



# Mid Year 2006 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
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Subject Area:	EART	Catalogue Number:	1008
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<b>INTRODUCTORY SOIL SCIENCE</b>
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Examination Day: Tuesday	Examination Date: 27 June 2006
Examination Time: 9.00AM	Length of Exam: 2 hours

Examination Venue:	Ridley Centre/Royal Banquet Room/Other _____
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<b>Instructions to Candidates</b>
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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) cation exchange capacity
- b) Self-mulching soil
- c) bioremediation
- d) peds
- e) osmosis
- f) primary macro plant nutrients
- g) Catena

(Each question is worth 2 marks)

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

- (a) How are soil porosity and bulk density related to soil texture?
- (b) What is capillary water and why is it important in soil?
- (c) What is the difference between an artesian water well and a sub- artesian water well?
- (d) What is the relationship between aggregate stability and water infiltration into the soil profile?
- (e) What are the three components of organic matter in soil?
- (f) How does soil pH affect nutrient availability to plants?
- (g) Why are silicates the most abundant minerals?

(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 profile has a sandy A horizon and a mottled light clay B horizon. What would the ASCS classification be? What might this indicate about the climate when the profile developed?
- (e) In Northcote's classification what soil characteristic is used to differentiate between U, G and D subdivisions?

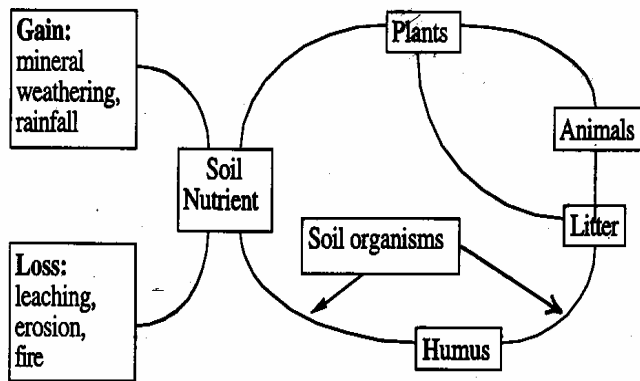
(Each question is worth 4 marks)



**SECTION C** - each question is worth 15 marks

1. Explain why clay soils generally have higher water holding capacity and higher fertility than sandy soils? How do these properties vary between 1:1 clays and 2:1 clays?
2. What is the difference between soil forming factors and soil forming processes? Name one of each and explain how each is involved in the development of a mature soil profile.
3. Describe and explain the relationship between soil colour and climate.
4. What is the nature of the texture change from the A horizon to the B horizon in a duplex soil? Explain how this may result from the processes of eluviation and illuviation. How else might this change occur?
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?

**Generalised nutrient cycle**



6. The generalised nutrient cycle shown above depicts the pathway of essential nutrients from the soil to the plant and back to the soil. It also shows the source (gain) and the loss pathways of the nutrients. Compare and contrast the nitrogen and phosphorus cycles.
7. 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!