MICROECONOMICS

Section II

Planning time—10 minutes

Writing time—50 minutes

Directions: You have fifty minutes to answer all three of the following questions. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. In answering the questions, you should emphasize the line of reasoning that generated your results; it is not enough to list the results of your analysis. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes.

1. (a) Assume that a profit-maximizing firm in a perfectly competitive industry is earning economic profits. For a given market price, draw a correctly labeled graph and show each of the following for a typical firm in this perfectly competitive industry.
   (i) Marginal revenue
   (ii) Output
   (iii) Economic profits

   (b) Using the information in (a), draw correctly labeled side-by-side graphs for the industry and a typical firm.
   (i) Given the existence of economic profits of the typical firm, show on the graphs how the industry adjusts in the long run and explain the process that leads to the long-run equilibrium.
   (ii) Show on the graphs each of the following for the industry and for the typical firm in long-run equilibrium.
   - Price
   - Output

   (c) Now assume that the government sets a price that is less than the equilibrium price but greater than average variable cost. Indicate how each of the following will change for the typical firm and explain why the change occurs.
   (i) Marginal revenue
   (ii) Level of output
   (iii) Short-run total cost
   (iv) Short-run total revenue

GO ON TO THE NEXT PAGE.

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

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Question 1

Correct answer:

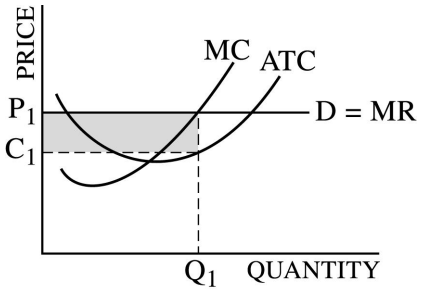
The firm has a perfectly elastic (or horizontal) marginal revenue curve that is equal to the market price. The firm produces the output level where marginal revenue equals marginal cost. The economic profit of the firm is the area bounded by the quantity produced multiplied by the difference between price and average total cost (P-ATC) at that output level.

With economic profits, new firms will enter the industry. The market supply will shift outward with the entry of firms, and market price will fall. The process continues until a long-run equilibrium is established. At this equilibrium, the market price is equal to the minimum of the long-run average cost of the typical firm. Each firm produces where P=MR=MC, which is the level of output that corresponds to the minimum of the long-run average cost. The firm makes zero economic profits.

A price control below the long-run equilibrium price but above the firm's average variable cost will result in short-run production. Since the price has fallen, the firm's marginal revenue falls. The firm's output level, where MR=MC, will also decrease. Since the firm is producing less output, total cost falls. Since both the firm's price and quantity have fallen, total revenue falls.

3+5+4 = 12

(a) **3 points**



A correctly labeled graph of the firm's situation is sufficient for full credit on part (a). An explanation is not necessary. The breakdown is as follows:

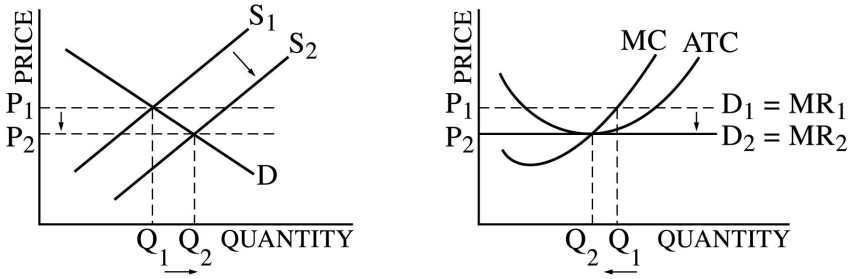
(i) **1 point** A horizontal MR shown.

(ii) **1 point** Show (and indicate) that output should be where MR = MC.

Question 1 (cont.)

(iii) **1 point** Show the area of profit as the rectangle whose width is the distance between 0 and the equilibrium quantity and whose height is the distance between the P(AR) and ATC at that quantity.

(b) **(5 points in total)**



(i) **3 points** The breakdown is as follows:

1 point showing correctly drawn side-by-side graphs of the firm and the market, with both graphs correctly labeled.

1 point showing a market supply curve shifting out and a market price decreasing, with this price being used in the firm graph.

1 point explaining that with economic profits, more firms enter the market.

(ii) **2 points** The breakdown is as follows:

1 point showing the *industry* equilibrium price and quantity. Students can either use a vertical line from the x axis to the equilibrium point, and one from the equilibrium point to the y axis (and label each axis) or else they can mark the equilibrium point with a letter and somehow indicate that the point represents the equilibrium.

1 point showing the *long-run* equilibrium price and quantity for the firm at the minimum ATC, indicating it via either of the methods discussed above in b (ii).

(c) **4 points** A graph is *not* necessary to answer this question. The point breakdown is as follows:

(i) **1 point** For indicating that marginal revenue has fallen because P has been lowered.

(ii) **1 point** For indicating that output has fallen because MR = MC is at a lower q.

(iii) **1 point** For indicating that total costs fell *because* output fell.

Question 1 (cont.)

(iv) **1 point** For indicating that price *and* quantity fell. It is *not* sufficient to state that merely one of the two fell: either both are explicitly stated, or else the student clearly shows on the graph that the new equilibrium has a lower P and Q and that because of this, total revenue falls.