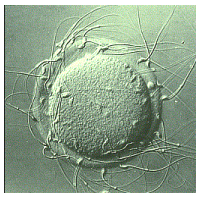
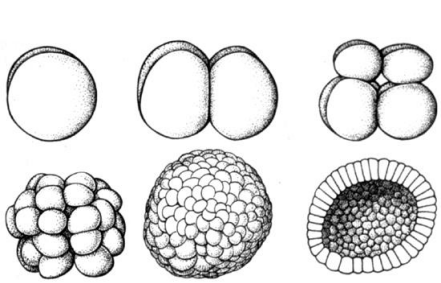
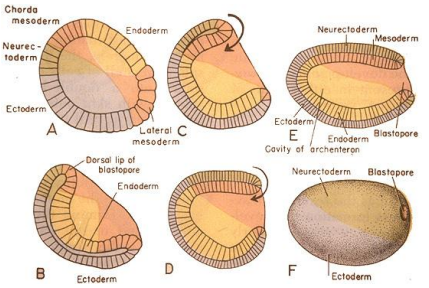
Zygote Formation and Development



A



B C D E F G



←----------H----------→

1. What is a zygote? Which picture shows the formation of a zygote?
A zygote is the union of egg and sperm (n + n = 2n). Picture A shows the formation of a zygote (fertilization).

2. What process is responsible for pictures b-f? What is another term for this process?
Mitosis is responsible for the changes seen in pictures b-f, another term used for this process is **cleavage**.

3. How do the cells in structure "e" compare to each other genetically?

The cells in structure "e" are genetically identically because they were formed by mitosis/cleavage.

4. The blastula is a hollow ball of identical cells, which picture shows this?

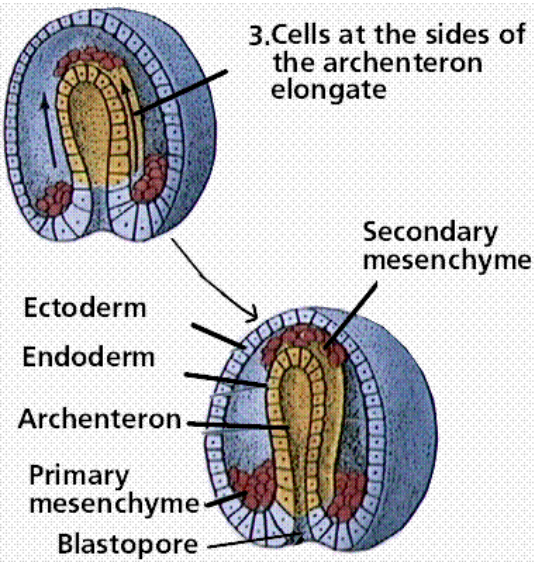
"G" shows the blastula.

5. Gastrulation is the process through which the blastula indents into three layers, which picture shows this?

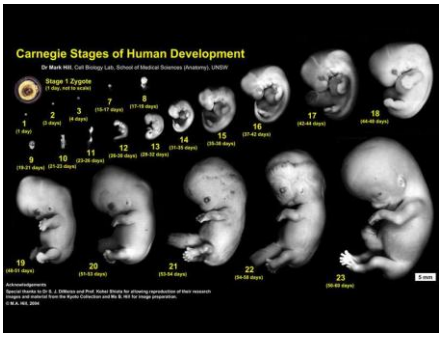
"H" shows gastrulation.

Up to this point, all of the cells of the gastrula are genetically identical and have not been given a specific task. A process known as **differentiation** then takes place, where different cells are given specific tasks; this is accomplished by the activation of certain genes in various cell types.

Predict what each of the following layers of the gastrula develops into:



Layer	Function
Ectoderm	This layer becomes the skin and nervous system
Mesoderm	This layer becomes most of the organs, muscle and bones
Endoderm	This layer becomes the linings of the digestive and respiratory tracts and some other organs



Fertilization and Development

Human reproduction is characterized by **internal** fertilization and **internal** development. Not all animals carry out fertilization and development this way. For example, amphibians, like frogs and fish, fertilize their eggs in the external water environment. Female frogs and fish release the eggs in the water and the males release their sperm onto them.

1. What is the evolutionary advantage of these organisms to release hundreds of eggs and sperm at the time of fertilization?

By releasing hundreds of eggs and sperm into the external environment, it increases the chances that some will get fertilized and develop into offspring.

2. Why could external fertilization be considered a disadvantage?

In external fertilization, the egg and sperm are exposed to the elements such as predators and other environmental conditions.

3. Predict the relative number of offspring common to external fertilization compared to internal fertilization. Which of Darwin's theories does this describe?

More offspring are produced in external fertilization compared to internal to ensure that some will survive (overproduction and survival of the fittest).

Terrestrial (land-based) organisms like reptiles and birds carry out **internal** fertilization and **external** development. The egg is fertilized in the reproductive tract of the female to insure a moist environment is maintained (yes, birds do "it"). The fertilized egg is then released and develops externally.

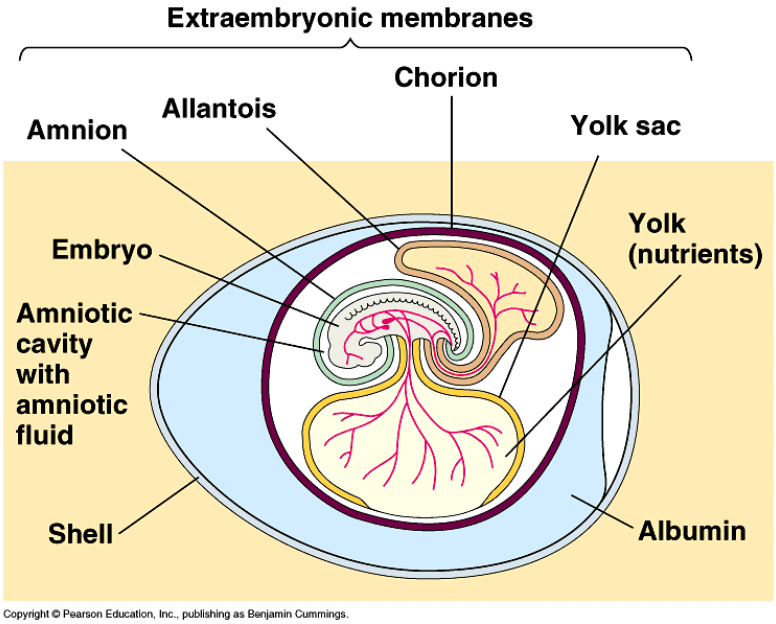
4. Why would terrestrial organisms require internal fertilization?

The sperm requires a moist environment to survive and swim to reach the egg; the reproductive tract of the female provides this.

5. Which type of development (internal or external) usually receives more parental care?

Internal development receives more parental care (inside the mother, provided with a warm, safe environment and nutrients).

A bird egg is shown in the diagram below:



Structure	Function
Amniotic cavity with amniotic fluid	The fluid in this cavity provides protection against shock (movement when mother sits on egg)
Shell	The shell provides additional protection and also allows gases in and out of the egg
Chorion	The chorion in a membrane that lines the inside of the shell and contains all the additional parts of the egg
Yolk sac/yolk	The yolk sac provides nutrients to the developing chick embryo (there must be enough to feed the embryo until the chick is ready to hatch)
Allantois	The allantois helps the developing chick eliminate liquid waste and exchange gas