1 pt  Name_________________  

I. 21 pts________
II. 25 pts________
III. 15 pts________
IV. 20 pts________
V. 20pts ________
Total 101pts ________

20 pts  I. True or False (Circle the correct letter) If false, make corrections to make it true.

T F  1. Growth factors are usually tyrosine kinases.
T F  2. Pax-6 is a transcription factor with 3 zinc finger motifs that bind to DNA.
T F  3. Spiral cleavage is found in mammalian embryos.
T F  4. In most species of animals, the egg finishes meiosis after fertilization.
T F  5. Notochord is formed in all chordates by a process called convergence and extension.
T F  6. B-catenin acts as a transcription factor in the cytoplasm of a sea urchin embryo.
T F  7. Gastrulation begins at the animal pole in sea urchin embryos.
T F  8. The polar body is a special cell which appears right at gastrulation.
T F  9. The sperm nucleus is highly compacted with special proteins called protamines.
T F  10. Mammalian eggs do not transcribe mRNAs until after gastrulation.
T F  11. Mesoderm gives rise to a variety of cell types, including muscle, cartilage, blood and brain.
T F  12. Histone acetylation is correlated with histones binding less tightly to the DNA, favoring transcription.
10 pts. II. Match the signalling molecule on the left with the correct transcription factor that it activates on the right.

A. Sonic Hedgehog____ A. SMAD proteins  
B. TGF-ß____ B. Cubitus interruptus  
C. Hedgehog _____ C. B catenin  
D. Wnt____ D. Gli  
E. Nodal_____  

10 pts. Match the following phylum of animals with the large group where they belong:  
A) Lophotrochozoa  
B) Deuterostomes  
C) Ecdysozoa  

1) Mollusca _____  
2) Insects _____  
3) Sea Urchins______  
4) Mammals______  
5) Annelid worms______  
6) Ascidians______  
7) Rotational cleavage______  
8) C. elegans______  
9) Amphioxus______  
10) Spiralian cleavage______  

5 pts. A. I found a new worm species while working at Friday Harbor last summer. It has some cells at the vegetal pole that form right after cleavage, then move into the embryo. I cut off the cells and the animals that developed were sterile. Using your knowledge gained from lecture, what can you tell me about what these cells might be doing? What experiments might you do to test your hypothesis?
15pts  III. 1.  Draw and egg and a sperm below. Label as many structures as you can in each cell. List any special RNAs or proteins that might be in each one by the side.

Sperm

Egg
10 pts  IV. Gastrulation involves cell movement and tissue rearrangement. Describe three movements of gastrulation, and give an example of where you could see this process in an embryo.

10 pts  Membrane fusion is found during several aspects of fertilization. Describe three different places where membrane fusion occurs during fertilization and what the consequences of the fusion is for each event.
10 pts  V. Describe three of the embryos that you saw in the film “A Dozen Eggs”. Discuss what was similar about each of these embryos and also how they differed. Be specific and use your knowledge gained from lectures in your answer.

10 pts  We discussed the process of meiosis in class. In which cells does meiosis occur? When does it occur? Outline the major steps of meiosis, explaining briefly what occurs at each stage.