

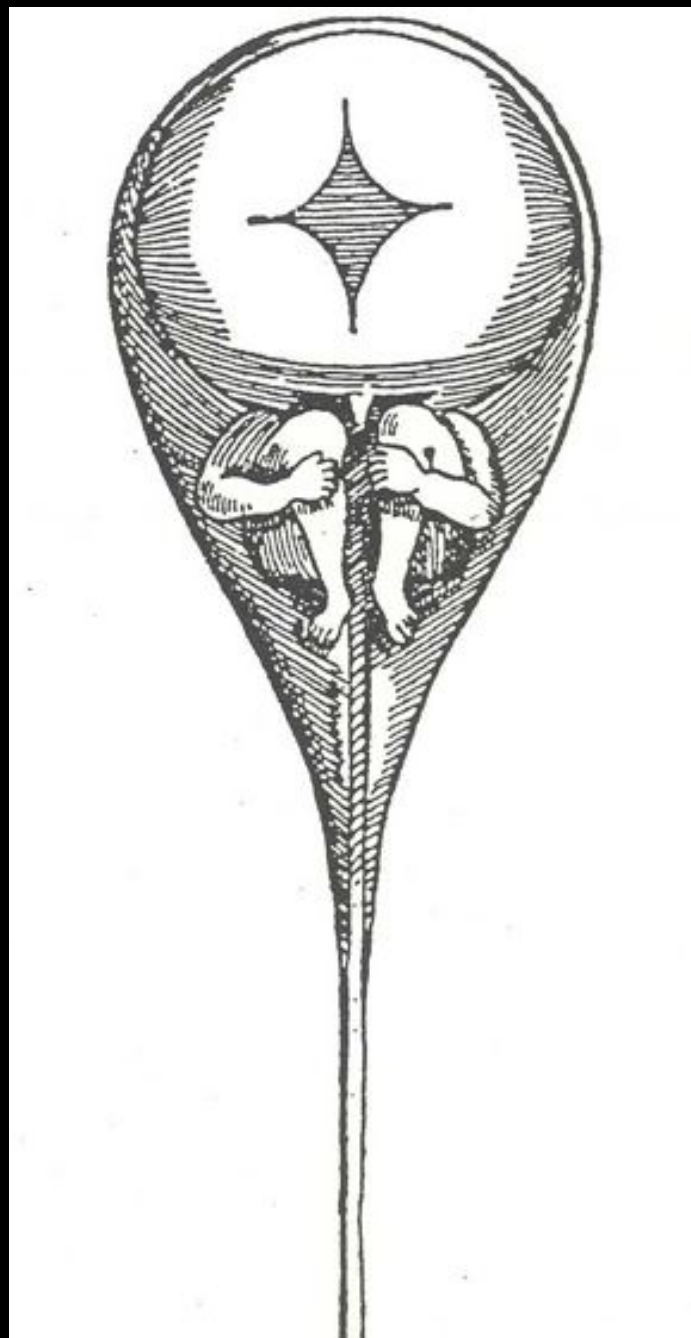
7-week-old human embryo



Human Development



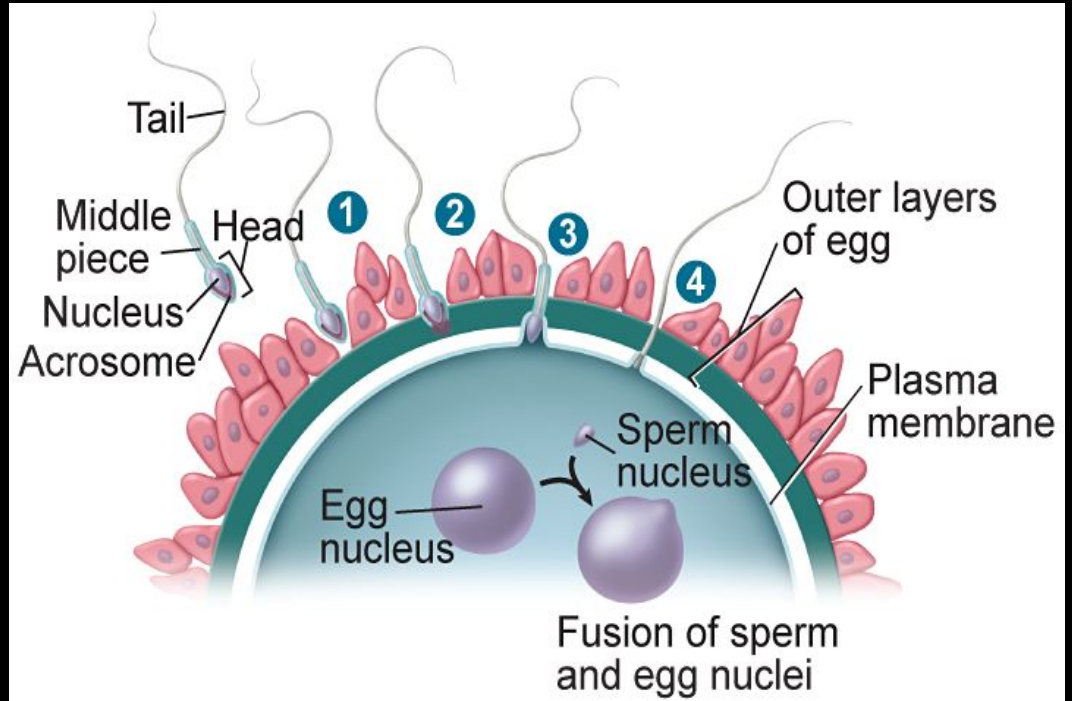
It is difficult to imagine that each of us began life as a single cell about the size of the dot at the end of this sentence.



Fertilization

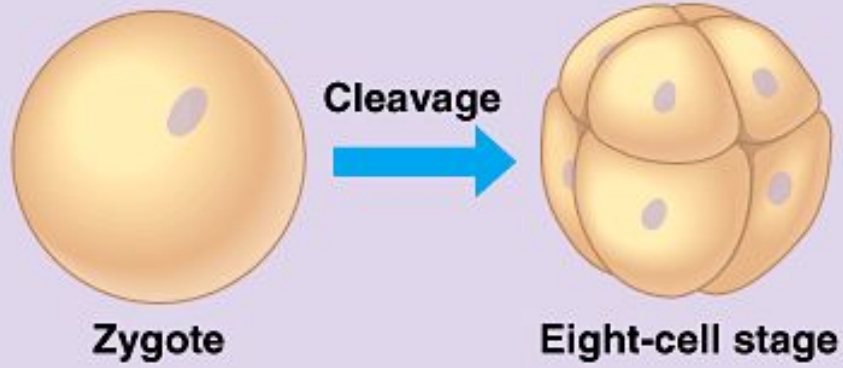
Process of a sperm cell joining with an egg cell – **zygote**.

- Each normally has 23 chromosomes.
- Fertilization restores 46 chromosomes.

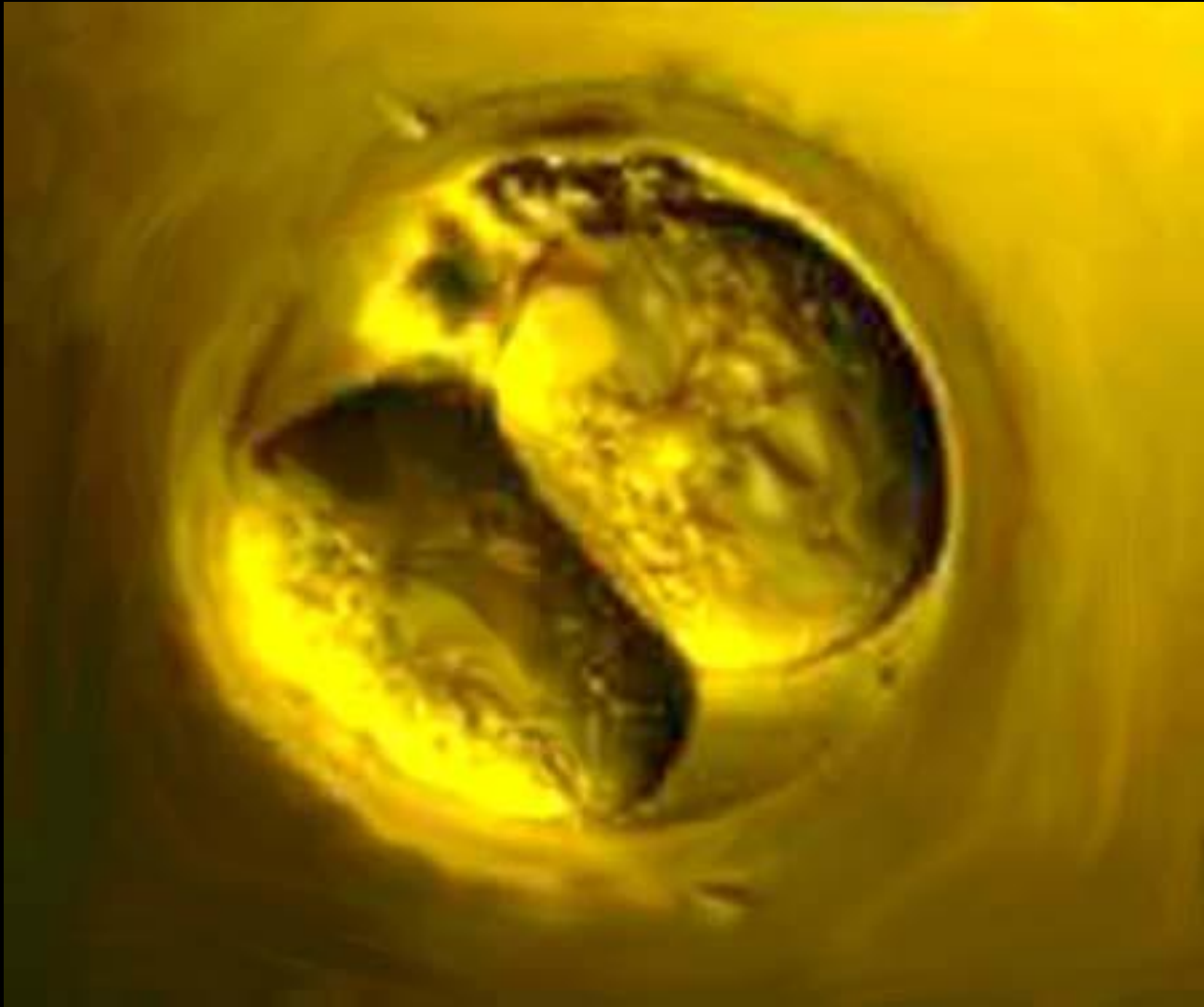


Cleavage

- A succession of rapid cell divisions that follow fertilization.
- The embryo does not enlarge during this period of development.
- Cleavage simply partitions the cytoplasm of one large cell (the zygote) into many small cells called **blastomeres**.



*Cleavage (divide via mitosis) forms the
2 cell stage*



They split again to form the 4 cell stage



And again to form the 8 cell stage...



And eventually form a Morula

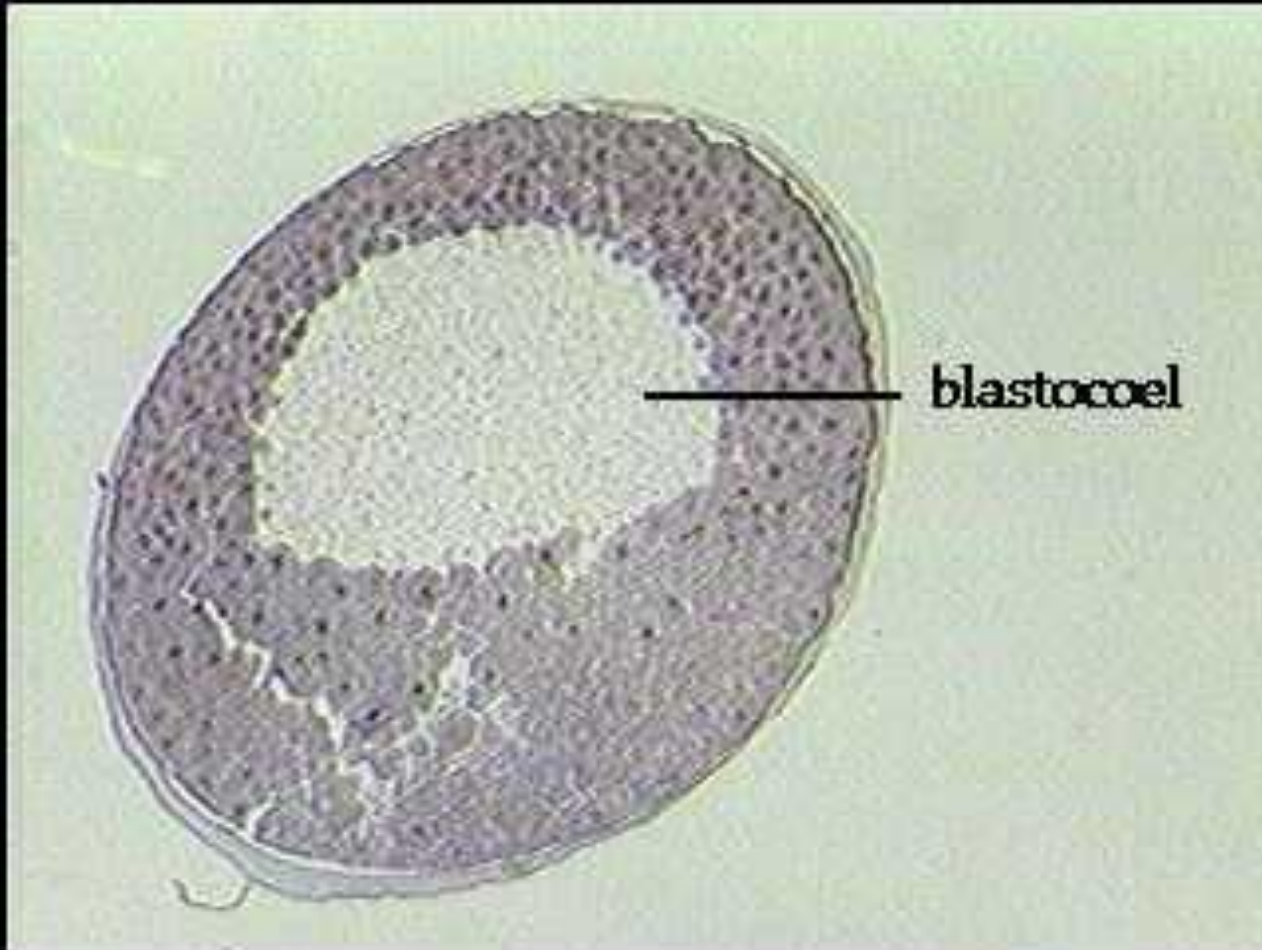


Morula

- Continued cleavage produces a solid ball of cells known as **morula**.
- 16-64 cells.

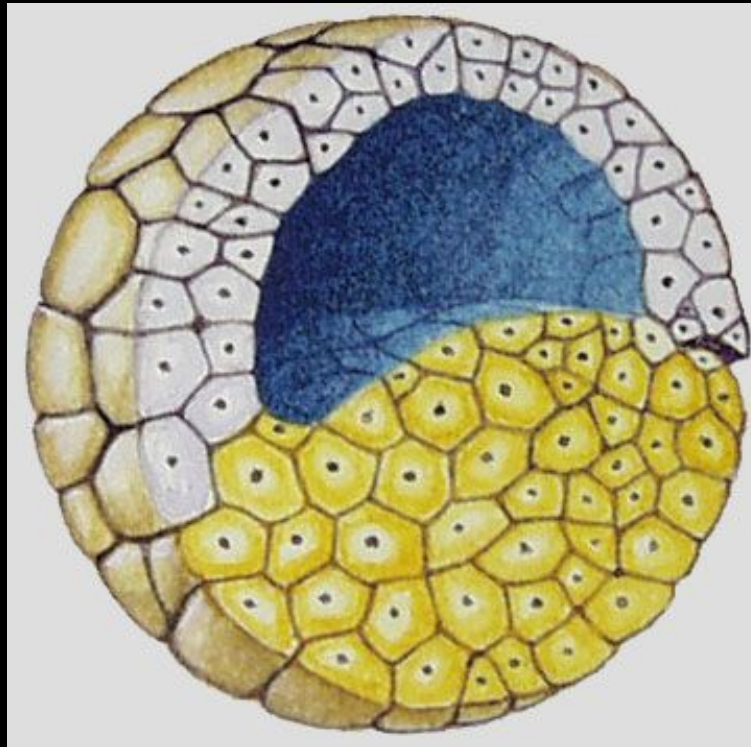


Next it becomes a blastula



Blastula (hollow ball)

- A fluid filled cavity called **blastocoel** forms within the morula creating a hollow ball called the blastula.





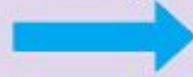
Zygote

Cleavage

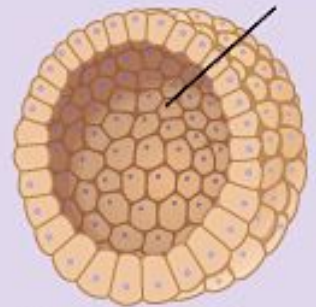


Eight-cell stage

Cleavage



**Blastula
(hollow ball)**



**Cross section
of blastula**

Blastocoel

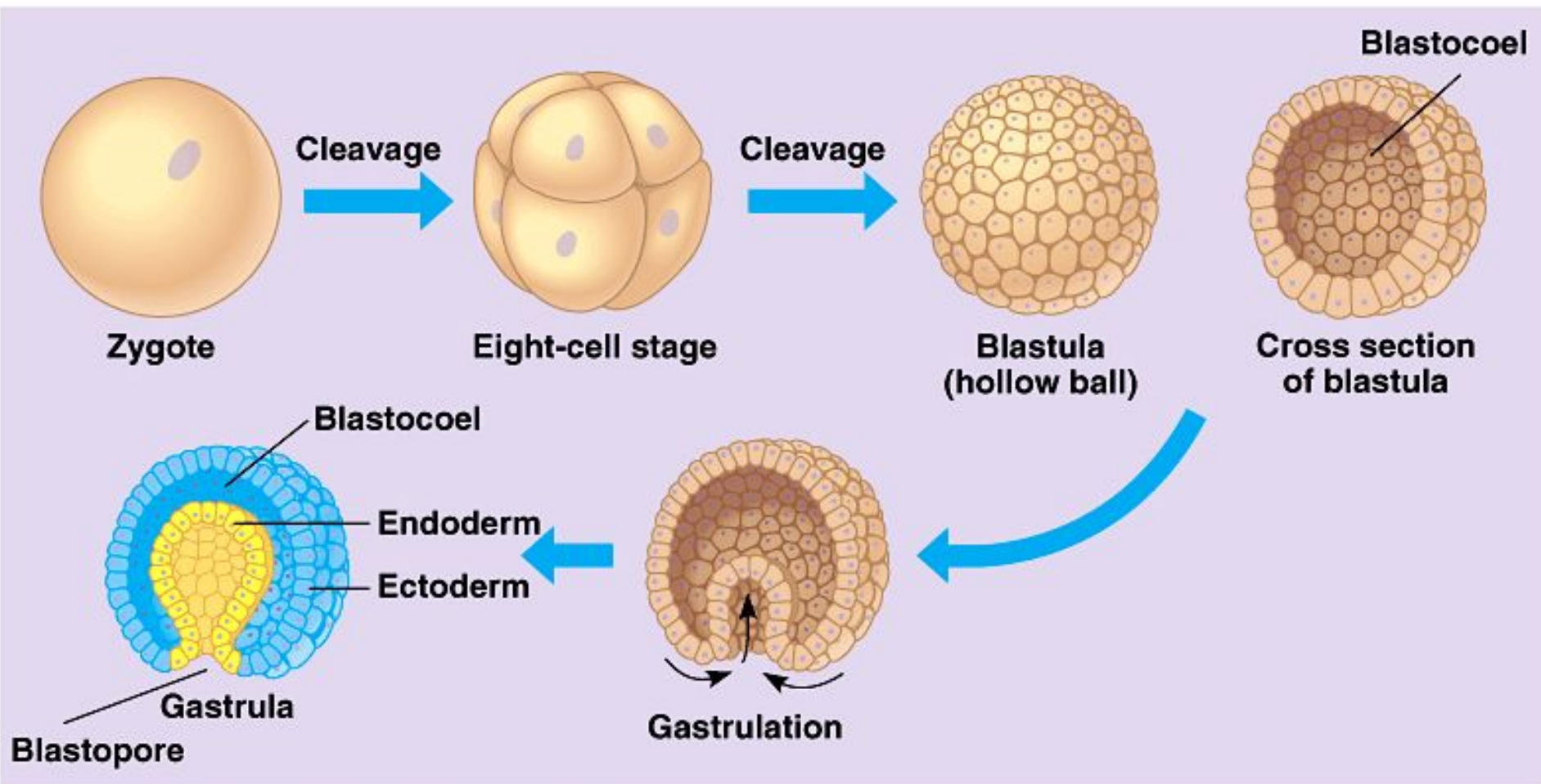


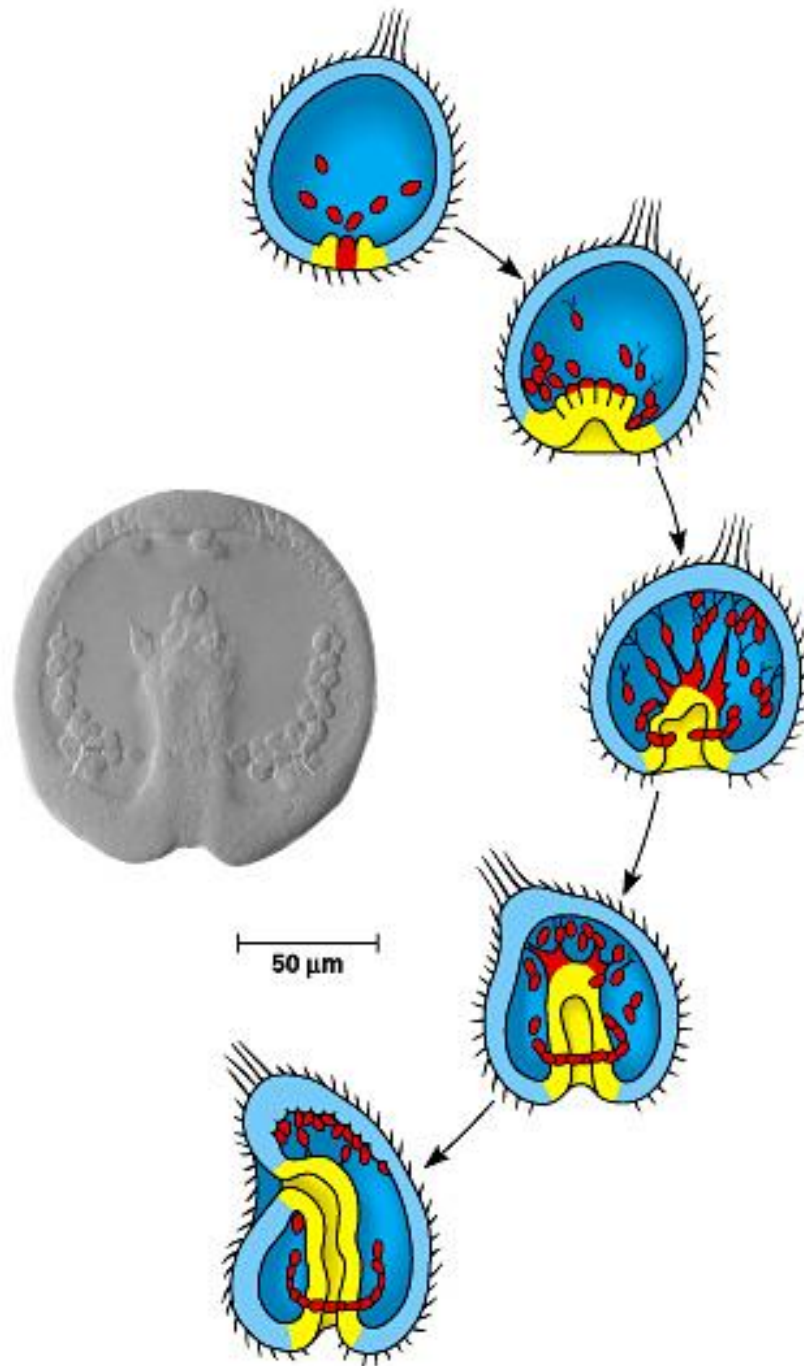
And next, a gastrula



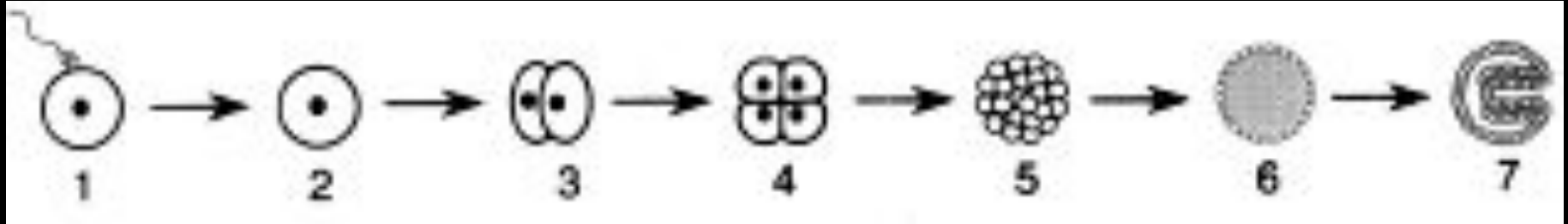
Gastrula

- **Gastrulation** – is a rearrangement of the cells of the blastula.
- Result of gastrulation is that some of the cells of blastula move to an interior location, and three cells layers are established – **invagination**.
- The three-layered embryo is called the **gastrula**.





The Regents Diagram...

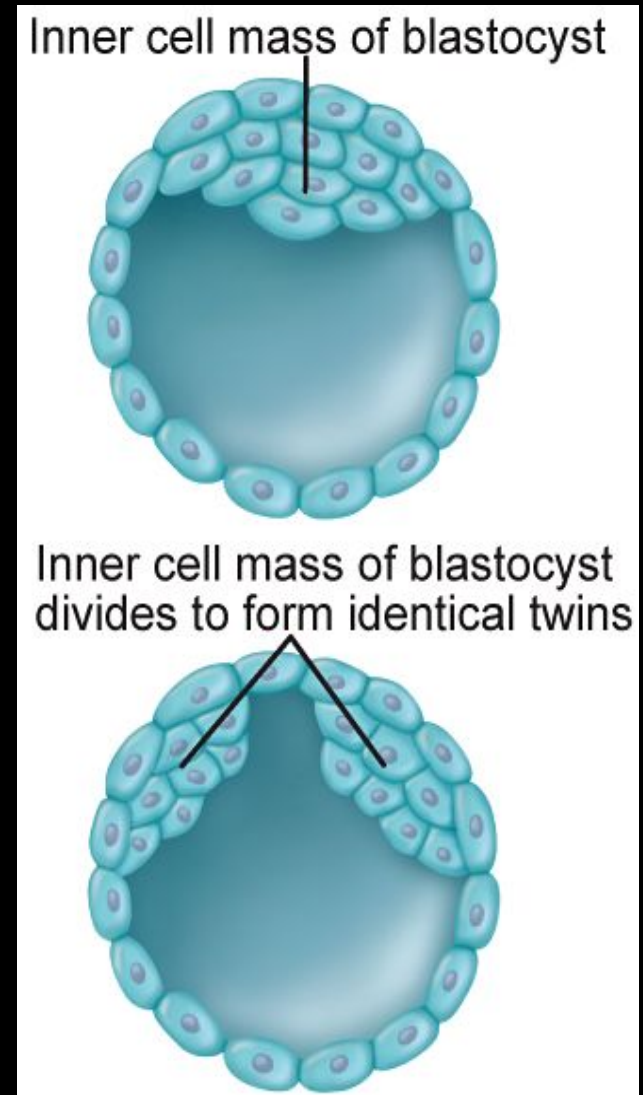


1. Sperm and ovum
2. Zygote (fertilized ovum)
3. 2-cell stage
4. 4-cell stage
5. Morula
6. Blastula
7. Gastrula

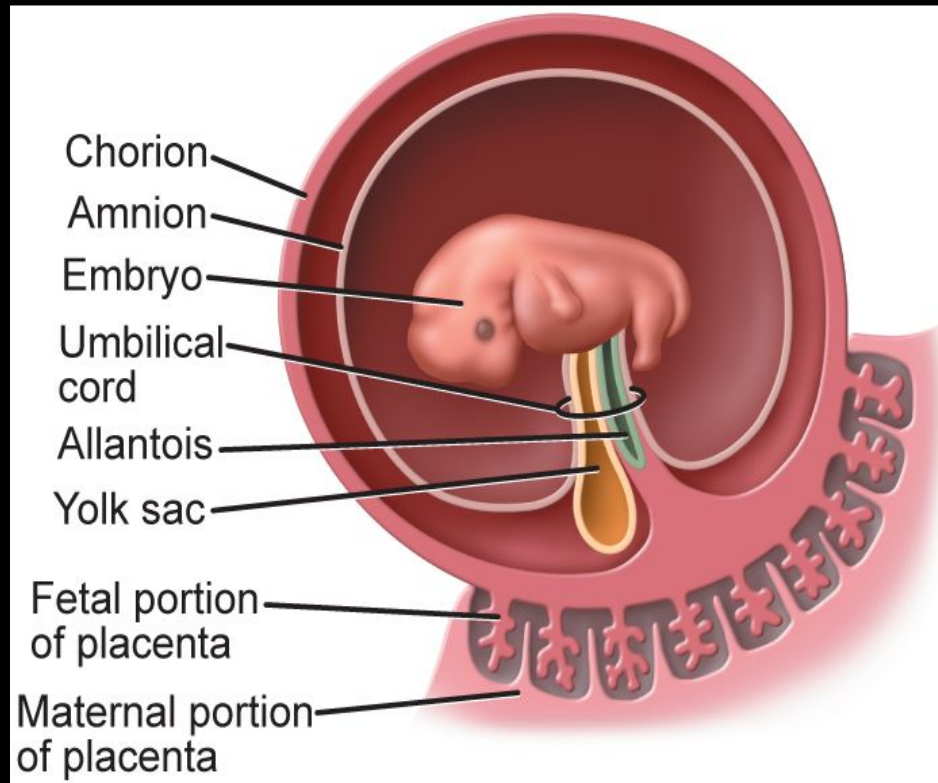
Early Development

- The fertilized egg is called a zygote.
- By the third day, the embryo, called a morula, leaves the oviduct and enters the uterus.

- By the fifth day, the morula has developed into a blastocyst.
- The blastocyst attaches to the wall of uterus around the sixth day and is fully implanted by Day 10.



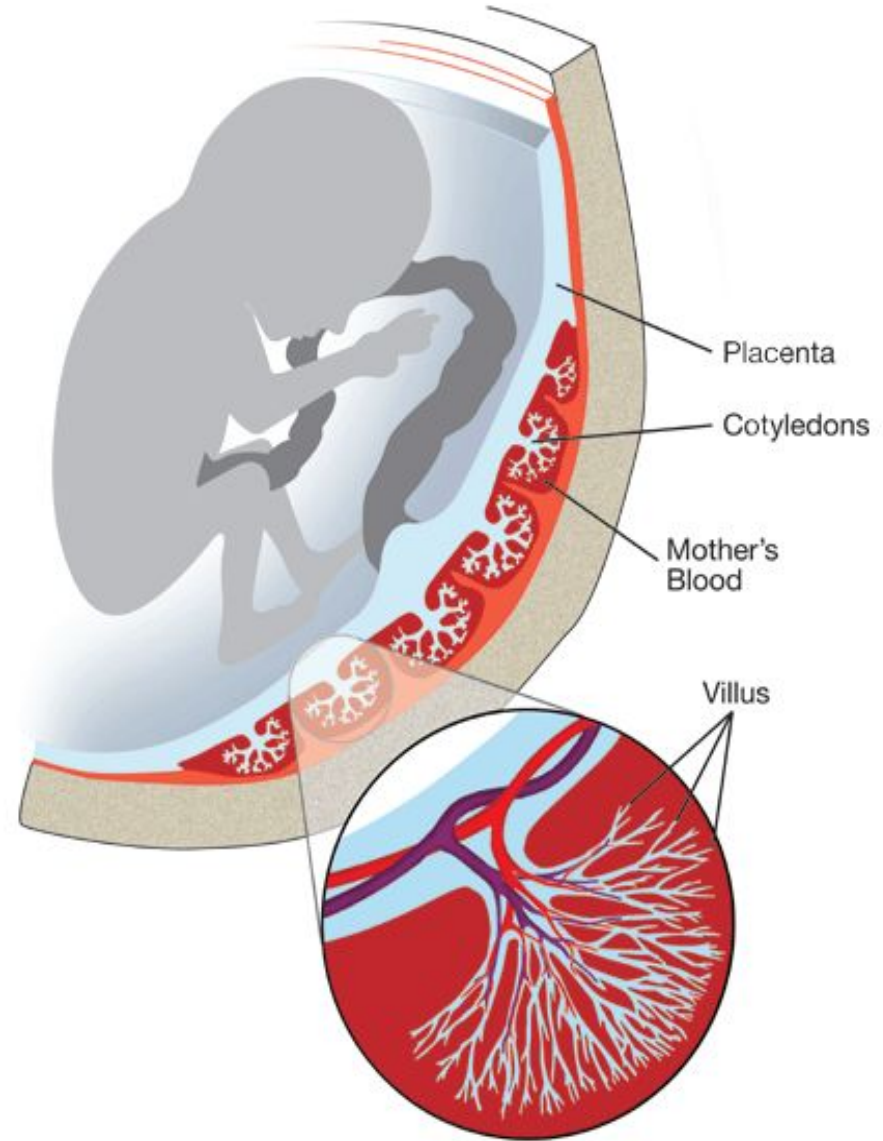
Extraembryonic Membranes



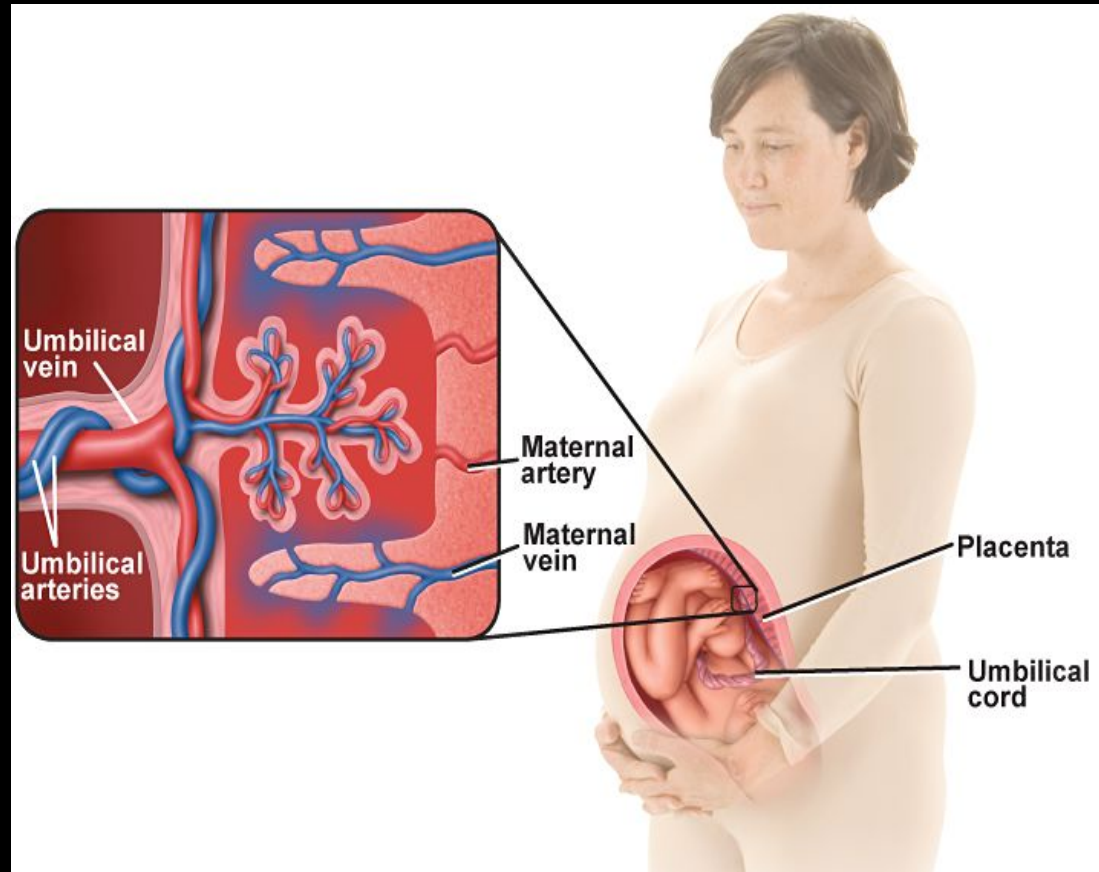
- Four extraembryonic membranes form.
- These membranes are the amnion, the chorion, the yolk sac, and the allantois.

The Placenta

- Provides food and oxygen and removes wastes
- The placenta has two surfaces
- A fetal side that forms from the chorion
- A maternal side that forms from uterine tissue



- A.** As an embryo develops, the chorionic villi begin to grow into the uterine wall.
- B.** Nutrients, oxygen, and wastes diffuse across maternal and fetal blood vessels.
- C.** The placenta contains tissue from both mother and fetus.

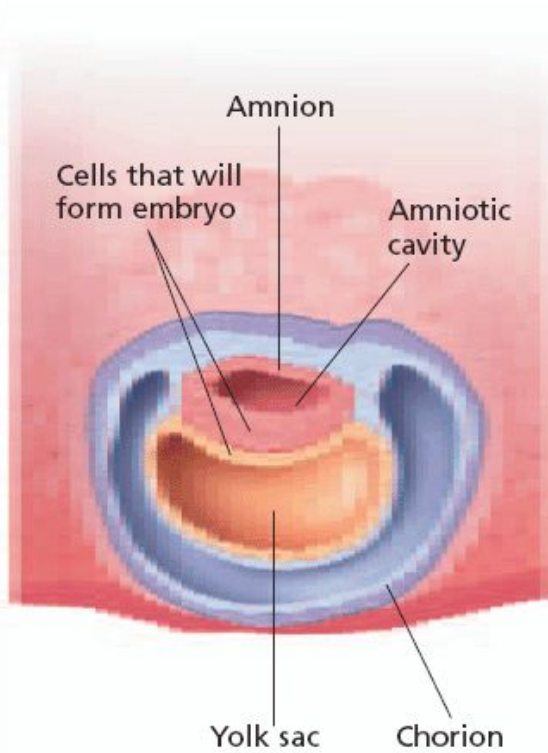


Three Trimesters of Development

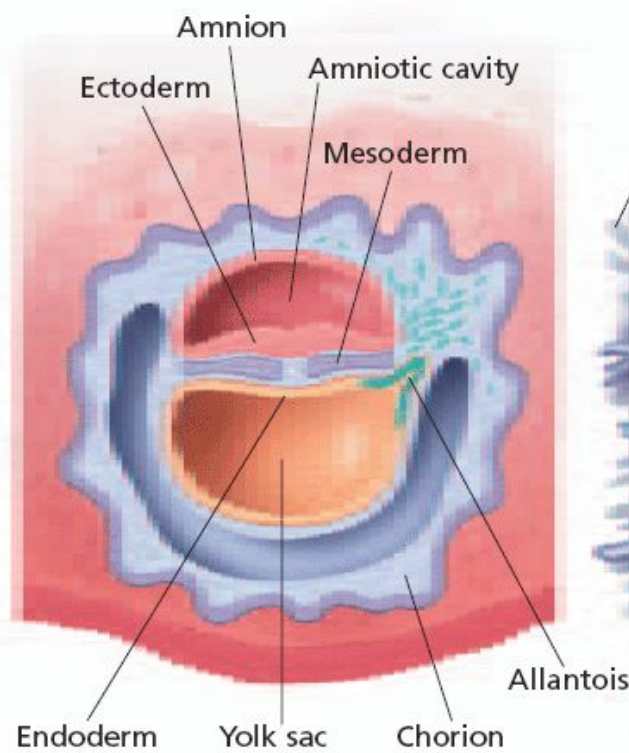
- Human development takes around 266 days from fertilization to birth.
- This period known as **gestation**, or pregnancy.
- The pregnancy is divided into three trimesters.

The First Trimester

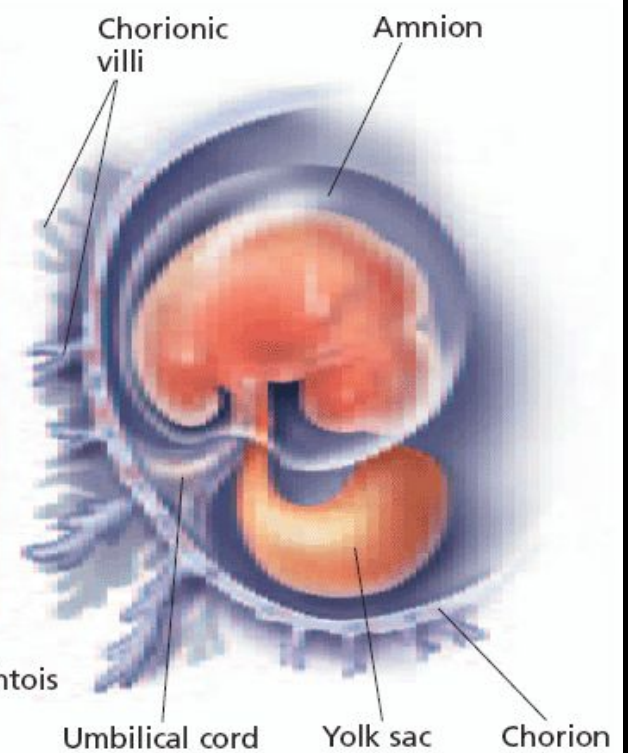
- All tissues, organs, and organ systems begin to develop.
- For the first 8 weeks of pregnancy, the developing human is called an **embryo**.
- At the end of eight weeks, the embryo is called a **fetus**.
- By the end of the fourth week the heart begins to beat.
- During the second month arms and legs take shape.



(a) 9-Day Blastocyst



(b) 16-Day Embryo



(c) 4-Week Embryo

The Second Trimester

- Period of growth

The Third Trimester

- The fetus continues to grow at a rapid rate.
- Fat accumulates under the skin to provide insulation for the fetus once it is born.

Preventable Causes of Birth Defects

Cause	Defect
Alcohol consumption	• Mental retardation
Cigarette smoking	• Health problems related to premature births and underweight babies
Lack of folic acid in diet	• Anecephaly (head and brain do not completely form) • Spina bifida (nerve cells from the spinal cord are exposed leading to paralysis)
Cocaine	• Low birth weight • Premature birth • Possible permanent brain damage and behavioral disorders
Methamphetamine	• Premature birth • Extreme irritability

Birth

- Birth occurs in three stages: dilation, expulsion, and the placental stage.
- The beginning of the birthing process is called **labor**.

Infancy

- The first two years of life

Childhood and Adolescence

- Childhood is the period of growth and development that extends from infancy to adolescence.
- Puberty marks the beginning of adolescence.
- Begins between ages 8 to 13 in girls and ages 10 to 15 in boys.

Adulthood

- At the end of adolescence, physical growth is complete, marking the beginning of adulthood.
- Decrease in muscle mass, a slowing of overall metabolism, and a decreased pumping ability of the heart.



ЗАРОДЫШ
2-МЕСЯЧ-
НЫЙ



ПЛОД
4 МЕСЯЦА



НОВО-
РОЖДЕН-
НЫЙ



2 ГОДА



6 ЛЕТ



12 ЛЕТ



25 ЛЕТ