

Learning Goals for classes 1-6 (First Quiz)

Be able to:

Gene Expression

1. Estimate and compare the information content of different genomes.
2. Define differential gene expression and its relationship to differentiation.
3. Describe the control points in gene expression at which synthesis of the active protein gene product can be regulated.
4. Explain what is meant by and the significance of *combinatorial controls* in the regulation of gene expression during development.

Cell signaling

1. Describe in general the process by which developmental signals are sent from one cell and received by other cells, and what happens in the receiving cells as a result.
2. Compare and contrast the major developmental signaling pathways (Wnt, TGF β , Hedgehog, RTK).
3. Explain how a mutant component of a signaling pathway can cause a cell to become cancerous.
4. Describe how the extracellular matrix (ECM) is involved in signaling.

Cell fate determination

1. Diagram the two major mechanisms of cell determination and explain their general molecular basis.
2. Distinguish (experimentally) between cell fate, cell commitment, and cell differentiation.
3. Explain what cytoplasmic maternally-contributed determinants are, and justify their importance during development.

Fertilization and cleavage

1. Describe, in a general way, the process of fertilization and the different features of sperm and oocyte.
2. Explain how the orientation of cleavage planes is determined.
3. Relate the orientation of cleavage planes to establishment of cell fate.
4. Explain the importance of and predict consequence of the "mid-blastula transition"

Gastrulation and Neurulation

1. Define the terms blastula, blastocoel, blastopore, archenteron, gastrula.
2. Explain the difference between epithelial and mesenchymal cells, and why transitions between the two cell types are a fundamental part of development.
3. Explain what gastrulation, in general, accomplishes for an embryo.
4. Predict what happens in the absence of gastrulation (with regard to cell type specification and differentiation).
5. Compare the movements of gastrulation to the movements (and the purpose of) neurulation.