RHODES UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL SCIENCE

EXAMINATION: JUNE 2013

ENVIRONMENTAL SCIENCE 201

PAPER 1

INTERNAL EXAMINER: Dr G. Cundill   MARKS: 100

EXTERNAL EXAMINER: Dr P. O'Farrell   DURATION: 3 HOURS

INSTRUCTIONS:

This paper has three sections (A, B, C).

Answer **EVERY SECTION**, noting the choices within sections.

Answer each section in a **SEPARATE** answer book.

Read the instructions for each section carefully.

NUMBER ALL ANSWERS CORRECTLY.

Wherever possible use examples to back-up your answers.

At the end of the examination, place all answer books inside the book used to answer **SECTION A**.

PLEASE DO NOT TURN OVER THIS PAGE UNTIL TOLD TO DO SO.

SECTION A: Introduction to Environmental Science   **(40 MARKS)**

Answer all questions in this section, taking note of the choice in question A3

QUESTION A1 (10 marks)

Discuss the ways in which the *Salton Sea case study* illustrates the importance of thinking *integratively* in terms of *linked social-ecological systems* in Environmental Science.

QUESTION A2 (10 marks)

a) Complete this sentence: "Environmental Science is the systematic study of..."? (5 marks)

b) Discuss some of the arguments put forward in support of greater *interdisciplinarity and transdisciplinarity* in Environmental Science. (5 marks)

QUESTION A3 (20 marks)

Answer **TWO** of the following three questions:

a) Discuss what the term *'local ecological knowledge'* refers to (10 marks)

b) In what ways are *culture and biodiversity* inter-dependent and mutually reinforcing? (10 marks)

c) In 2002, indigenous groups from around the world gathered in Johannesburg for the World Summit on Sustainable Development. Discuss some of the *challenges* that you observed in bringing *different knowledge systems together* in discussions about sustainable development (10 marks)

SECTION B: Ecosystem services and human well-being   (20 MARKS)

Answer both questions B1 and B2 noting internal choices in B1

QUESTION B1 (5 marks)

Answer **ONE** of the following two questions:

a) With reference to examples, discuss the different kinds of *ecosystem services* that people receive from ecosystems. (5 marks)

b) What are the constituents of *'human well-being'*? (5 marks)

QUESTION B2 (15 marks)

Drawing on examples, discuss the direct and indirect impacts of the *loss of ecosystem services on human well-being* (15 marks)

SECTION C: Systems thinking, complexity and sustainability   (40 MARKS)

Answer all questions in this section, taking note of the choice within questions

QUESTION C1 (10 marks)

Answer **TWO** of the following three questions:

a) What were the *key variables* considered in the original Limits to Growth study in 1972, and what *conclusions* did the authors draw regarding the future of the planet? (5 marks)

b) What is the *Anthropocene*, and what *implications* does this concept have for the ways in which Environmental Scientists approach global environmental challenges? (5 marks)

c) What is the *'safe and just operating space for humanity'* put forward by Raworth (2012)? Discuss with reference to the conceptual model put forward by the author. (5 marks)

QUESTION C2 (10 MARKS)

Identify the key messages emerging from Rokstrom *et al*.'s (2009) work on *Planetary Boundaries*, and discuss at least 5 of the planetary boundaries identified by the authors

QUESTION C3 (10 MARKS)

Answer any **TWO** of the following four questions for 5 marks each:

a) What is the difference between a *negative and a positive feedback loop* in a system? (5 marks)

b) What features distinguish a *complex system* from a merely complicated system? (5 marks)

c) Why is an awareness of *thresholds* between alternative stable states important for environmental managers? (5 marks).

d) Explain the term *resilience*. (5 marks)

QUESTION C4 (10 MARKS)

Answer **ONE** of the following two questions:

a) What are *regime shifts between alternative stable states* in an ecosystem? Discuss with reference to at least *two* detailed *examples*. (10 marks)

b) What kinds of *policy recommendations* are relevant for building resilience in social-ecological systems? (10 marks)

END OF EXAMINATION PAPER