

Part I: Each is worth 2 points.

1. There are essentially three ways of reducing M (raw material usage) and, therefore, residuals discharged into the natural environment. These include all of the following **EXCEPT**:
 - a) reducing G (output of goods)
 - b) increasing R_p (production residuals)
 - c) decreasing $R_p + R_c$ (recycled production and consumption residuals)
 - d) all of the above.

2. All of the following are examples of point-source pollutants except one. Which one is **NOT** an example of a point-source pollutant?
 - a) municipal waste treatment plants
 - b) agricultural chemical runoff
 - c) electric power plants
 - d) Chevron's manufacturing plant

3. Technological advancement has the effect of shifting the marginal cost of production curve (vertically) upward.
 - a) True
 - b) False

4. Consider the market for automobiles. If the price of steel rises due to increased pollution controls on the steel industry, what impact will this have on the equilibrium price and quantity of autos?
 - a) The price of autos will rise and the quantity will rise.
 - b) The price of autos will fall and the quantity will rise.
 - c) The price of autos will rise and the quantity will fall.
 - d) The price of autos will fall and the quantity will fall

5. An unintended consequence or unintended side-effect (either beneficial or detrimental) associated with a market transaction is referred to as:
 - a) marginal social cost
 - b) imperfect information
 - c) an inequity in the market
 - d) an externality

Part II: Answer ONLY ONE question from this part. Each is worth 10 points.

6. True-False-Uncertain: In the presence of a positive externality, the free market tends to produce more than the socially efficient amount of output. Explain your answer verbally and using a supply & demand graph.
7. How does the market demand curve for a private good differ from the market demand for a public good? Explain without using any graphs. Give an example of each type of good.

Part III: Answer each question in this part.

8. Suppose a firm has three different technologies capable of reducing pollution but with differing cost schedules. The total costs of reducing various amounts of pollution using the three technologies is listed below. [10 pts]

Pollution Reduction	Techonology X	Techonology Y	Techonology Z
0	5	15	10
1	15	30	22
2	30	45	36
3	50	60	51
4	75	75	67
5	105	90	84

If the company decides that it must reduce 9 units of pollution, how will it allocate its reduction across the various technologies so that it minimizes its total cost of reduction? What will be the total cost of reoduction? What is the marginal cost of reducing the last unit of pollution for each techonology?

9. The following equations describe the market for recycled paper.
- Demand: $Q_d = 2500 - 10P$
- and
- Supply: $Q_s = 1000 + 5P$

Where P is the price per ton of recycled paper and Q is the quantity (measured in tons).

- a) Calculate the market equilibrium price and quantity. Show all work. [2 points]
- b) Illustrate the equilibrium with a supply and demand graph. Label all axes and curves. [2 points]
- c) Calculate the consumer and producer surplus at the equilibrium. Show all work. Indicate these areas on your graph. [2 points]
- d) Who is likely to be a buyer of recycled paper? Who is likely to be a seller of recycled paper? [2 points]
- e) Consider the supply equation above. If $P = 0$, what is quantity supplied equal to? What could account for this positive quantity supplied, even at a price of zero? [2 points]