

THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME – LEVEL 04
FINAL EXAMINATION – 2014/15



ZLU2182 – ANIMAL DEVELOPMENT

DATE: 06th May 2015

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.

- 1.
2. This question is based on reproduction of sea urchins, which is an echinodermate living in marine habitats.
 - (i) Sea urchins release large number of small eggs. Fertilized eggs produce pluteus larvae, which later metamorphosize into adults.
 - (a) Where do the eggs of sea urchin fertilize?
.....
(03 marks)
 - (b) Give a rough estimate about the number of eggs that a female produce at a time.
.....
(03 marks)
 - (c) Give the scientific term that describe the amount of yolk in the eggs.
.....
(03 marks)
 - (d) Give the scientific term that describe the yolk distribution in these eggs.
.....
(03 marks)

(e) What is the reason for the development of larvae from their eggs?

.....

(03 marks)

(ii) The eggs of sea urchin are covered by a gelatinous egg membrane containing some chemicals. The sperms of sea urchin get attracted to eggs due to chemotaxis of one of these chemicals.

(f) What is the type of chemical attractant involved in attracting the sperms towards ova of sea urchins?

.....

(03 marks)

(g) Explain the way by which the sperms get attracted to ova.

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

(06 marks)

(h) The sperms that are attracted towards eggs get attached on to the surfaces of gelatinous coat. This triggers the acrosomal reaction, which helps the sperm to penetrate the egg membrane. Explain how the acrosomal reaction is triggered.

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(08 marks)

(i) How is the egg membrane penetrated by the sperm during acrosomal reaction?

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(10 marks)

(j) Figure 1 shows how the acrosomal filament attaches on to the egg of the sea urchin. Label P, Q, R and S.

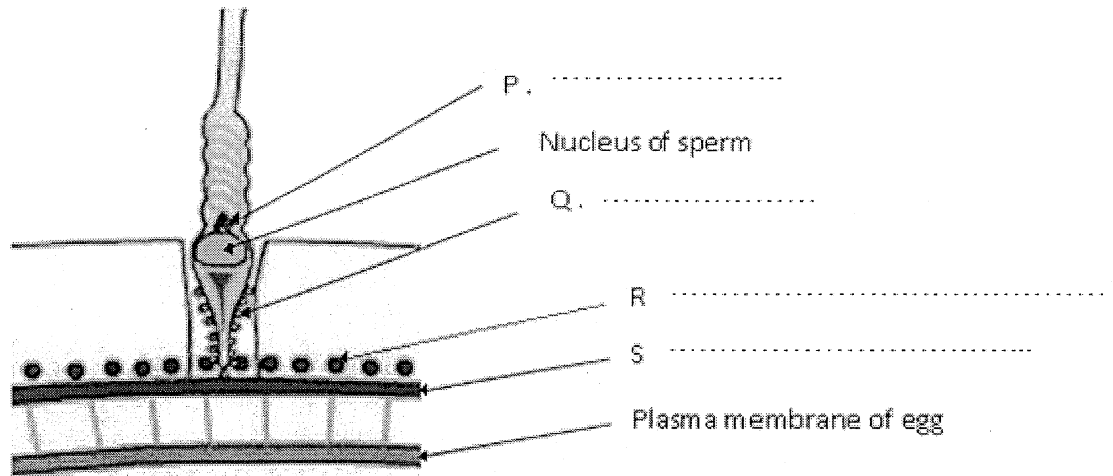


Figure 1

(8 marks)

(k) Give a specific character of Q and R and mention the importance of it.

.....

(4 marks)

(iii) The digestion of the S membrane shown in the Figure 1 leads to the direct contact of sperm head with the plasma membrane of egg and fusion of the two plasma membranes. This activates the egg to embark on its developmental process.

(l) Mention three important events that occur due to the activation of egg.

1.
2.
3.

(6 marks)

(m) Of the three activities mentioned in Part (iii) (l), which is the one that causes changes in plasma membrane or vitelline membrane of egg?

.....

(3 marks)

(n) What is the importance of the process mentioned in Part (iii) (m)?

.....

(3 marks)

(o) How does this process cause a quick change to the plasma membrane?

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

(6 marks)

(p) How does this process cause a permanent change to the vitelline membrane?

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.....
.....

(6 marks)

(q) Mention three changes that occurs in vitelline membrane due to the process mentioned in Part (iii) (m).

- 1.
- 2.
- 3.

(6 marks)

(7

(iv) After the union of gametes, the zygote starts to divide giving more and more cells. The cells that are formed gradually become determined.

(r) What are the two methods involved in the cell determination of an animal?

- 1.
- 2.

(4 marks)

(s) Figure 2 (a) shows that meridional separation of sea urchin embryos using a glass needle at 8-cell stage leads to the development of 2 small, normal larvae while Figure 2 (b) shows that an equatorial separation of sea urchin embryos at 8-cell stage leads to the development of 2 small, but abnormal larvae. What is the reason for this observation?

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(8 marks)

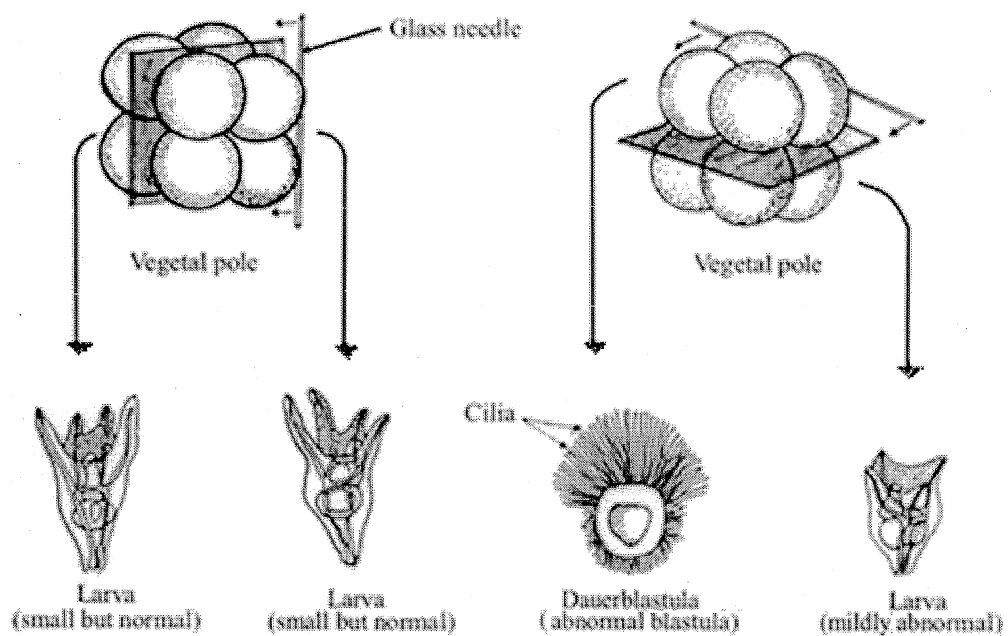


Figure 2

- (t) What is the cell determination method mainly involved in the sea urchin at the development stage shown in Figure 2?

.....

(4 marks)

3. (i) Describe the process of oogenesis in (eutherian) mammals. (70 marks)
(ii) Briefly describe the types of follicles surrounding the egg stages undergoing oogenesis in mammals. (30 marks)
4. (i) Describe the process of gastrulation in amphioxus. (88 marks)
(ii) Highlight the differences between the process of gastrulation in amphioxus and that of frog. (12 marks)
4. (i) Outline the process of vertebrate eye formation and differentiation of lens. (88 marks)
(ii) Considering the formation of eye as an example, explain; primary, secondary and tertiary inductions taking place during organogenesis. (12 marks)
5. (i) How does differential protein production in an embryo cause cell differentiation? (20 marks)
(ii) Explain the process of transcription of nuclear mRNA. (60 marks)
(iii) How can the process of transcription be regulated for differential protein production? (20 marks)
6. Write short notes on any two (2) of the following topics
- (a) Spiral cleavage
 - (b) Amphibian metamorphosis
 - (c) Role of cytoskeleton in morphogenesis
 - (d) Animal cloning
- (50 per each)