



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

UNIVERSITY EXAMINATIONS 2013/2014  
THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF  
BACHELOR OF EDUCATION (SCIENCE)

SZL 301: DEVELOPMENTAL BIOLOGY

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Time: 2 Hrs

**INSTRUCTIONS:**

1. Answer ALL questions in section A (3 Marks each)
  2. Answer any TWO questions in section B (20 Marks each)
  3. Use illustrations where appropriate
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**SECTION A (30 Marks):**

1. Describe 3 characteristics that make the nematode, *C. elegans*, attractive for the study of development. (3 marks)
2. Name the three populations of neural crest cells and one tissue that come from each population of cells. (3 marks)
3. Most eukaryotic embryos comprise of three primary germ layers. Name the three germ layers and provide two examples of adult tissues derived from each layer. (3 marks)
4. List the four major techniques involved in experimental embryology. (3 marks)
5. Describe the mechanisms that during fertilization help to ensure species specificity. (3 marks)
6. A scientist studying birth defects in Bondo District Hospital realises that some the defects are as result of genetic events while the rest are due to exposure to exogenous agents.
  - a) How do embryologists refer to each of the defects? (1 mark)
  - b) State the distinguishing characteristics of these defects (1 mark)
  - c) How are the environmental agents that causes these defects called. Give one example of such agents? (1 mark)
7. Using frog embryos as an example, describe how you can set up an experiment to show that morphogenesis involves selective affinity of cells. (3 marks)
8. Distinguish between the following terms giving examples:- (3 marks)
  - a) Induction and competence (1 mark)
  - b) Implantation and capacitation (1 mark)
  - c) Invagination and involution (1 mark)
9. Giving examples, state any three embryonic cleavage patterns . (3 marks)
10. Describe the process of secondary neurulation at the tissue level. (3 marks)

**SECTION B (40 MARKS)**

11. In the late 19<sup>th</sup> century, August Weismann proposed his theory of inheritance that was based on the idea of “nuclear determinants”.
- Briefly explain Weismann’s theory of inheritance. (4 marks)
  - What predictions does Weismann’s theory make regarding mosaic versus regulative development? (8 marks)
  - Briefly describe an experiment which can prove that Weismann’s theory to be in error. Indicate how the results of the experiment contradict Weismann. (8 marks)
12. Using a frog as an example, describe the general life cycle of organisms (20 marks)
- 13.
- Describe what happens in the fast block to polyspermy in sea urchins. (8 marks)
  - Some researchers are interested in studying the consequences of sea urchin polyspermy. Describe one method that can be used in the laboratory to overcome the fast block to polyspermy. (8 marks)
  - Explain the importance of prevention of polyspermy. (4 marks)
14. A researcher reports that he has discovered a new protein, Inhibin, that he believes inhibits the migration of neural crest cells through the sclerotome. He demonstrates that Inhibin is specifically made in the anterior of each sclerotome. Another researcher claims that this report must be inaccurate.
- Do you believe the report about Inhibin? Why or why not (5 marks)
  - Propose a simple experiment (not in human beings) to test whether Inhibin is an inhibitor of neural crest cell movement. Include possible results and their interpretations. (15 marks)