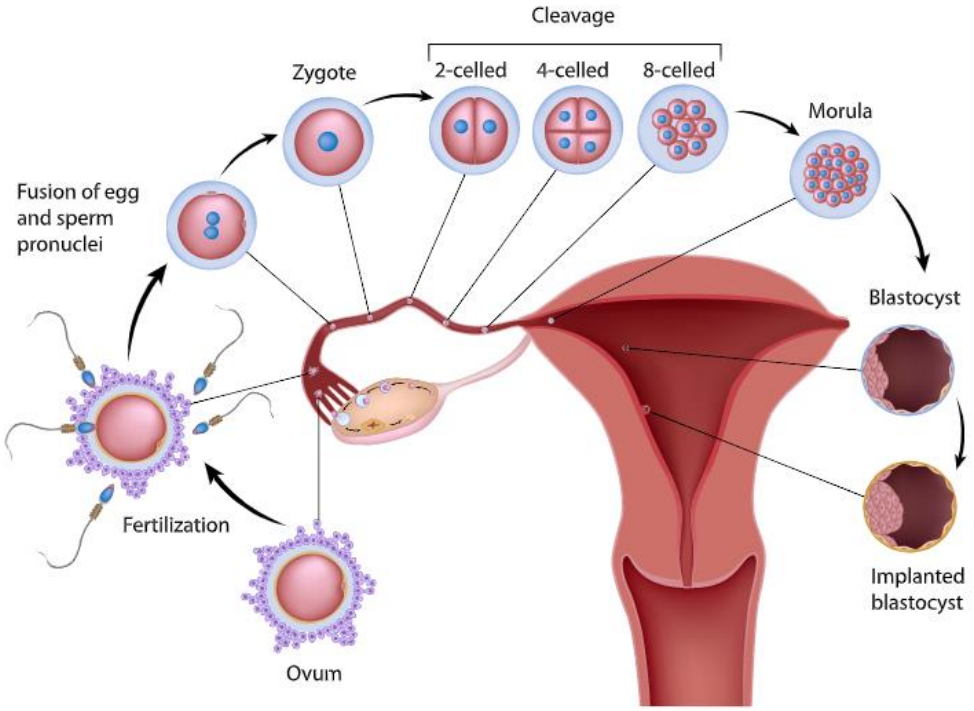
EXAMPLE:



CONCEPT: ANIMAL DEVELOPMENT

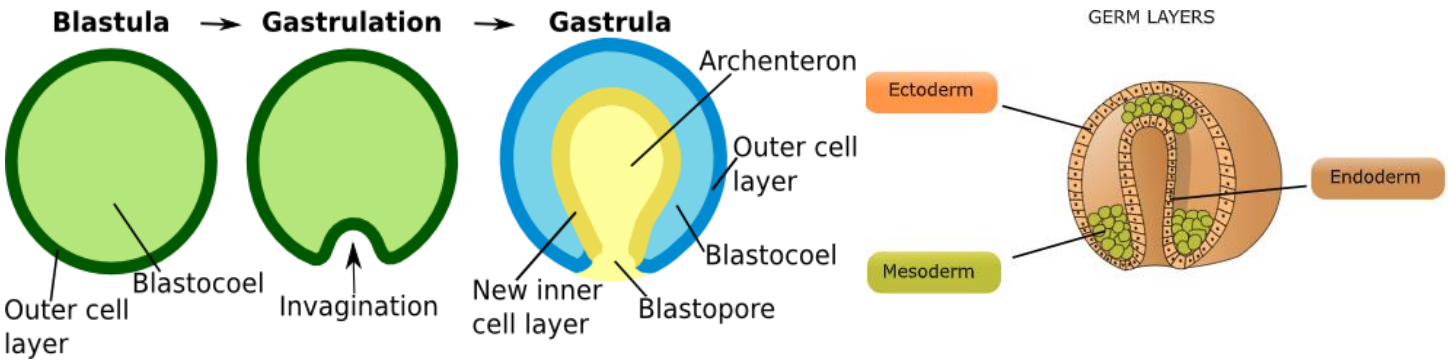
- ***Implantation*** – blastocyst implants in uterus
    - hCG is secrete by the implanted blastocyst
    - Levels of hCG should replace the falling levels of LH and allow continued secretion of estrogen and progesterone
    - Once placenta develops, it will produce estrogen and progesterone throughout pregnancy

EXAMPLE:



- ***Gastrulation*** – formation of the three germ layers, forming a gastrula
    - Gastrulation defines the body axes, blastopore becomes mouth or anus
    - ***Blastopore*** – the opening that forms to the digestive tube (archenteron)
    - ***Ectoderm*** – cells that remain outside and form nerves, adrenal medulla, skin, brain, eyes, and inner ear
    - ***Mesoderm*** – internal cells that give rise to organs, adrenal cortex, blood, bone, gonads, and the soft tissues
    - ***Endoderm*** – innermost cells that form the epithelial linings of the digestive tract, liver, pancreas, and lungs

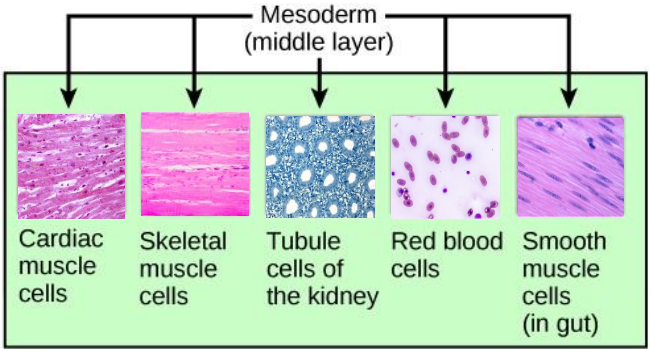
EXAMPLE:



CONCEPT: ANIMAL DEVELOPMENT

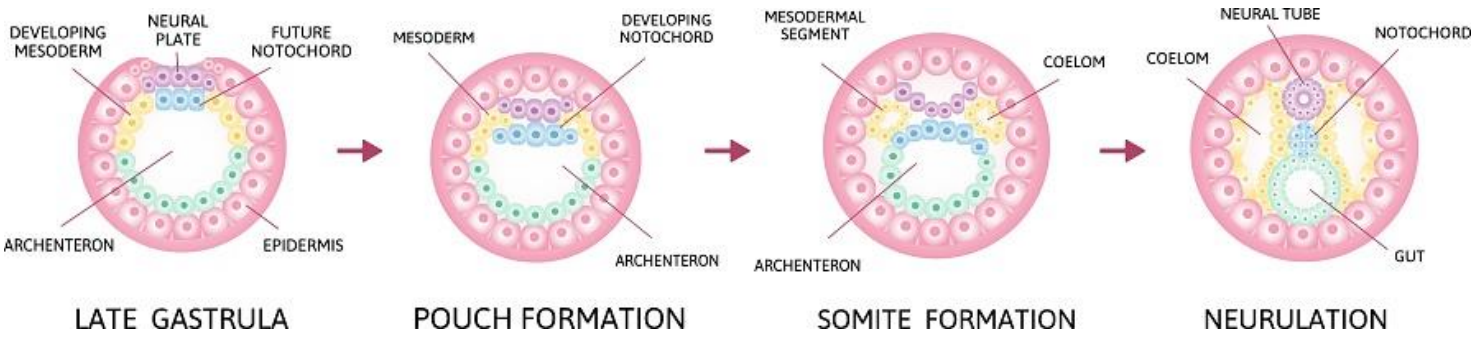
- ***Organogenesis*** – the process of organ and tissue development
    - ***Somites*** – pairs of mesodermal tissue
        - Cells position in somite determines what it develops into
        - Cells from somite break away in groups and migrate in developing embryo

EXAMPLE:



- ***Neurulation*** – formation of nervous tissue from primary germ layers
    - ***Notochord*** – primitive backbone formed in chordates during development
        - In some animals this develops into the vertebrae of the spine
        - In some animals it is a transient structure during development
    - ***Neural tube*** – hollow structure that the brain and spinal cord derive from
        - Neural tube swells in multiple places, forming the embryonic brain
    - Mesoderm cells form notochord and induce ectoderm cells to furrow forming neural groove and neural folds
    - Neural folds surround neural groove to form neural tube that gives rise to the central nervous system

EXAMPLE:



- Cell determination – irreversible commitment of a cell to a particular developmental path, resulting in a specific cell type
    - Differentiation is a gradual process, but once a cell is committed to a path its fate is sealed