00240

THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME – LEVEL 04
FINAL EXAMINATION – 2010/11

ZLU2182/ZOU2166 – ANIMAL DEVELOPMENT

DATE: 27th December 2010 Time: 9.30 a.m. – 11.30 a.m.

Index No: .....

ANSWER QUESTION (1) AND ANY THREE (3) OF THE OTHER 5 QUESTIONS

ANSWERS TO QUESTION (1) SHOULD BE WRITTEN IN THE SPACES PROVIDED ON THE QUESTION PAPER.

ANSWERS OF QUESTIONS (2) – (6) SHOULD BE ILLUSTRATED WITH CLEARLY LABELLED DIAGRAMS, WHERE NECESSARY.

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(1) This structured essay question is based on early development of vertebrates.

(i) a. What is oogenesis?

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b. During the early development of tadpole, the ovarian tissue lack sex cells. These cells migrate from outside and get deposited forming the germinal epithelia of ovaries. What is the name given for these migratory cells?

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c. What is the name given for the self-renewing stem cell population in the germinal epithelia of the ovaries of an adult frog?

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d. What are the two types of cells that will form from the stem cell population in the ovary of frog?

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e. In an adult mammalian ovary, actively dividing stem cell population mentioned in Part (i)c is absent. What is the reason for this difference?

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(ii) The graph given in Figure 1 shows the growth of an egg during the maturation phase of the frog *Rana pipiens,* living in the temperate region.

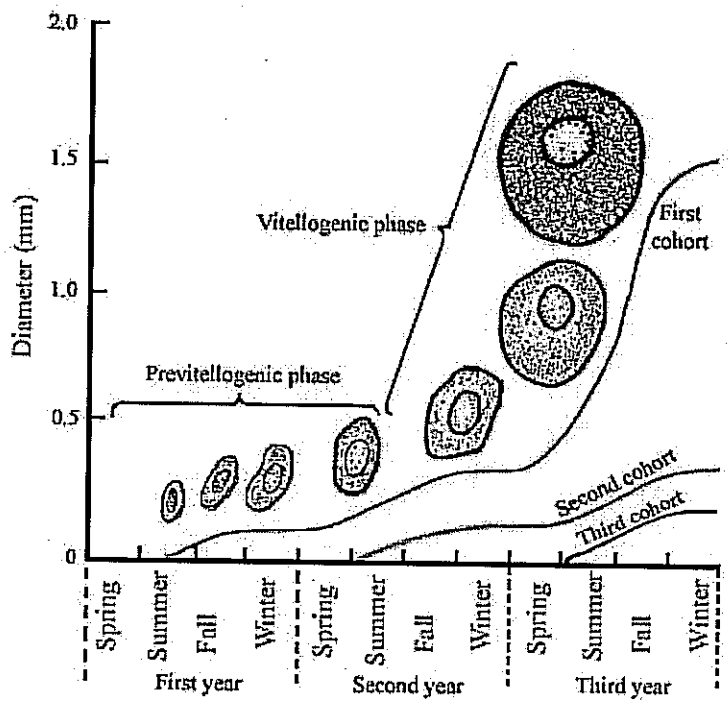

Figure 1

f. According to the graph,

What is the duration of the growth period of an egg? .....

What is the time interval between the developments of two batches of eggs?

.....

What can be the most important environmental factor that activates the development of eggs in *Rana pipiens*? .....

g. What is the organ which detects the environmental clues and stimulates the endocrine system of frog for egg production? What is the hormone it secretes for this stimulation? .....

h. What is the organ which gets stimulated by the secretion mentioned in Part (ii)g and release gonadotrophins? .....

i. State the three major ways by which the cytoplasm of an egg gets modified during egg development?

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j. What is the major difference between a mature frog egg and a mammalian egg?

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(iii)

k. Name the hormone that stimulates ovulation in frog? .....

l. State the stage of development of a frog egg, when it is released from ovary?

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m. Where does the fertilization of frog eggs occur?

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n. What are the morphological changes that occur in a just fertilized frog egg, which you would be able to observe from outside?

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o. Describe the first three cleavage furrows of the frog embryo?

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(iv)

p. When a scientist cultured explants from an early frog blastula, he could observe the development of ectodermal and endodermal tissues only. What is the reason for the absence of the development of mesodermal tissues?

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q. However, when a small piece of pre-labeled tissue from the animal half of the blastula, which would normally form only ectoderm, is placed in contact with the tissues of the vegetal region as shown in Figure 2 and cultured for three days, mesodermal tissues such as muscle, notochord, blood and loose mesenchyme developed from the pre-labeled tissue.

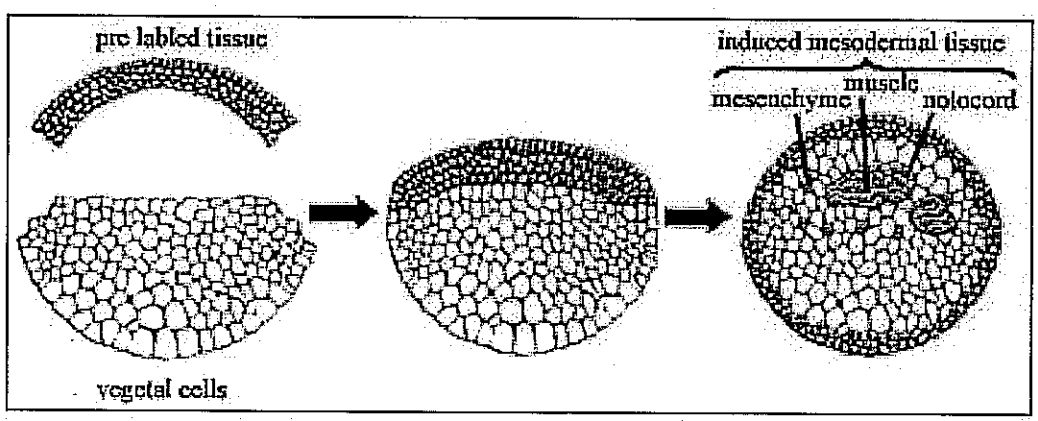

Figure 2

What can you conclude from this observation?

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r. In which ways does the piece of tissue receive signals from the vegetal region to change as described in Part (iv)q?

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s. What is the method of cell determination involved in Part (iv)q called?

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2. Explain the way by which the sea urchin sperms get attracted towards the eggs and how the sperms penetrate the eggs.

3. Describe the process of gastrulation in amphioxus.

   Highlight the differences between the process of gastrulation in amphioxus and that of frog.

4. Outline the process of vertebrate eye formation and differentiation of lens.

   Considering the formation of eye as an example explain primary, secondary and tertiary inductions taking place during organogenesis.

5. What is cell determination?

   'Cell determination relies partly on receiving different cytoplasmic contents at cleavage'. Justify this statement.

6. Write short notes on **any 2** of the following;
   (a) Spiral cleavage
   (b) Amphibian metamorphosis
   (c) Role of cytoskeleton in morphogenesis
   (d) Animal cloning