2530025

THE UNIVERSITY of York

Degree Examination 2007

ENVIRONMENT DEPARTMENT

BSc Environment, Economics & Ecology
BSc Environmental Science
Part 2

POLLUTION CONTROL AND WASTE MANAGEMENT

Time allowed: **two hours**

Answer **ALL** of the short answer questions in **SECTION A** and **ONE** of the long answer questions in **SECTION B**

Question 11 of **SECTION A** to be answered on the separate sheet provided and is to be handed in with the answer booklet at the end of the exam

Graph paper will be provided

Pay adequate attention to spelling, punctuation and grammar, so that your answers can be readily understood

SECTION A

Short answer questions (total 50%)

Question 1. What is the difference between a contaminant and a pollutant? (1)

Question 2. Compound X has a water solubility of 200 mg/l, a molecular weight of 278 g/mole and a vapour pressure of 0.1 Pa.

a. What is the Henry's Law Constant of the substance? (2)

b. How is it likely to behave in an aeration treatment system? (2)

Question 3.

a. Name five gaseous air pollutants. (2)

b. For each pollutant, describe the significance in terms of human or environmental health. (5)

c. List five approaches to controlling or treating gaseous pollutants. (5)

Question 4. Name five potential mechanisms of degradation of a chemical. (5)

Question 5.

a. What do you understand by the term 'disinfection by-product'? (3)

b. Why should we be concerned about the presence of these substances in drinking water supplies? (2)

Question 6. How will the EU Landfill Directive affect disposal of our biodegradable waste? (2)

Question 7. Describe the waste management hierarchy. (4)

Question 8. List six social costs that you might consider in a cost-benefit analysis of a recycling scheme. (3)

Question 9. What do you understand by the term 'hazardous waste'? (1)

Question 10. Provide the regulatory definition of contaminated land. (2)

Question 11. Complete the table on the separate sheet that summarises the different forms of ionising radiation (4)

Question 12.

a. What is the half life of uranium-238? (1)

b. Give the chemical equation that describes the decay of uranium (3)

c. How does ionising radiation affect organisms at the molecular level? (3)

SECTION B

Long answer questions – answer one of the two questions (Total 50%)

Question 1

A significant proportion of the waste we produce will ultimately end up in a landfill site:

a. Describe the chemical processes involved in the degradation of waste in landfill sites.
b. What are the potential by-products from these processes? How can these be controlled or treated?
c. What are the advantages and limitations of landfill disposal? How do landfill sites fit into integrated waste management systems?

Question 2

a. A scientist adds different concentrations of substance Y to a mixture of 10 g of dried activated sludge and 200 ml of water. After 24 hours, the concentration of the substance in the water phase is measured and the results are shown in the Table below. What is the water-sludge partition coefficient of the substance?

Amount added (mg)	Concentration in water (mg/l)
5	0.025
10	0.062
25	0.11
50	0.26
100	0.51

b. The scientist also tests the persistence of chemical Y in simulated activated sludge plant and calculates the half-life to be 2 days. What is the degradation rate constant for substance Y?

c. If 10 g of the substance is emitted to an activated sludge plant with a hydraulic retention time of 8 days, what proportion would you expect to be emitted in the effluent?

d. Comment on the assumptions you have made in the above calculations and describe the potential dissipation routes of the compound in the plant. What other treatment methodologies might you consider to treat the substance?

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Section A – To be handed in with answer booklet

Question 11. Complete the table that summarises the different forms of ionising radiation

(4)

Radiation Type	Name	Formula indicating mass and charge	Effect on atom of particle emission
			Atomic number reduced by 2
		${}^{0}_{-1}e$	
γ			