THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME – LEVEL 04

ZLU2182 – ANIMAL DEVELOPMENT
CAT 2 (OPEN BOOK TEST)

DATE: 31st March 2013 TIME: 11.00 – 12.00 noon

REGISTRATION NUMBER: .....

Answer all questions
Answers should be written in the space provided

Q.1 The following questions are based on cell determination of amphibian embryos.

The Figure 1 explains two experiments carried out by Hans Spemann in 1918. Pigmented donor embryos and unpigmented recipient embryos of two closely related newt species were used for the experiments. In the Experiment (a), a piece of presumptive neural ectoderm of an early gastrula was transplanted to the presumptive epidermal area of another early gastrula. In the experiment (b), the same procedure was repeated using embryos in the late gastrula stage.

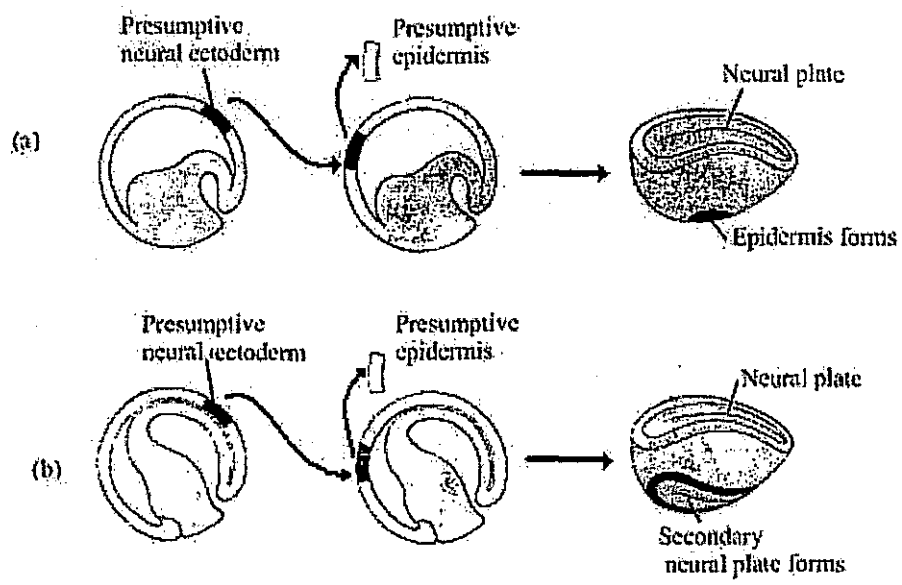

Figure 1

1.1 When selecting a donor gastrula and a recipient gastrula for the above experiment, a pigmented one and an unpigmented one of two closely related species had been chosen.

(i) Why was it necessary to select a pigmented gastrula and an unpigmented gastrula for each experiment?

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(ii) Why was it necessary to select embryos of two closely related species?

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1.2 What is the reason for the development of presumptive neural ectoderm into an epidermis, when early gastrulae were used for the Experiment (a)?

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1.3 What is the reason for the development of presumptive neural ectoderm into a secondary neural plate, when late gastrulae were used for the Experiment (b)?

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1.4 What cause the difference of the result of the Experiment (b)?

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1.5 Which method of cell determination is involved in the Experiment (b)?

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1.6 If the Nieuwkoop centres/ grey crescent areas of the donor embryos were injured by pricking and removing contents before cleavage start, what would you expect to see in the results of the two experiments?

Experiment (a): .....

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Experiment (b) .....

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1.7 Can you suggest a reason for the observations in the Question 1.6?

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1.8 What is the practical use of the two experiments carried out by Hans Spemann?

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(40 marks)

Q2. The following questions are on the specifications of germ layers in amphibian embryos.

2.1 Explain the difference between the construction of a specification map and that of a fate map?

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2.2 Name two regions that are absent in a specification map when compared with a fate map.

(i)..... (ii) .....

2.3 When explants from animal hemisphere/region of frog early blastulae are cultured in a simple medium, they develop to form epidermal cells. When explants from vegetal hemisphere/region are cultured, they develop to form endodermal cells. Therefore, which factors can be responsible for their determination?

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2.4 When a small piece of pre-labelled tissue from the animal hemisphere of a blastula is places in contact with tissues of the ventral region for about three days, mesodermal tissues such as muscle, notochord, blood and mesenchyme cells are developed from the pre-labelled tissues in addition to the formation of epidermis (see Figure 2).

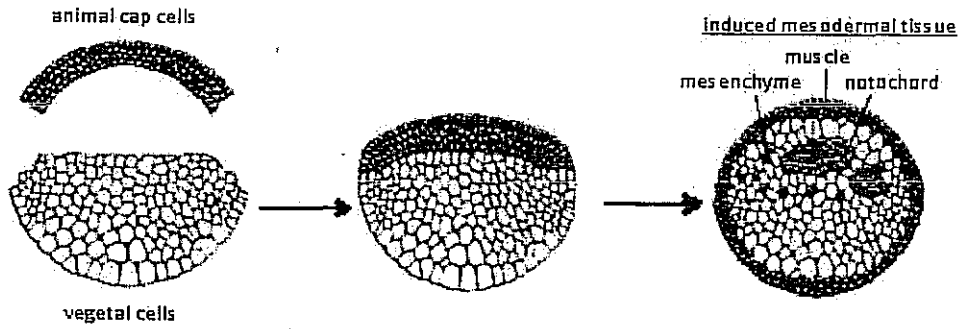

Figure 2

How do you explain this observation?

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2.5 What is the duration to which the animal cap cells of frog embryo is competent to respond to the effect created by vegetal region?

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(30 marks)

Q3. The following questions are based on current applications of the knowledge of developmental biology.

3.1 Select the most appropriate assisted reproductive technique that suits the infertile couples with defects given below.

(a) Both fallopian tubes blocked .....

(b) Low sperm motility .....

(c) With only one good fallopian tube .....

(d) Low sperm count .....

3.2 Does cloning naturally occur? If yes, give an example.

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3.3 What is reproductive cloning?

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3.4 Explain the difference between normal sexual reproduction and reproductive cloning.

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3.5 Explain the difference between reproductive cloning and therapeutic cloning.

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3.6 In both reproductive and therapeutic cloning, why is it essential to use an unfertilized egg to receive nuclear material of the parent animal to be cloned?

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(30 marks)

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