Definitions. 2pts each. Restrict your answers to the space provided.

1. Cap cells
2. Nanog
3. Hoxb6
4. follicle cell
5. Delta
6. floorplate
7. ring canal
8. pole cells
9. Bruno
10. Cbx
11. Macho-1
12. Mediator
13. Paralogous
14. Syncytium
15. HES repressor

Short answer. 5 pts each. Restrict your answers to the space provided.

1. Ophthalmoptera is a homeotic mutant in Drosophila that causes the formation of wing tissues in the eye. Could this be caused by the misexpression of Ubx?
2. Name that phenotype. Triple mutant. Polycomb-/Polycomb-; Abd-B-/Abd-B-; Antp-/Antp-

1. Predict the consequences of removing the 3- UTR from the Ash1 mRNA in budding yeast.
2. Propose a model for why olig2 expression is restricted to the MN neuron and absent in the V3 interneuron.
3. Niches restrict stem cell proliferation. We discussed Dpp/BMP in class. Suggest another signaling pathway that would be ideally suited for this purpose.

Problem sets. Restrict your answers to the space provided and be sure to justify your answers.

1. (10 pts). Propose a strategy for reversing the anterior-posterior axis of the Drosophila embryo.
2. (15 pts). Predict the phenotype of an embryo derived from an egg containing the pipe coding sequence attached to the Bicoid promoter and 3- UTR. Assume that the activity of the endogenous pipe gene has been eliminated.
3. (20 pts). Consider the eve stripe 3 and stripe 4 enhancers. Both enhancers are regulated by ubiquitous activators, as well as the localized Hunchback and KNirps repressor gradients in anterior and posterior regions, respectively.
	1. Propose a model for why higher levels of Hunchback are required to establish the anterior stripe 3 border than the anterior stripe 4 border.
	2. Why are higher levels of Knirps required to establish the posterior stripe 4 border than the posterior stripe 3 border?
	3. Why isn’t the eve stripe 5 enhancers repressed by Knirps in the presumptive abdomen of early embryos?
	4. The stripe 3 enhancer is located upstream of the eve transcription unit while the stripe 4 enhancer is located downstream. Predict the consequences of placing the two enhancers next to each other on the expression of a linked reporter gene.