2. Assume that product X is produced in a perfectly competitive industry and that product X yields costs to individuals who are neither consumers nor producers of product X.

   (a) Using one correctly labeled graph, show the industry output and price under each of the following conditions.

      (i) The industry ignores the externality.

      (ii) The industry produces the socially optimum level of output.

   Assume that the market is producing the level of output you identified in (i).

   (b) Identify one policy the government might use to achieve the level of output you identified in (ii).

3. Sparkle Car Wash is a profit-maximizing firm with the following production information.

Number of Workers	Number of Cars Washed per Day
0	0
1	15
2	35
3	60
4	75
5	85
6	80

   (a) With which worker is marginal product maximized?

   (b) Identify and define the economic principle that explains why marginal product eventually decreases.

   (c) Explain why Sparkle would never hire the sixth worker.

   (d) If Sparkle charges $6 for washing a car, what is the maximum daily wage that Sparkle would be willing to pay the fourth worker?

END OF EXAMINATION

AP® MICROECONOMICS
2001 SCORING GUIDELINES

Question 2

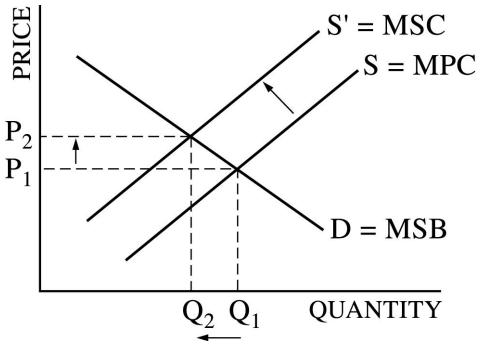
Correct Answer:

The student should show a market supply curve that includes only private costs of production. For a given market demand curve, there will be an equilibrium price and quantity of output. There should be a second supply curve that incorporates all costs of production, including the external costs. The socially optimum level of output is found at the intersection of the market demand and the supply curve that incorporates all costs, both private and external. With the same market demand curve, at the social optimum, the equilibrium price should be higher and the equilibrium quantity lower. In essence, the unregulated private market will produce too much output at too low a unit price.

To achieve the socially optimum level of output the government could introduce a unit tax on output. If properly chosen, this tax could raise the supply curve with only private costs to intersect at the socially optimum output level. Alternatively, quantity controls or pollution permits could be used to correct the overproduction.

---

3 + 1 = 4 points



(a)

(i) **1point** A simple supply and demand diagram, correctly labeled, is sufficient for full credit.

(ii) **1 point** Recognizing that the negative externality results in a difference between the private supply curve and the socially optimum supply curve.

- The second supply curve must be labeled "socially optimal" or MSC or something to that effect.
- They need not explicitly identify the externality.
- Simply labeling curves S1 and S2 w/o an explanation is insufficient.
- A firm graph is incorrect.

The difference in two supply curves *must be due* to the existence of external costs:

- MSC > MPC
- Cost not accounted for in the private market
- $S^{\text{with external costs}} > S^{\text{private}}$

They can **not** get credit for shifting supply due to a tax — it confuses causality.

Question 2 (cont.)

(iii) **1 point** Showing a higher price and lower quantity in the socially optimum equilibrium.

(b) **1 point** Various answers will suffice:

- A unit tax
- Quantity restriction
- Effective price ceiling (*not* a price floor) that leads to production of Q_1
- Pollution permits