

THE OPEN UNIVERSITY OF SRI LANKA



B. Sc. DEGREE PROGRAMME – LEVEL 04

**ZOU 2166 – ANIMAL DEVELOPMENT  
CAT 2 (OPEN BOOK TEST)**

DATE: 10<sup>th</sup> November 2007

Time: 11.00 a.m. – 12.00 noon

**REGISTRATION NUMBER: .....**

**Answer all questions  
Answers should be written in the space provided**

**1. The following questions are on cell determination of animal embryos.**

1.1 What is cell determination?

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.....  
.....  
.....

1.2 State the stage/s of embryonic development during which cell determination occurs?

.....  
.....

1.3 Name the two common methods by which cell determination is achieved.

(i) .....

(ii) .....

1.4 In an experiment, when the 8-cell embryos of the tunicate, *Styela partita* were separated into four doublets (anterior animal pole cells, posterior animal pole cells, anterior vegetal pole cells, posterior animal pole cells) and were allowed to develop separately in plates with a



nutrient medium. It was observed that the doublets develop into their normal fates without requiring any interactions between them. What is the type of cell determination taking place in these embryos?

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1.5 In 1920, Hans Spemann and Heide Mangold transplanted pieces of dorsal lips (grafts) of the blastopore from gastrulae of an unpigmented newt species to the ventral region of presumptive epidermis of a species of gastrulae (hosts) with pigmentation. They observed the formation of entire secondary embryos with the pigmentation mostly similar to hosts rather than the grafted tissues. Explain this observation.

.....  
.....

1.6 State the 3 (three) methods by which inductive signals are propagated from one cell to another.

1. ....
2. ....
3. ....

1.7 State whether the following statements are true or false.

- (a) The response of a cell to inductive signals entirely depends on the ability of that cell to receive and convey signals to its own genome. ....
- (b) Induction instructs the cells about their locations within the body and how they should behave during the development of the organism. ....
- (c) Induction allows the responding cells to differentiate with the use of proteins made by their own genes. ....

**2. The following questions are on morphogenesis of animal embryos.**

2.1 State 3 (three) forms of behaviour of cells necessary for the morphogenesis of embryos.

1. ....
2. ....
3. ....

In an experiment carried out by Townes and Holtfreter in 1955, single cell-suspensions were prepared from each of the three amphibian germ layers soon after the formation of neural tube. Two or more of these suspensions were combined in various ways on agar-coated petri-dishes as shown in (a), (b) and (c) in the Figure 1 given below.

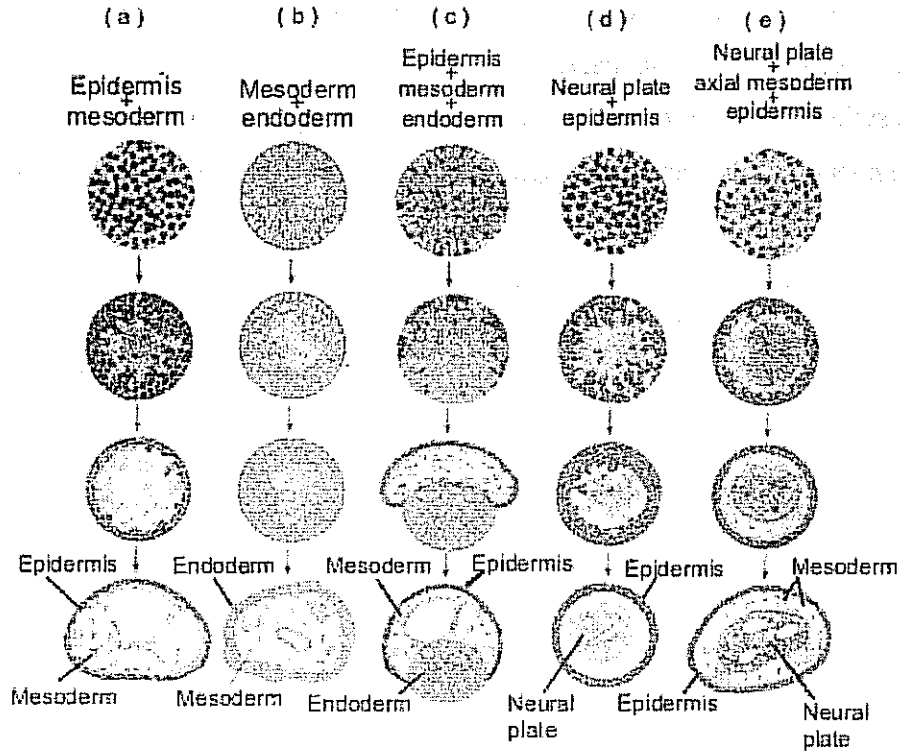


Figure 1

2.2 Describe how the cells of these suspensions namely (a), (b) and (c), behaved on the agar media.

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2.3 How do you explain the final arrangement of cells of each germ layer on agar media?

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2.4 During the preparation of (d) and (e) cell mixtures, the cells of different regions of the same germ layer were segregated and recombined. Explain the results of the experiment.

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**3. The following questions are based on the genes that control the development of the fruit fly, *Drosophila melanogaster*.**

3.1 List the three types of genes that have been found to be involved in the development of segmental structures of *Drosophila*, in the order that they are expressed.

1. ....
2. ....
3. ....

3.2 The first group of genes is not present within the egg or embryo.

Where are these genes found? .....

The messages from these genes are stored in the egg in an inactive form. What is this form? .....

How do these messages enter the egg? .....

What is the stimulus which converts these inactive messages to the active form? .....

Draw a graph to show the distribution of these active products along the anterior posterior axis of the *Drosophila* embryo.

3.3 In the Figure 2, three (3) types of *Drosophila* larvae are given. The wild type one has no mutations in its genes, the bicoid mutant larva has a *bicoid* mutant gene and the nanos mutant larva has a *nanos* mutant gene. Explain the influence of the mutated genes on the body development of *Drosophila* larva.

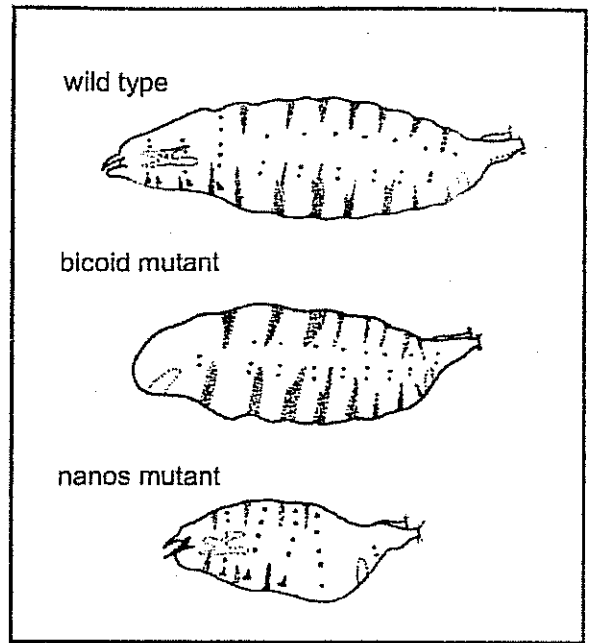


Figure 2

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 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....

3.4 What is the type of genes that are involved in the development of discrete regions that will give rise to different segments in *Drosophila*?

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3.5 What is the type of genes that designate the final adult structures?

.....

3.6 Where are the genes mentioned in 3.5 located in *Drosophila*?

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