



Mid Year 2005 Final Examination

Introductory Soil Science

Student ID:		Student Name:	
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DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING & THE ENVIRONMENT
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SCHOOL OF NATURAL & BUILT ENVIRONMENTS

Subject Area:	EART	Catalogue Number:	1008
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INTRODUCTORY SOIL SCIENCE

Examination Day: Saturday	Examination Date: 18 June 2005
Examination Time: 2.00PM	Length of Exam: 2 hours

Examination Venue:	Ridley Centre/Royal Banquet Room/Other _____
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Instructions to Candidates

The exam is divided into three sections; the table below indicates how many questions you should answer, depending on whether or not you wish to count your mid-semester quiz.

Section	Not count mid-semester quiz	Count mid-semester quiz
A	Answer all questions.	Answer 6 of question 1, & 5 of question 2
B	Answer all questions	Answer all questions
C	Answer three questions	Answer two questions

Answer all questions in the exam booklet and pass up this question paper with the booklet(s).

Please tick one of the following options.

I wish to count my mid-semester quiz

I do not wish to count my mid-semester quiz



SECTION A

1. Define/explain the following terms, using one sentence only for each:

- a) soil horizons
- b) aquifer
- c) cation exchange capacity
- d) Self-mulching soil
- e) bioremediation
- f) sustainability
- g) soil degradation

(Each question is worth 2 marks)

2. Write one or two sentences only in answer/explanation to each of the following:

- (a) How do the relative proportions of clay and quartz affect soil texture?
- (b) How is soil porosity related to soil texture?
- (c) Explain how land clearance may cause rising groundwater?
- (d) What is the difference between an artesian water well and a sub- artesian water well
- (e) What is the relationship between aggregate stability and water infiltration into the soil profile.
- (f) Why does clearing of mangrove swamps lead to soil acidification?
- (g) What are the three components of organic matter in soil?

(Each question is worth 4 marks)

SECTION B

3. **Note:** The following questions relate to the practical work.
Give short answers to each of the following:

- (a) What is the Munsell chart used to test for?
- (b) What would you expect the pH of a soil to be that gives a positive reaction with hydrochloric acid
- (c) What texture group(1-6) would you expect a soil to be that has no visible or audible sand, is not silky, forms a coherent bolus and produces a long ribbon?
- (d) A soil is described as mottled. Describe what this means and name a soil forming process (not factor) that would contribute to this.
- (e) What division would a soil be in Northcote's classification that has
 - i. the same texture throughout the profile be?
 - ii. a texture difference between the A & B horizons of more than one and a half texture groups be?

(Each question is worth 4 marks)



SECTION C - each question is worth 15 marks

4. The co-evolution of inorganic and organic components takes place in a seral succession which begins with exposure of bedrock and progresses towards a relatively deep and mature soil. Name three soil forming processes and four soil forming factors and describe how each influences the character of the soil that develops.
5. Explain the role of producers, consumers and decomposers and give an example of each in the soil ecosystem. Where does the energy come from that powers this system?
6. The cycling of nitrogen between the atmosphere, the soil, plants and animals takes place by four chemical processes. Draw a diagram to represent the nitrogen cycle indicating where these processes take place and in what form nitrogen exists at each part. Name the micro-organisms that are involved and show where they participate in the cycle.
7. Irrigation salinity is having a marked effect on the River Murray floodplain.
 - a. What is irrigation salinity
 - b. What are some of the causes of the increased salt levels entering the river?
 - c. Describe how engineering practices and changing irrigation methods can reduce the problem.
8. The following data have been taken from Charman & Murphy.

Texture Class	Field Capacity (% by weight)	Wilting Point (% by weight)	Available Water Capacity (mm/m)
Sand	14	4	150
Loamy sand	18	7	158
Sandy loam	26	9	175
Silt loam	39	16	192
Silty clay	47	25	183
Clay	42	25	175

- a. Explain the terms "field capacity", "wilting point" and "available water capacity".
- b. Explain why each of these properties changes with soil texture.
- c. What do the data indicate about the most desirable texture for plant growth?
- d. Would the texture(s) you have suggested in (c) also provide adequate soil air to plants? Explain!