

Mid semester examination (LS 4103) Time- 1:15 hour

Section A

1. Which of the following genes is never transcribed in the embryo itself? (1mark)
 - a. *bicoid*
 - b. *hunchback*
 - c. *even-skipped*
 - d. *engrailed*
 - e. *abdominal-B*
2. Which would lead to a ventralized embryo? (1)
 - a. *dorsal* mutant
 - b. *cactus* mutant
 - c. *Toll* mutant
 - d. *spätzle* mutant
 - e. *bicoid* mutant
3. Which statement describes the role of dorsal protein in D-V axis formation? (1 mark)
 - a. a gradient of nuclear localization of dorsal sets the ventral side at the position of highest nuclear dorsal concentration
 - b. a gradient of nuclear localization of dorsal sets the dorsal side at the position of highest nuclear dorsal concentration
 - c. transcription of the *dorsal* gene is greatest on the dorsal side of the embryo, in response to spätzle signaling
 - d. transcription of the *dorsal* gene is greatest on the ventral side of the embryo, in response to spätzle signaling
 - e. high dorsal concentrations specify the dorsal side of the embryo, whereas high decapentaplegic concentrations specify the ventral side of the embryo
4. A gap gene mutation would cause which of the following defects in the embryonic body plan? (1 mark)
 - a. every other segment would be missing, resulting in T1, T3, A2, A4, etc. but no T2, A1, A3, and so on.
 - b. segments A2 through A6 would be missing, but the rest of the pattern is essentially normal
 - c. no segmentation would be evident
 - d. patterning within each segment would be abnormal, causing for example denticle belts to form across the entire segment
 - e. the identity of one or more segments would be transformed to that of a different segment, such that the T3 leg would transformed to a T2 leg
5. Segments are first positioned at the cell-by-cell level by the (1 mark)
 - a. maternal genes
 - b. gap genes
 - c. pair-rule genes
 - d. segment polarity genes
 - e. homeotic genes



Section B

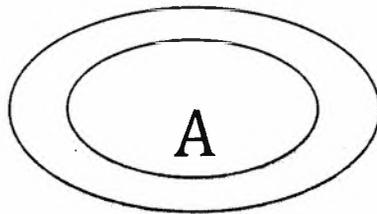
Answer Briefly

1. What do you mean by the Collinearity of the Homeotic genes? (2 marks)
2. What may happen if an early *Drosophila* egg chamber is treated with Nocodazole (Inhibitor of microtubule polymerization)? (3marks)

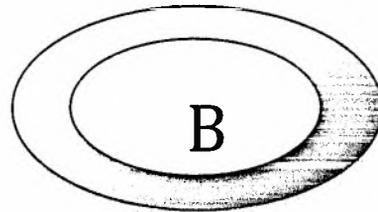
Section C

Justify your answer with appropriate reason/s.

1. Two MS students are studying the expression of a novel gene (X) in *Drosophila* development. One of them has to examine the expression of gene X in *bicoid* mutants while the other has to examine it in the *Krüppel* mutants. The student using the *Krüppel* mutants finishes the experiment faster than the one employing *bicoid* mutants. Assuming they worked at the same pace, can you suggest the reason why the other student took longer time than the one who was using the *Krüppel* mutant? (4 marks) **Please elaborate**
2. Please analyze the mutant phenotype below and speculate the molecular reasons for this observation. A- Wild type, B- mutant (4 marks)



Snail
expression



Snail
expression

3. How you would predict stripe 2 of the Even-skipped gene expression to be affected in the following cases: *giant* mutant embryos, *Krüppel* mutant embryos, embryos from *bicoid* mutant mothers, embryos from mothers with one normal and one mutant copy of the *bicoid* gene, embryos from mothers with 6 copies of the *bicoid* gene. (3 marks)

