THE UNIVERSITY *of York*

Degree Examination 2007

ENVIRONMENT DEPARTMENT

**BSc in Environment, Economics and Ecology
Part 1b**

ECONOMICS OF ENVIRONMENTAL POLICY

Time allowed: **one and a half hours**

Answer **THREE** questions from **FIVE**

Calculators and graph paper will be provided

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

1. Consider Firm 1 and Firm 2 with the following marginal abatement costs:

    Firm 1: $MAC_1 = 225 - 1/2\ E_1$
    Firm 2: $MAC_2 = 130 - 1/2\ E_2$

    where E is the level of pollution emission.

    a) Compute the total quantity of pollution emitted by Firms 1 and 2 if there is no environmental policy intervention. (*10% of marks*)

    b) The Environment Agency decides to reduce total emissions by 40%. Assuming that Total Costs are not known discuss the possibility of achieving the cost-effective allocation of pollution emissions comparing the following scenarios:

    i. An equal reduction in emissions across the two firms. *(10% of marks)*

    ii. A uniform Pigouvian tax per unit of emissions. *(30% of marks)*

    iii. The establishment of a transferable permit system in which permits are auctioned. *(30% of marks)*

    c) Discuss the limitations of implementing a Pigouvian tax to achieve the target. *(20% of marks)*

2.   The following is the demand function for a product generating a negative externality:

$$P = 30 - 1/2\ Q$$

where P and Q are price and quantity of output produced respectively.
The firm's Private total costs (PTC) is $PTC = 5Q + 0.2Q^2$ while the Social Total Cost (STC) for the society is $STC = 10Q + 0.2Q^2$.

a) The equilibrium output and price that maximises net private benefit.
(10% of marks)

b) The equilibrium output and price that maximises net social benefit.
(10% of marks)

c) The equilibrium output and price if the producer is a monopolist.
(15% of marks)

d) Plot using the graph paper provided PMC, SMC, SMB and PMB on a diagram indicating equilibrium prices and quantities from parts (a) (b) and (c).
(20% of marks)

e) Comment on the results and plots produced. *(15% of marks)*

f) Discuss the implications of the results for policy. *(30% of marks)*

3.   Consider 2 goods (X and Y), 2 consumers (A and B), and 2 factors of production (capital K, and labour L), together with the following Utility functions:

$$U_A = U_A(X_A, Y_A)$$
$$U_B = U_B(X_B, Y_B)$$

and Production functions:

$$X = X(L_X, K_X)$$
$$Y = Y(L_Y, K_Y)$$

Describe analytically how the utility and production functions would change if the following externalities were taken into account:

   a) Consumption affecting consumption. *(5% of marks)*

   b) Production affecting production. *(5% of marks)*

   c) Production affecting consumption. *(5% of marks)*

In cases (a) and (b):

   i. Given a suitable assignment of property rights, discuss how private bargaining can correct externalities and help to achieve efficient outcomes. *(20% of marks)*

   ii. Discuss the limitations of implementing private bargaining to correct externalities. *(15% of marks)*

In case (c):

   i. Discuss alternative ways for government agencies to correct market failures. *(20% of marks)*

   ii. Consider a second-best problem produced by the presence of externalities and a monopolist in the market. Comment on the gains, if any, achieved by implementing a second-best tax on emissions. *(30% of marks)*

4. Describe in words and diagrammatically the use of emissions taxes and abatement subsidies. Explain, if any, the limitations of these policy instruments.
(100% of marks)

5. The following tables, *Table 1* and *Table 2*, illustrate the pay-off matrices of net profits for countries A and B, with two strategies: to "pollute" or "not to pollute".

Table 1

Country B

		Pollute	Don't Pollute
	Pollute	3,1	0,0
Country A	**Don't Pollute**	0,0	1,3

Table 2

Country B

		Pollute	Don't Pollute
	Pollute	1/2,1/2	4,0
Country A	**Don't Pollute**	0,4	1,1

a) Find the Nash Equilibria and any dominant strategies in *Table 1* and in *Table 2*. *(50% of marks)*

b) Evaluate the feasibility and the implications for environmental policy of Country A and Country B in *Table 2* agreeing to cut emissions if the pollutant is a global pollutant. *(50% of marks)*