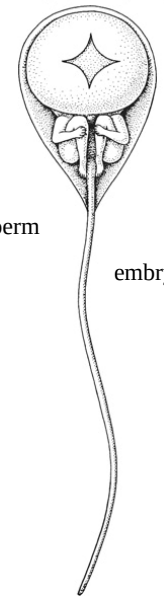
# Chapter 8 Principles of Development

Figure 08.01





## Preformation

miniature adult in egg or sperm

## Epigenesis

embryo contains building materials that are assembled

Figure 08.02



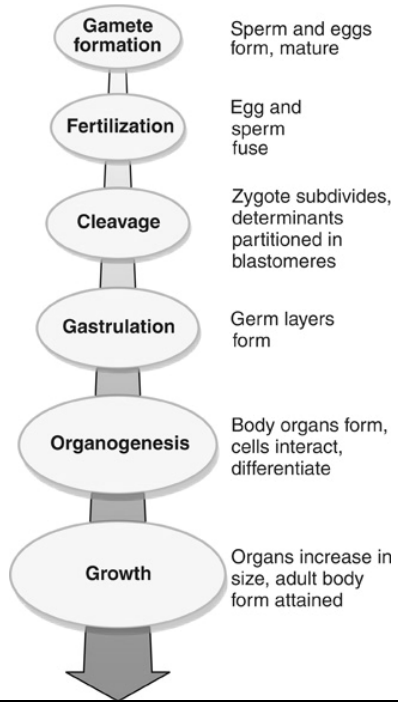



Figure 08.06



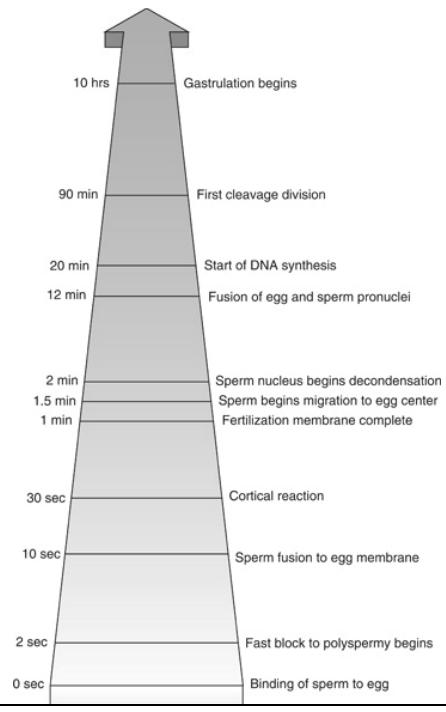
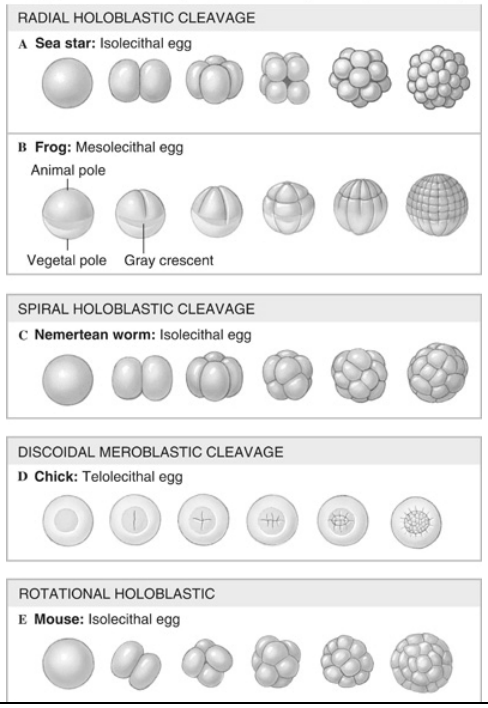


Figure 08.07






**blastomeres**

no cell growth

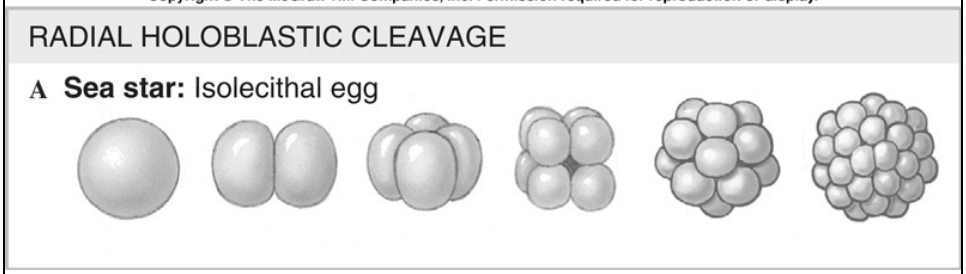
polychaete worms 1000 cells

amphioxus-9000 cells

frogs-700,000 cells

Figure 08.07a






very little yolk

yolk is distributed evenly

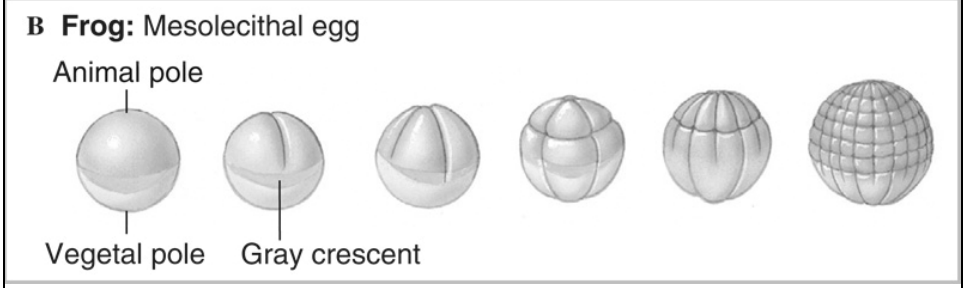
cleavage furrow extends completely through the egg

echinoderms, tunicates, cephalochordates, molluscs & mammals

cleavage is slowed in the yolk-rich vegetal pole

Figure 08.07b






animal pole opposite vegetal pole & contains cytoplasm & very little yolk

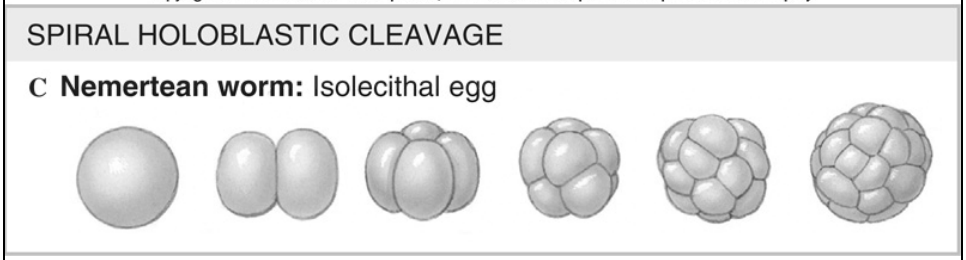
cleavage holoblastic but retarded in the yolk vegetal region

cleavage is faster in the animal region

amphibians

Figure 08.07c






very little yolk

yolk is distributed evenly

spiral cleavage

Figure 08.07d



DISCOIDAL MEROBLASTIC CLEAVAGE

**D Chick:** Telolecithal egg

much yolk concentrated at vegetal pole

actively dividing cytoplasm confined to narrow shaped disc mass on yolk

cleavage is partial (meroblastic): furrow does not cut through the yolk

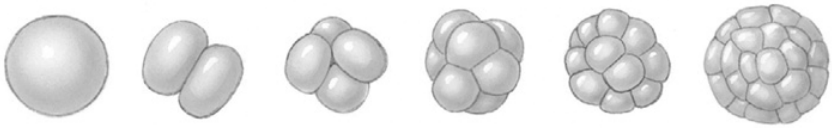
birds, reptiles, most fishes & few amphibians

Figure 08.07e



ROTATIONAL HOLOBLASTIC

**E Mouse:** Isolecithal egg



**Centrolecithal** egg

cytoplasmic cleavage limited to a surface layer of yolk-free cytoplasm

yolk-rich inner cytoplasm uncleaved

meroblastic cleavage

insects & many other arthropods

**Cleavage Patterns**

Affected by:

genes controlling symmetry of cleavage

quantity and distribution of yolk

**Yolk**

Determines larval development

**direct development**:

enough yolk support growth to juvenile stages (reptiles & birds)

telolecithal egg

**indirect development**: larval stages between egg & adult

isolecithal/mesolecithal eggs

**Development**

single cell—differentiate into different body parts

commonality among 32 multicellular phyla

Figure 08.08



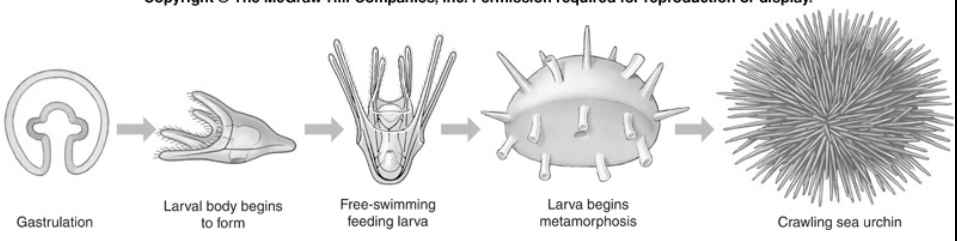
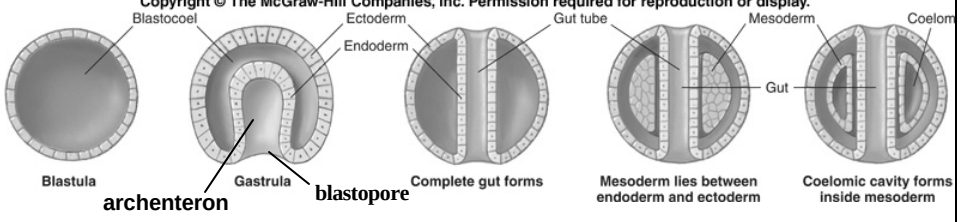



Figure 08.09






**blastula**

blastocoel: fluid-filled cavity

few 100-several thousand cells

single germ layer occurs in all multicellular animals

development into second germ layer except sponges

germ layers produce all structural parts

**gastrula**

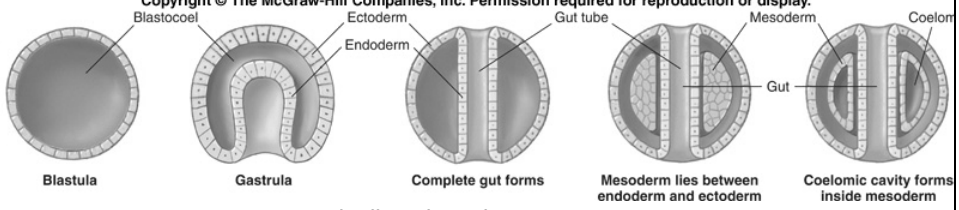
second germ layer

**invagination**

formation of new internal cavity = **archenteron**/gastrocoel

formation of opening = **blastopore**

outer layer-ectoderm; inner layer-endoderm = **diploblastic**




**complete gut** = mouth-digestive tube-anus
**incomplete gut** = blind/only mouth-digestive tube

**Mesoderm =** germ layer between ectoderm & endoderm
arises from endoderm
formation two ways
cells pushing outwards from central archenteron
proliferation of cells near blastopore
ectoderm, endoderm & mesoderm = **triploblastic**

**Coelom =** internal fluid-filled cavity surrounded by mesodermal tissue
enterocoely: **evagination** = central archenteron cells push outward & pinch off
schizocoely: cells dividing near blastopore

Figure 08.10



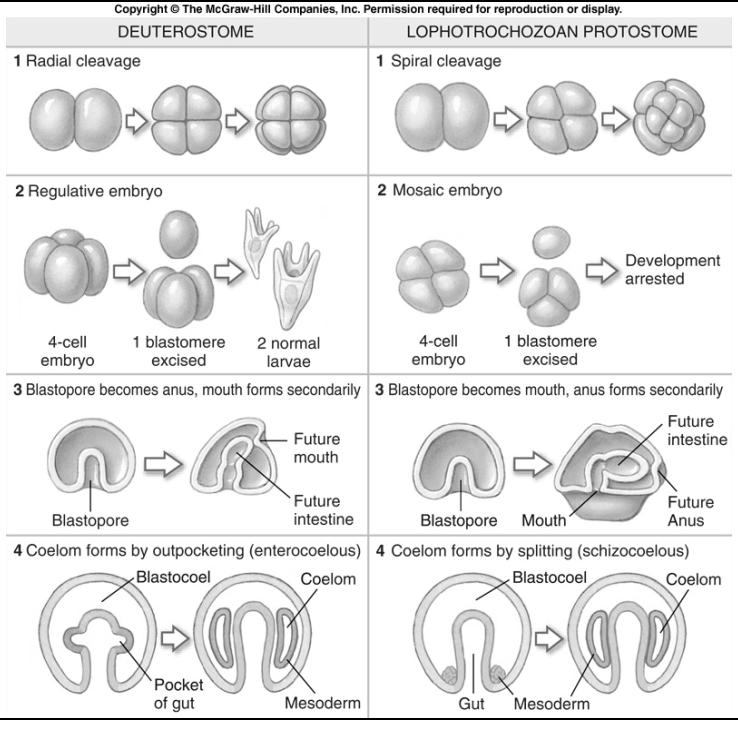


Figure 08.11



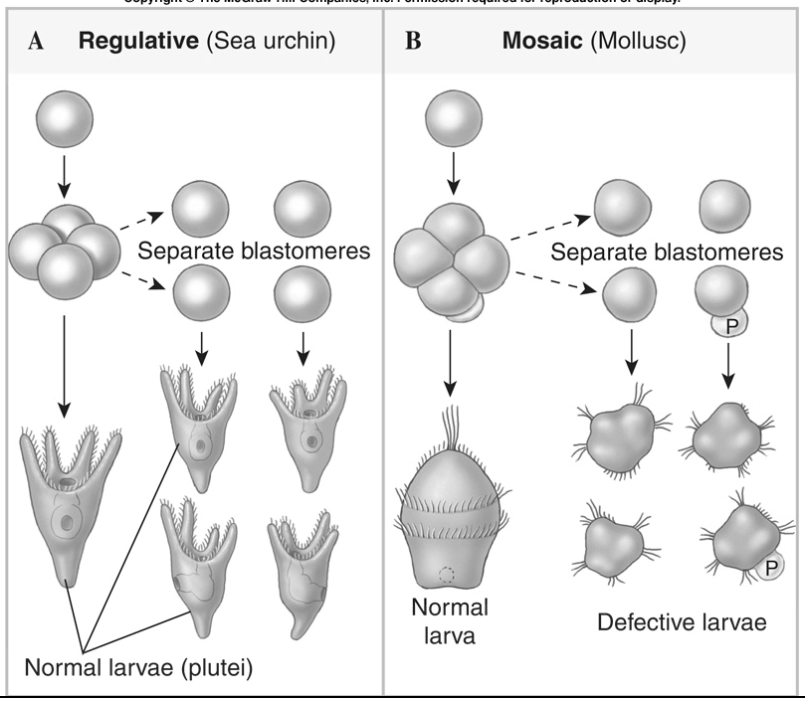



Figure 08.11a



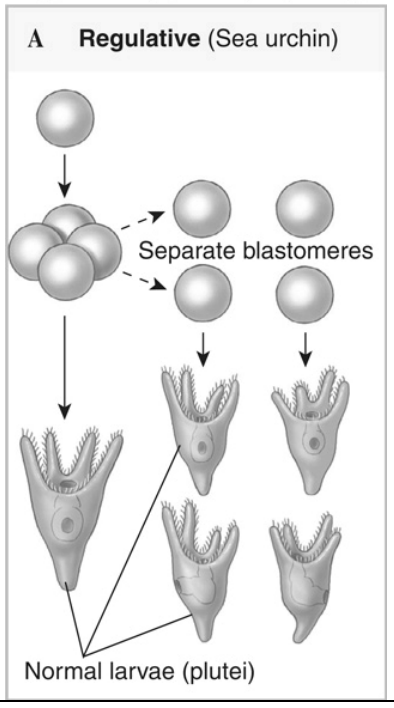


Figure 08.11b



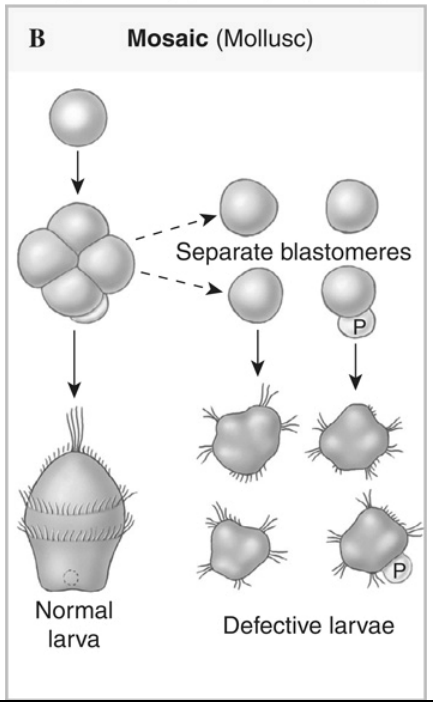



Figure 08.13a



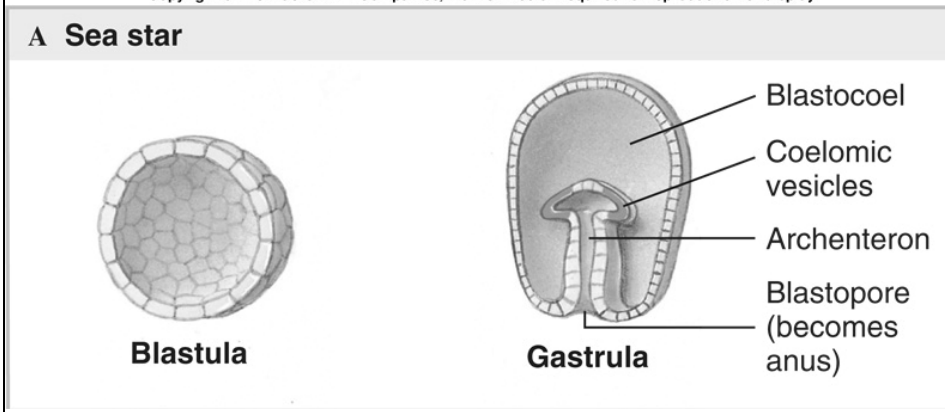


Figure 08.13c



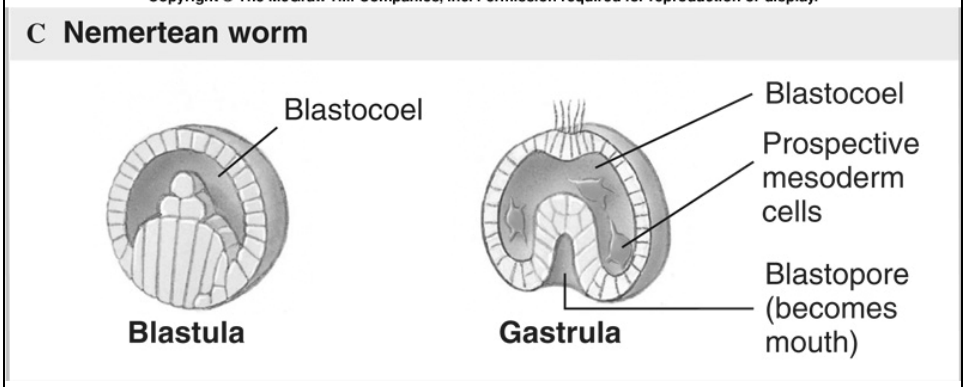



Figure 08.21



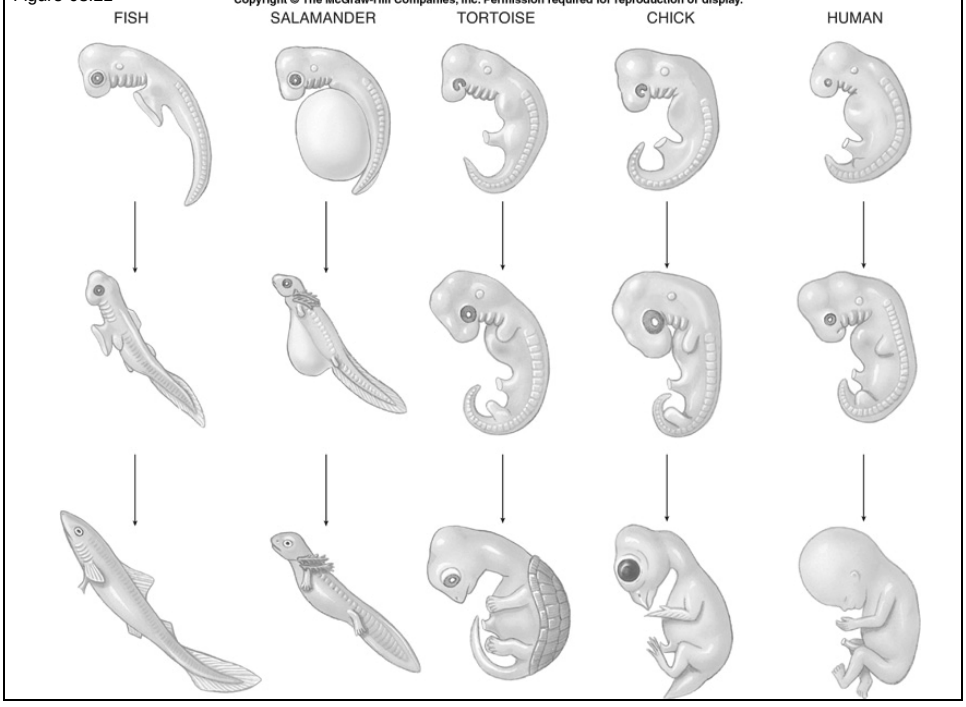


Figure 08.26