THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME – LEVEL 04
FINAL EXAMINATION – 2012/13

ZLU2182/ZOU2166 – ANIMAL DEVELOPMENT

DATE: 01st June 2013 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 oogenesis and early embryonic development of birds, especially chick.

a. Birds lay few eggs in a clutch compared to fish and amphibians. Why is it sufficient for birds to lay few eggs?

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(03 marks)

b. State the technical terms that can be used to describe chick egg based on the amount and distribution of yolk.

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(04 marks)

c. Why is it necessary for birds/chicks to have the amount of yolk you mentioned in the Section (1) b?

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(04 marks)

d. Draw a complete, fully labeled diagram to show a longitudinal section of a chick egg.

(09 marks)

e. List the primary, secondary and tertiary egg membranes in a chick egg.

Primary membranes	Secondary membranes	Tertiary membranes

(05 marks)

f. Describe the way that the chick egg undergoes cleavage.

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(06 marks)

g. Explain the effect of yolk on the cleavage of chick egg.

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(04 marks)

h. Label A – E in the Figure 1 given below, which is a vertical longitudinal section of the late blastula stage of the chick embryo.

(05 marks)

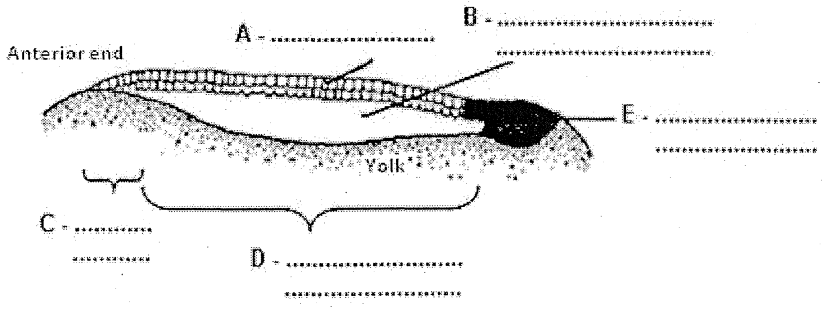

Figure 1

i. Explain how the blastocoel is formed in chick embryo during early gastrulation.

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(06 marks)

j. What is the prospective area of the new layer that formed when blastocoel is establishing? ....

(03 marks)

k. The Figure 2 given below is a fate map of a late blastula of chick embryo. Label F-J marked in it to show the prospective areas of the different parts of the blastoderm.

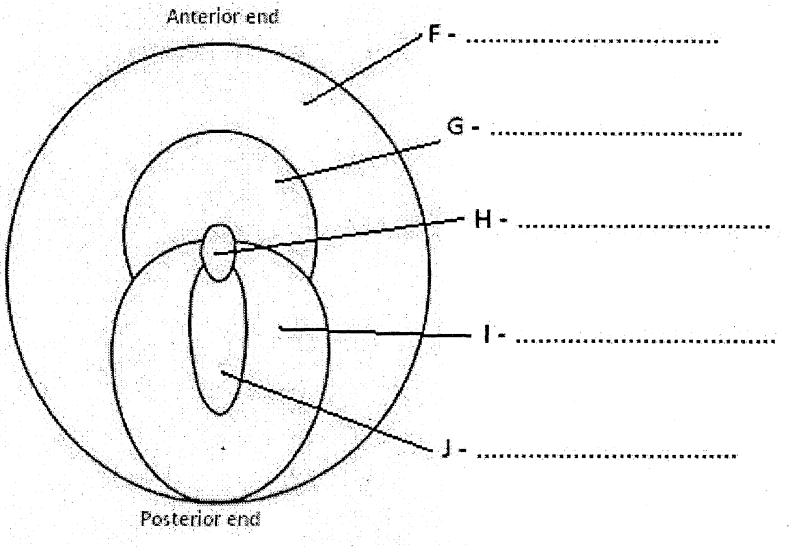

Figure 2

(05 marks)

l. In the Figure 2 given above, shade and label the areas which will contribute to form the extra-embryonic membranes of chick embryo.

(03 marks)

m. Draw a fully labeled dorsal view of a chick embryo to show the inward movement of mesoderm and notochord during gastrulation. Use arrows to show the movements.

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(05 marks)

n. Explain how the notochord and neural plate extends backward to cover the whole length of the chick embryo.

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(06 marks)

o. Explain how the neural tube and the somites are formed in the chick embryo.

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(06 marks)

p. What are the genes responsible for the positional identity of somites in chick embryo? .....

(03 marks)

q. Explain how they are expressed as gastrulation proceeds.

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(06 marks)

r. In an experiment, the unsegmented (before forming somites) pre-somatic (dorsal) mesoderm of the thoracic region of a chick embryo, lying behind the formed somites of neck region was grafted to replace the presumptive mesoderm of the neck region of another embryo in the same developmental stage. The grafted region still formed the thoracic vertebrae with ribs. What can you infer from this experiment?

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(04 marks)

s. After about 30 hours of incubation of chick egg (10-12 somites stage), the head fold and tail fold of amnion form and extends above the embryo to form amniotic cavity. At the same time the yolk sac starts to form. Draw a diagram to illustrate the formation of these extra-embryonic membranes. Use different colours to indicate the three germinal layers.

(12 marks)

2. Describe the process of oogenesis in (eutherian) mammals. (70 marks)

   Mention the types of follicles surrounding the egg stages undergoing oogenesis. (18 marks)

   How does the process of oogenesis in mammals differ from that of other vertebrates? (12 marks)

3. Discuss the adaptations that animals possess to ensure successful fertilization of their gametes. (36 marks)

   Explain how polyspermy is prevented at fertilization of sea urchin egg. (64 marks)

4. Outline the process of the development of heart in the frog embryo. (85 marks)

   State two important differences between the formation of heart in frog and chick embryos. (15 marks)

5. Compare the fate map and the specification map of an animal. (30 marks)

   Explain how the specification of three germ layers takes place in early frog embryos. (70 marks)

6. Write short notes on **any 2** of the following;
   (a) Insect metamorphosis
   (b) Cell determination
   (c) Cell-cell adhesion
   (d) Therapeutic cloning

   (50 marks for each)