

Pure Competition

Chapter 9 is the first of three chapters that bring together the previous discussion of demand and production costs. These chapters examine demand and production costs under four different market structures: pure competition, monopoly, oligopoly, and monopolistic competition. This chapter focuses exclusively on the pure competition market structure, which is characterized by (1) a large number of firms, (2) the selling of a standardized product, (3) firms that are price takers rather than price makers, and (4) ease of entry into and exit from the industry.

The main section of the chapter describes profit maximization for the purely competitive firm in the **short run**. Although two approaches to profit maximization are presented, the one given the greatest emphasis is the **marginal revenue–marginal cost** approach. You will learn the rule that a firm maximizes profit or minimizes losses by producing the output level at which marginal revenue equals marginal cost. Finding this equality provides the answers to the three central questions each firm has to answer: (1) Should we produce? (2) If so, how much output? (3) What profit (or loss) will be realized?

Answers to these questions also give insights about the **short-run supply curve** for the individual firm. The firm will find it profitable to produce at any output level where marginal revenue is greater than marginal costs. The firm will also produce in the short run, but it will experience losses if marginal revenue is less than marginal costs and greater than the minimum of average total cost. You will be shown how to construct the short-run supply curve for the purely competitive firm, given price and output data. The market supply curve for the industry is the sum of all supply curves for individual firms.

This chapter also discusses what happens to competitive firms in the **long run** as equilibrium conditions change. Over time, new firms will enter an industry that is making economic profits and existing firms will exit an industry that is experiencing economic losses, and changing price and output in the industry. Here you will learn that the shape of the **long-run supply curve** is directly affected by whether the industry is one characterized by constant costs, increasing costs, or decreasing costs as output increases.

In the long run, pure competition produces almost ideal conditions for **economic efficiency**. These ideal conditions and their qualifications are discussed in detail near the end of the chapter. Pure competition results in products produced in the least costly way, and thus it is *productively efficient*. Pure competition also allocates resources to firms so that they produce the products most wanted by society, and therefore it is *allocatively efficient*.

You will find out that these two efficiency conditions can be expressed in the triple equality: Price (and marginal revenue) = marginal cost = minimum of average total cost.

You must understand the purely competitive model because it is the efficiency standard or norm for evaluating different market structures. You will be using it often for comparison with the pure monopoly model in Chapter 10 and with the models for monopolistic competition and oligopoly in Chapter 11.

■ CHECKLIST

When you have studied this chapter you should be able to

- List the five characteristics of each of the four basic market models.
- Give examples of industries related to the four basic market models.
- Describe the major features of pure competition.
- Explain why a purely competitive firm is a price taker.
- Describe the demand curve for a purely competitive firm.
- Explain the relationship between marginal revenue and price in pure competition.
- Compute average, total, and marginal revenues when given a demand schedule faced by a purely competitive firm.
- Use the total-revenue and total-cost approaches to determine the output that a purely competitive firm will produce in the short run in the profit-maximizing case.
- Use the marginal-revenue and marginal-cost approach to determine the output that a purely competitive firm will produce in the short run in the profit-maximizing, loss-minimizing, and shutdown cases.
- State characteristics of the $MR = MC$ rule.
- Find the firm's short-run supply curve when you are given the firm's short-run cost schedules.
- Explain the links among the law of diminishing returns, production costs, and product supply in the short run.
- Graph a shift in the firm's short-run supply curve and cite factors that cause the curve to increase or decrease.
- Find the industry's short-run supply curve (or schedule) when you are given the typical firm's short-run cost schedules.
- Determine, under short-run conditions, the price at which the product will sell, the output of the industry, and the output of the individual firm.

- Describe the basic goal for long-run adjustments in pure competition.
- Determine, under long-run conditions, the price at which the product will sell, the output of the firm, and the output of the industry.
- Explain the role played by the entry and exit of firms in a purely competitive industry in achieving equilibrium in the long run.
- Describe the characteristics and rationale for the long-run supply curve in a constant-cost industry, in an increasing-cost industry, and in a decreasing-cost industry.
- Distinguish between productive and allocative efficiency.
- Explain the significance of $MR (= P) = MC = \text{minimum ATC}$.
- Describe how allocative efficiency is related to maximum consumer and producer surplus.
- Discuss how pure competition makes dynamic adjustments.
- Describe how the "invisible hand" works in competitive markets.
- Explain how a fall in the price of drugs increases the consumer surplus and society experiences efficiency gains (Last Word).

■ CHAPTER OUTLINE

1. The price a firm charges for the good or service it produces and its output of that product depend not only on the demand for and the cost of producing it, but on the characteristics of the market (industry) in which it sells the product. The four market models are *pure competition*, *pure monopoly*, *monopolistic competition*, and *oligopoly*. These models are defined by the number of firms, whether the product is standardized or differentiated, the firm's control over price, the conditions for entry into the industry, and degree of nonprice competition (see Table 9.1 in text). Compared with *pure competition*, the other three market models are considered different forms of *imperfect competition*.

2. This chapter examines *pure competition*, in which a very large number of independent firms, no one of which is able to influence market price by itself, sell a standardized product in a market where firms are free to enter and to leave in the long run. Although pure competition is rare in practice, it is the standard against which the *efficiency* of the economy and other market models can be compared.

3. Demand as seen by the purely competitive firm is unique because a firm selling its product cannot influence the price at which the product sells, and therefore is a *price taker*.

- a. The demand for its product is perfectly elastic.
- b. There are three types of revenue. *Average revenue* is the amount of revenue per unit. *Total revenue* is calculated as the price times the quantity a firm can sell. *Marginal revenue* is the change in total revenue from selling one more unit. Average revenue (or price) and marginal revenue are equal and constant at the fixed (equilibrium) market price ($AR = P = MR$). Total revenue increases at a constant rate as the firm increases its output.

c. The demand (average revenue) and marginal revenue curves faced by the firm are horizontal and identical at the market price. The total revenue curve has a constant positive slope.

4. The purely competitive firm operating in the *short run* is a price taker that can maximize profits (or minimize losses) only by changing its level of output. Two approaches can be used to determine the optimal level of output for the firm.

a. The *total revenue–total cost* approach to profit maximization sets the level of output at that quantity where the difference between total revenue minus total cost is greatest. An output at which total revenue covers total costs (including a normal profit) is a *break-even point*.

b. The *marginal revenue–marginal cost* approach to profit maximization basically sets the level of output at the quantity where marginal revenue (or price) equals marginal cost. There are three possible cases to consider when using this approach.

(1) The firm uses the *MR = MC rule* to evaluate profit maximization. The firm will produce that level of output where the marginal revenue from each additional unit produced is equal to the marginal cost of each additional unit to produce. The rule is an accurate guide to profit maximization for the four basic types of firms. For the purely competitive firm, however, the rule can be restated as $P = MC$.

(2) The firm will *maximize profits* when $MR = MC$ at an output level where price is greater than average total cost.

(3) The firm will *minimize losses* when $MR = MC$ at an output level where price is greater than the minimum average variable cost (but less than average total cost).

(4) The firm will *shut down* when $MR = MC$ at an output level where price is less than average variable cost.

5. There is a close relationship between marginal cost and the *short-run supply curve* for the purely competitive firm and industry.

a. The short-run supply curve for the purely competitive firm is the portion of the marginal-cost curve that lies above average variable cost.

b. There are links among the law of diminishing returns, production costs, and product supply. The law of diminishing returns suggests that marginal costs will increase as output expands. The firm must receive more revenue (get higher prices for its products) if it is to expand output.

c. Changes in variable inputs will change the marginal cost or supply curve for the purely competitive firm. For example, an improvement in technology that increases productivity will decrease the marginal cost curve (shift it downward).

d. The *short-run supply curve of the industry* (which is the sum of the supply curves of the individual firms) and the total demand for the product determine the short-run equilibrium price and equilibrium output of the industry. Firms in the industry may be either prosperous or unprosperous in the short run.

6. In the *long run*, the price of a product produced under conditions of pure competition will equal the minimum

average total cost ($P = \text{minimum ATC}$). The firms in the industry will neither earn economic profits nor suffer economic losses.

a. If economic profits are being received in the industry in the short run, firms will enter the industry in the long run (attracted by the profits), increase total supply, and thereby force price down to the minimum average total cost, leaving only a normal profit.

b. If losses are being suffered in the industry in the short run, firms will leave the industry in the long run (seeking to avoid losses), reduce total supply, and thereby force price up to the minimum average total cost, leaving only a normal profit.

c. If an industry is a **constant-cost industry**, the entry of new firms will not affect the average-total-cost schedules or curves of firms in the industry.

(1) An increase in demand will result in no increase in the long-run equilibrium price, and the industry will be able to supply larger outputs at a constant price.

(2) Graphically, the **long-run supply curve** in a constant-cost industry is horizontal at the minimum of the average total cost curve, indicating that firms make only normal profits, but not economic profits.

d. If an industry is an **increasing-cost industry**, the entry of new firms will raise the average-total-cost schedules or curves of firms in the industry.

(1) An increase in demand will result in an increase in the long-run equilibrium price, and the industry will be able to supply larger outputs only at higher prices.

(2) Graphically, the long-run supply curve in an increasing-cost industry is upsloping at the minimum of the average-total-cost curve, indicating that firms make only normal profits but not economic profits.

e. If an industry is a **decreasing-cost industry**, the entry of new firms will lower the average total cost schedules or curves of firms in the industry.

(1) An increase in demand will result in a decrease in the long-run equilibrium price, and the industry will be able to supply larger outputs only at lower prices.

(2) Graphically, the long-run supply curve in a decreasing-cost industry is downsloping at the minimum of the average total cost curve, indicating that firms make only normal profits, but not economic profits.

7. In the long run, **competition** and **efficiency** compel the purely competitive firm to produce that output at a price at which marginal revenue, average cost, and marginal cost are equal and average cost is a minimum. An economy in which all industries are purely competitive makes efficient use of its resources.

a. There is **productive efficiency** when the average total cost of producing goods is at a minimum; buyers benefit most from this efficiency when they are charged a price just equal to minimum average total cost ($P = \text{minimum ATC}$).

b. There is **allocative efficiency** when goods are produced in such quantities that the total satisfaction obtained from the economy's resources is at a maximum, or when the price of each good is equal to its marginal cost ($P = MC$).

(1) When price is greater than marginal cost, there is an **underallocation** of resources to the production of a product.

(2) When price is less than marginal cost, there is an **overallocation** of resources to the production of a product.

(3) When price is equal to marginal cost, there is efficient allocation of resources to the production of a product.

(4) Pure competition maximizes the **consumer surplus** (the difference between the maximum prices that consumers are willing to pay for a product and the market price of that product). It also maximizes the **producer surplus** (the difference between the minimum prices that producers are willing to accept for a product and the market price of the product).

(5) The purely competitive economy makes dynamic adjustments to changes in demand or supply that restore equilibrium and efficiency.

(6) The "invisible hand" is at work in a competitive market system by organizing the private interests of producers that will help achieve society's interest in the efficient use of scarce resources.

8. (Last Word). The competitive model predicts that when there are new entrants into a previously monopolized market, prices will fall, output will increase, and efficiency will improve. Such is the case in the drug market when a drug patent expires and the drug can be produced as a generic. Generic drugs are cheaper for consumers. The decline in price for these drugs compared with the patented versions boosts output and increases the consumer surplus.

■ HINTS AND TIPS

1. The purely competitive model is extremely important for you to master even if examples of it in the real world are rare. The model is the standard against which the other market models—pure monopoly, monopolistic competition, and oligopoly—will be compared for effects on economic efficiency. Spend extra time learning the material in this chapter so you can make model comparisons in later chapters.

2. Make sure that you understand why a purely competitive firm is a **price "taker"** and not a price "maker." The purely competitive firm has no influence over the price of its product and can only make decisions about the level of output.

3. Construct a table for explaining how the purely competitive firm maximizes profits or minimizes losses in the short run. Ask yourself the three questions in the table: (1) Should the firm produce? (2) What quantity should be produced to maximize profits? (3) Will production result in economic profit? Answer the questions using a marginal revenue–marginal cost approach. Check your answers against those presented in the text.

4. The average purely competitive firm in long-run equilibrium will not make economic profits. Find out why by following the graphical analysis in Figures 9.8 and 9.9.

5. The triple equality of $MR (= P) = MC = \text{minimum ATC}$ is the most important equation in the chapter because it allows you to judge the allocative and productive efficiency of a purely competitive economy. Check your understanding of this triple equality by explaining what happens to productive efficiency when $P > \text{minimum ATC}$, or to allocative efficiency when $P < MC$ or $P > MC$.

■ IMPORTANT TERMS

pure competition	break-even point
pure monopoly	MR = MC rule
monopolistic competition	short-run supply curve
oligopoly	long-run supply curve
imperfect competition	constant-cost industry
price taker	increasing-cost industry
average revenue	decreasing-cost industry
total revenue	productive efficiency
marginal revenue	allocative efficiency

SELF-TEST

■ FILL-IN QUESTIONS

1. The four market models examined in this and the next two chapters are

- a. _____
- b. _____
- c. _____
- d. _____

2. The four market models differ in terms of the (age, number) _____ of firms in the industry, whether the product is (a consumer good, standardized) _____ or (a producer good, differentiated) _____, and how easy or difficult it is for new firms to (enter, leave) _____ the industry.

3. What are the four specific conditions that characterize pure competition?

- a. _____
- b. _____
- c. _____
- d. _____

4. The individual firm in a purely competitive industry is a price (maker, taker) _____ and finds that the demand for its product is perfectly (elastic, inelastic) _____.

5. The firm's demand schedule is also a (cost, revenue) _____ schedule. The price per unit to the seller is (marginal, total, average) _____ revenue; price multiplied by the quantity the firm can sell is _____ revenue; and the extra revenue that results from selling one more unit of output is _____ revenue.

6. In pure competition, product price (rises, falls, is constant) _____ as an individual firm's output increases. Marginal revenue is (less than, greater than, equal to) _____ product price.

7. Economic profit is total revenue (plus, minus) _____ total cost. If the firm is making only a normal profit, total revenue is (greater than, equal to) _____ total cost. In the latter case, this output level is called the (profit, break-even) _____ point by economists.

8. If a purely competitive firm produces any output at all, it will produce that output at which its profit is at a (maximum, minimum) _____ or its loss is at a _____. Or, said another way, the output at which marginal cost is (equal to, greater than) _____ marginal revenue.

9. A firm will be willing to produce at an economic loss in the short run if the price which it receives is greater than its average (fixed, variable, total) _____ cost.

10. In the short run, the individual firm's supply curve in pure competition is that portion of the firm's (total, marginal) _____ cost curve which lies (above, below) _____ the average variable cost curve.

11. The short-run market supply curve is the (average, sum) _____ of the (short-run, long-run) _____ supply curves of all firms in the industry.

12. In the short run in a purely competitive industry, the equilibrium price is the price at which quantity demanded is equal to (average cost, quantity supplied) _____, and the equilibrium quantity is the quantity demanded and _____ at the equilibrium price.

13. In a purely competitive industry, in the short run the number of firms in the industry and the sizes of their plants are (fixed, variable) _____, but in the long run they are _____.

14. When a purely competitive industry is in long-run equilibrium, the price that the firm is paid for its product is equal to (total, average) _____ revenue,

and to long-run _____ cost. In this case, the long-run average cost is at a (maximum, minimum) _____.

15. An industry will be in long-run equilibrium when firms are earning (normal, economic) _____ profits, but firms tend to enter an industry if the firms in the industry are earning _____ profits. Firms will tend to leave an industry when they are realizing economic (profits, losses) _____.

16. If the entry of new firms into an industry tends to raise the costs of all firms in the industry, the industry is said to be (a constant-, an increasing-, a decreasing-) _____ cost industry. Its long-run supply curve is (horizontal, downsloping, upsloping) _____.

17. If the entry of new firms into an industry tends to lower costs of all firms in the industry, the industry is said to be (a constant-, an increasing-, a decreasing-) _____ cost industry. Its long-run supply curve is (horizontal, downsloping, upsloping) _____.

18. The purely competitive economy achieves productive efficiency in the long run because price and (total, average) _____ cost are equal and the latter is at a (maximum, minimum) _____.

19. In the long run the purely competitive economy is allocatively efficient because price and (total, marginal) _____ cost are equal.

20. One of the attributes of purely competitive markets is their ability to restore (monopoly, efficiency) _____ when disrupted by changes in the economy. The "invisible hand" also operates in a competitive market system because it (maximizes, minimizes) _____ the profits of individual producers and at the same time the system creates a pattern of resource allocation that _____ consumer satisfaction.

■ TRUE-FALSE QUESTIONS

Circle T if the statement is true, F if it is false.

- 1. The structures of the markets in which business firms sell their products in the U.S. economy are very similar. T F
- 2. There are significant obstacles to entry in a purely competitive industry. T F
- 3. Only in a purely competitive industry do individual firms have no control over the price of their product. T F
- 4. Imperfectly competitive markets are defined as all markets except those that are purely competitive. T F
- 5. One reason for studying the pure competition model is that most industries are purely competitive. T F

6. The purely competitive firm views an average revenue schedule as identical to its marginal revenue schedule. T F

7. The demand curves for firms in a purely competitive industry are perfectly inelastic. T F

8. Under purely competitive conditions, the product price charged by the firm increases as output increases. T F

9. The purely competitive firm can maximize its economic profit (or minimize its loss) only by adjusting its output. T F

10. Economic profit is the difference between total revenue and average revenue. T F

11. The break-even point means that the firm is realizing normal profits, but not economic profits. T F

12. A purely competitive firm that wishes to produce and not close down will maximize profits or minimize losses at that output at which marginal costs and marginal revenue are equal. T F

13. Assuming that the purely competitive firm chooses to produce and not close down, to maximize profits or minimize losses it should produce at that point where price equals average cost. T F

14. If a purely competitive firm is producing output less than its profit-maximizing output, marginal revenue is greater than marginal cost. T F

15. If, at the profit-maximizing level of output for the purely competitive firm, price exceeds the minimum average variable cost but is less than average total cost, the firm will make a profit. T F

16. A purely competitive firm will produce in the short run the output at which marginal cost and marginal revenue are equal provided that the price of the product is greater than its average variable cost of production. T F

17. The short-run supply curve of a purely competitive firm tends to slope upward from left to right because of the law of diminishing returns. T F

18. If a purely competitive firm is in short-run equilibrium and its marginal cost is greater than its average total cost, firms will leave the industry in the long run. T F

19. When firms in a purely competitive industry are earning profits that are less than normal, the supply of the product will tend to decrease in the long run. T F

20. The long-run supply curve for a competitive, increasing-cost industry is upsloping. T F

21. Pure competition, if it could be achieved in all industries in the economy, would result in the most efficient allocation of resources. T F

22. Under conditions of pure competition, firms are forced to employ the most efficient production methods available to survive. T F

23. The marginal costs of producing a product are society's measure of the marginal worth of alternative products. T F

24. In a purely competitive market, product price measures the marginal benefit, or additional satisfaction, that society obtains from producing additional units of the product. **T F**

25. Pure competition minimizes the consumer and producer surplus. **T F**

■ MULTIPLE-CHOICE QUESTIONS

Circle the letter that corresponds to the best answer.

1. For which market model are there a very large number of firms?

- (a) monopolistic competition
- (b) oligopoly
- (c) pure monopoly
- (d) pure competition

2. In which market model is the individual seller of a product a price taker?

- (a) pure competition
- (b) pure monopoly
- (c) monopolistic competition
- (d) oligopoly

3. Which industry comes *closest* to being purely competitive?

- (a) wheat
- (b) shoes
- (c) electricity
- (d) automobile

4. In a purely competitive industry,

- (a) each existing firm will engage in various forms of nonprice competition
- (b) new firms are free to enter and existing firms are able to leave the industry very easily
- (c) individual firms have a price policy
- (d) each firm produces a differentiated (nonstandardized) product

5. The demand schedule or curve confronted by the individual purely competitive firm is

- (a) perfectly inelastic
- (b) inelastic but not perfectly inelastic
- (c) perfectly elastic
- (d) elastic but not perfectly elastic

6. Total revenue for producing 10 units of output is \$6. Total revenue for producing 11 units of output is \$8. Given this information, the

- (a) average revenue for producing 11 units is \$2.
- (b) average revenue for producing 11 units is \$8.
- (c) marginal revenue for producing the 11th unit is \$2.
- (d) marginal revenue for producing the 11th unit is \$8.

7. In pure competition, product price is

- (a) greater than marginal revenue
- (b) equal to marginal revenue
- (c) equal to total revenue
- (d) greater than total revenue

8. Suppose that when 2000 units of output are produced, the marginal cost of the 2001st unit is \$5. This amount is

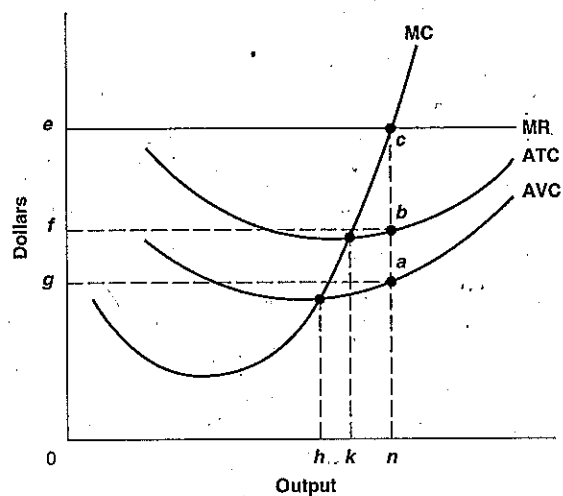
equal to the minimum of average total cost, and marginal cost is rising. If the optimal level of output in the short run is 2500 units, then at that level,

- (a) marginal cost is greater than \$5 and marginal cost is less than average total cost
- (b) marginal cost is greater than \$5 and marginal cost is greater than average total cost
- (c) marginal cost is less than \$5 and marginal cost is greater than average total cost
- (d) marginal cost is equal to \$5 and marginal cost is equal to average total cost

9. The Zebra, Inc., is selling in a purely competitive market. Its output is 250 units, which sell for \$2 each. At this level of output, marginal cost is \$2 and average variable cost is \$2.25. The firm should

- (a) produce zero units of output
- (b) decrease output to 200 units
- (c) continue to produce 250 units
- (d) increase output to maximize profits

Questions 10, 11, 12, and 13 are based on the following graph.



10. If the firm is producing at output level $0n$, the rectangular area *fecb* is

- (a) total variable cost
- (b) total fixed costs
- (c) total revenue
- (d) total economic profit

11. At the profit-maximizing output, average fixed cost is

- (a) *ab*
- (b) *ac*
- (c) *na*
- (d) *nb*

12. At the profit-maximizing output, the total variable costs are equal to the area

- (a) *0fbn*
- (b) *0ecn*
- (c) *0gan*
- (d) *gfba*

13. The demand curve for this firm is equal to
 (a) MR, and the supply curve is the portion of the MC curve where output is greater than level *n*
 (b) MR, and the supply curve is the portion of the MC curve where output is greater than level *k*
 (c) MR, and the supply curve is the portion of the MC curve where output is greater than level *h*
 (d) MR, and the supply curve is the portion of the ATC curve where output is greater than level *k*

Answer Questions 14, 15, 16, 17, and 18 on the basis of the following cost data for a firm that is selling in a purely competitive market.

Output	AFC	AVC	ATC	MC
1	\$300	\$100	\$400	\$100
2	150	75	225	50
3	100	70	170	60
4	75	73	148	80
5	60	80	140	110
6	50	90	140	140
7	43	103	146	180
8	38	119	156	230
9	33	138	171	290
10	30	160	190	360

14. If the market price for the firm's product is \$140, the competitive firm will produce
 (a) 5 units at an economic loss of \$150
 (b) 6 units and break even
 (c) 7 units and break even
 (d) 8 units at an economic profit of \$74
15. If the market price for the firm's product is \$290, the competitive firm will produce
 (a) 7 units at an economic profit of \$238
 (b) 8 units at an economic profit of \$592
 (c) 9 units at an economic profit of \$1071
 (d) 10 units at an economic profit of \$1700
16. If the product price is \$179, the *per-unit* economic profit at the profit-maximizing output is
 (a) \$15
 (b) \$23
 (c) \$33
 (d) \$39
17. The total fixed costs are
 (a) \$100
 (b) \$200
 (c) \$300
 (d) \$400
18. The equilibrium price will be
 (a) \$140
 (b) \$180
 (c) \$230
 (d) \$290
19. The individual firm's short-run supply curve is that part of its marginal cost curve lying above its
 (a) average total cost curve
 (b) average variable cost curve
 (c) average fixed cost curve
 (d) average revenue curve
20. Which statement is true of a purely competitive industry in short-run equilibrium?
 (a) Price is equal to average total cost.
 (b) Total quantity demanded is equal to total quantity supplied.
 (c) Profits in the industry are equal to zero.
 (d) Output is equal to the output at which average total cost is a minimum.
21. Assume that the market for wheat is purely competitive. Currently, firms growing wheat are experiencing economic losses. In the long run, we can expect this market's
 (a) supply curve to increase
 (b) demand curve to increase
 (c) supply curve to decrease
 (d) demand curve to decrease
22. The long-run supply curve under pure competition will be
 (a) downsloping in an increasing-cost industry and upsloping in a decreasing-cost industry
 (b) horizontal in a constant-cost industry and upsloping in a decreasing-cost industry
 (c) horizontal in a constant-cost industry and upsloping in an increasing-cost industry
 (d) upsloping in an increasing-cost industry and vertical in a constant-cost industry
23. The long-run supply curve in a constant-cost industry will be
 (a) perfectly elastic
 (b) perfectly inelastic
 (c) unit elastic
 (d) income elastic
24. In a decreasing-cost industry, the long-run
 (a) demand curve would be perfectly inelastic
 (b) demand curve would be perfectly elastic
 (c) supply curve would be upsloping
 (d) supply curve would be downsloping
25. Increasing-cost industries find that their costs rise as a consequence of an increased demand for the product because of
 (a) the diseconomies of scale
 (b) diminishing returns
 (c) higher resource prices
 (d) a decreased supply of the product
26. When a purely competitive industry is in long-run equilibrium, which statement is true?
 (a) Firms in the industry are earning normal profits.
 (b) Price and long-run average total cost are not equal to each other.

Assume there are 100 identical firms in this industry and total or market demand is as shown.

Price	Quantity demanded
\$360	600
290	700
230	800
180	900
140	1000
110	1100
80	1200

- (c) Marginal cost is at its minimum level.
 - (d) Marginal cost is equal to total revenue.
27. Which triple identity results in the most efficient use of resources?
- (a) $P = MC = \text{minimum ATC}$
 - (b) $P = AR = MR$
 - (c) $P = MR = \text{minimum MC}$
 - (d) $TR = MC = MR$
28. An economy is producing the goods most wanted by society when, for each and every good, its
- (a) price and average cost are equal
 - (b) price and marginal cost are equal
 - (c) marginal revenue and marginal cost are equal
 - (d) price and marginal revenue are equal
29. If there is an increase in demand for a product in a purely competitive industry, it results in an industry
- (a) contraction that will end when the price of the product is greater than its marginal cost
 - (b) contraction that will end when the price of the product is equal to its marginal cost
 - (c) expansion that will end when the price of the product is greater than its marginal cost
 - (d) expansion that will end when the price of the product is equal to its marginal cost
30. The idea of the "invisible hand" operating in the competitive market system means that
- (a) there is a unity of private and social interests that promotes efficiency
 - (b) the industries in this system are described as decreasing-cost industries
 - (c) there is an overallocation of resources to the production of goods and services
 - (d) productive efficiency is more important than allocative efficiency.

■ PROBLEMS

1. Using the following set of terms, complete the following table by inserting the appropriate letter or letters in the blanks.

- a. one
- b. few
- c. many
- d. a very large number
- e. standardized
- f. differentiated
- g. some
- h. considerable
- i. very easy
- j. blocked
- k. fairly easy
- l. fairly difficult
- m. none
- n. unique

Market characteristics	Market model			
	Pure competition	Monopolistic competition	Oligopoly	Pure monopoly
Number of firms	_____	_____	_____	_____
Type of product	_____	_____	_____	_____
Control over price	_____	_____	_____	_____
Conditions of entry	_____	_____	_____	_____
Nonprice competition	_____	_____	_____	_____

2. Following is the demand schedule facing the individual firm.

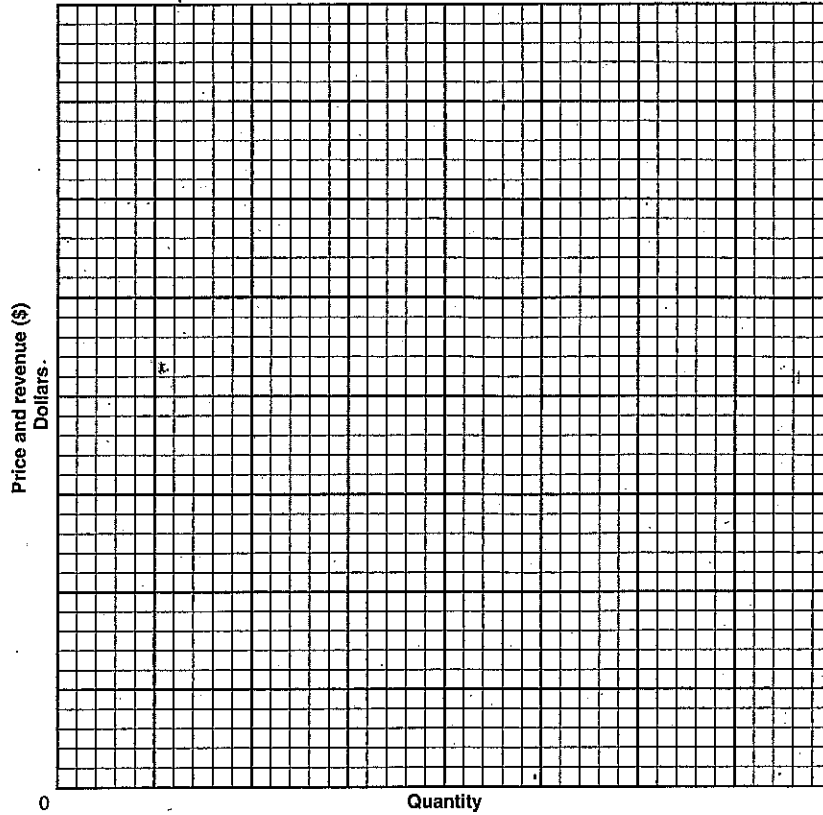
Price	Quantity demanded	Average revenue	Total revenue	Marginal revenue
\$10	0	\$ _____	\$ _____	—
10	1	_____	_____	\$ _____
10	2	_____	_____	_____
10	3	_____	_____	_____
10	4	_____	_____	_____
10	5	_____	_____	_____
10	6	_____	_____	_____

- a. Complete the table by computing average revenue, total revenue, and marginal revenue.
- b. Is this firm operating in a market that is purely competitive? _____ How can you tell? _____
- c. The coefficient of the price elasticity of demand is the same between every pair of quantities demanded. What is it? _____
- d. What relationship exists between average revenue and marginal revenue? _____
- e. On the graph at the top of next page, plot the demand schedule, average revenue, total revenue, and marginal revenue; label each curve.
- f. The demand, average revenue, and marginal revenue curves are all _____ lines at a price of \$ _____ across all quantities.
- g. The total revenue curve is an upsloping line with a _____ slope because marginal revenue is _____

3. Assume that a purely competitive firm has the following schedule of costs.

Output	TFC	TVC	TC
0	\$300	\$ 0	\$ 300
1	300	100	400
2	300	150	450
3	300	210	510
4	300	290	590
5	300	400	700
6	300	540	840
7	300	720	1020
8	300	950	1250
9	300	1240	1540
10	300	1600	1900

- a. Complete the following table to show the total revenue and total profit of the firm at each level of output the firm might produce. Assume the market price is \$200.



Output	Market price = \$200	
	Revenue	Profit
0	\$ _____	\$ _____
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____

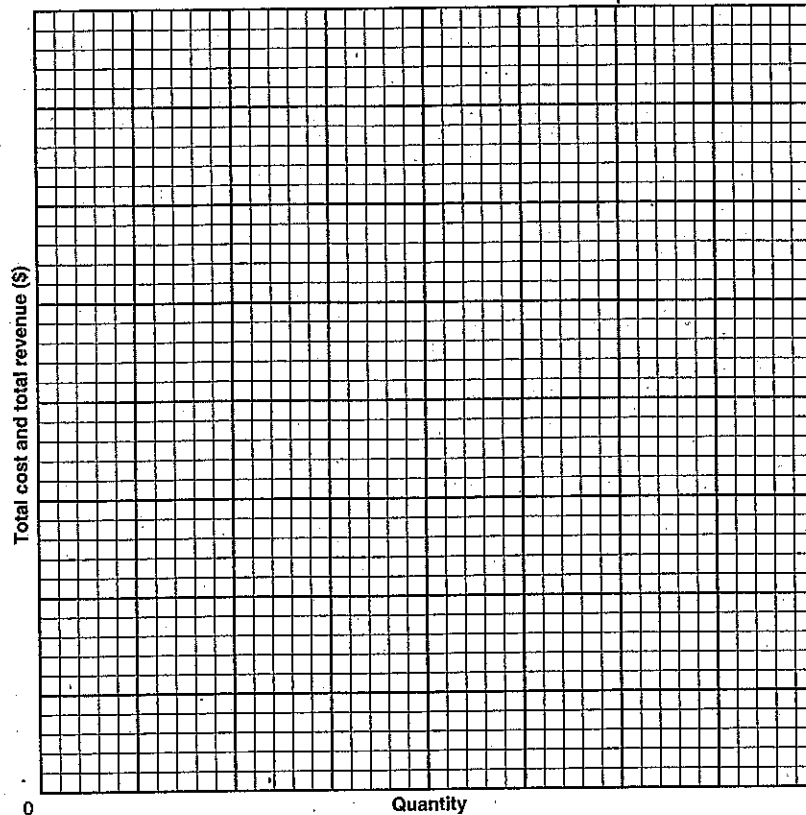
4. Now assume that the same purely competitive firm has the following schedule of average and marginal costs:

Output	AFC	AVC	ATC	MC
1	\$300	\$100	\$400	\$100
2	150	75	225	50
3	100	70	170	60
4	75	73	148	80
5	60	80	140	110
6	50	90	140	140
7	43	103	146	180
8	38	119	156	230
9	33	138	171	290
10	30	160	190	360

b. At a price of \$200, the firm would produce an output of _____ units and earn a profit of \$ _____.

c. Plot the cost data for total variable cost and total cost on the graph at the top of the next page. Then plot the total revenue when the price is \$200. For this price, indicate the level of output and the economic profit or loss on the graph.

a. At a price of \$55, the firm would produce _____ units of output. At a price of \$120, the firm would produce _____ units of output. At a price of \$200, the firm would produce _____ units of output. At the \$200 price compare your answers to those you gave in Problem 3.



b. The *per-unit* economic profit (or loss) is calculated by subtracting _____ at a particular level of output from the product price. This *per-unit* economic profit is then multiplied by the number of units of _____ to determine the economic profit for the competitive firm.

(1) At the product price of \$200, the average total costs are \$ _____, so *per-unit* economic profit is \$ _____. Multiplying this amount by the number of units of output results in an economic profit of \$ _____.

(2) At the product price of \$120, the average total costs are \$ _____, so *per-unit* economic losses are \$ _____. Multiplying this amount by the number of units of output results in an economic loss of \$ _____.

c. Plot the data for average and marginal cost in the larger graph on the next page. Then plot each marginal revenue when the price is \$55, \$120, and \$200. For each price, indicate the level of output and the economic profit or loss on the graph.

5. Use the average and marginal cost data in Problem 4 in your work on Problem 5.

a. In the following table, complete the supply schedule for the competitive firm and state what the economic profit will be at each price.

Price	Quantity supplied	Profit
\$360	_____	\$ _____
290	_____	_____
230	_____	_____
180	_____	_____
140	_____	_____
110	_____	_____
80	_____	_____
60	_____	_____

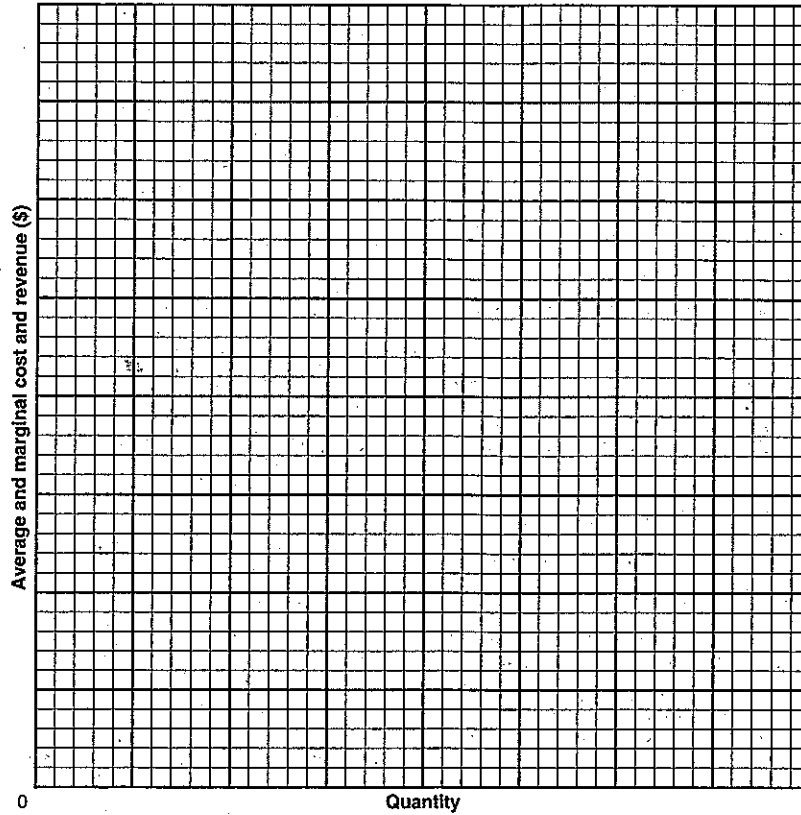
b. If there are 100 firms in the industry and all have the same cost schedule,

(1) complete the market supply schedule in the following table.

Quantity demanded	Price	Quantity supplied
400	\$360	_____
500	290	_____
600	230	_____
700	180	_____
800	140	_____
900	110	_____
1000	80	_____

(2) Using the demand schedule given in (1):

(a) What will the market price of the product be?
\$ _____



(b) What quantity will the individual firm produce?

(c) How large will the firm's profit be? \$ _____

(d) Will firms tend to enter or leave the industry in the long run? _____ Why? _____

6. If the average total costs assumed for the individual firm in Problem 4 were long-run average total costs and if the industry were a constant-cost industry,

a. what would be the market price of the product in the long run? \$ _____

b. what output would each firm produce when the industry was in long-run equilibrium? _____

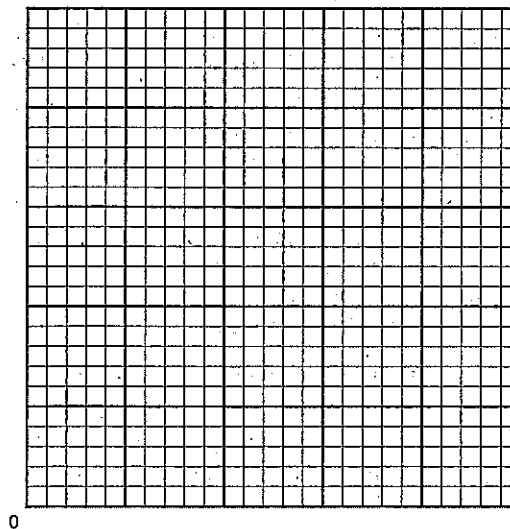
c. approximately how many firms would there be in the industry in the long run, given the present demand for the product as shown in the table in Problem 5b?

d. if the following table were the market demand schedule for the product, how many firms would there be in the long run in the industry? _____

Price	Quantity demanded
\$360	500
290	600
230	700
180	800
140	900
110	1000
80	1100

7. On the following graph, draw a long-run supply curve of

- a. a constant-cost industry
- b. an increasing-cost industry



■ SHORT ANSWER AND ESSAY QUESTIONS

1. What are the four market models (or situations) that economists employ, and what are the major characteristics of each type of market?

2. Describe in detail four characteristics of pure competition.

3. If pure competition is so rare in practice, why are students of economics asked to study it?

4. Explain how the firm in a purely competitive industry sees the demand for the product it produces in terms of the

- price elasticity of demand
- relationship of average to marginal revenue
- behavior of total, average, and marginal revenues as the output of the firm increases

5. Describe the total revenue–total cost approach to profit maximization.

6. Compare and contrast the total revenue–total cost approach with the marginal revenue–marginal cost approach to profit maximization. Are the two approaches consistent?

7. Explain the $MR = MC$ rule and its characteristics.

8. Why does the purely competitive firm want to maximize total profit but not its per-unit profit?

9. Why is a firm willing to produce at a loss in the short run if the loss is no greater than the fixed costs of the firm?

10. Explain how the short-run supply of an individual firm and of the purely competitive industry is each determined.

11. What determines the equilibrium price and output of a purely competitive industry in the short run? Will economic profits in the industry be positive or negative?

12. Why do the $MC = MR$ rule and $MC = P$ rule mean the same thing under conditions of pure competition?

13. What are the important distinctions between the short run and the long run and between equilibrium in the short run and in the long run in a competitive industry?

14. When is the purely competitive industry in long-run equilibrium? What forces the purely competitive firm into this position?

15. What is a constant-cost industry? What is an increasing-cost industry? Under what economic conditions is each likely to be found? What will be the nature of the long-run supply curve in each of these industries?

16. Explain the conditions for productive efficiency in an economy.

17. Describe the conditions for allocative efficiency. Why is it said that a purely competitive economy is an efficient economy?

18. How does a purely competitive economy eliminate an overallocation for resources for the production of a product and correct for an underallocation?

19. Explain how dynamic adjustments are made in pure competition as a result of changes in demand for a product or the supply of a resource.

20. Explain how pure competition maximizes the consumer and producer surplus.

ANSWERS

Chapter 9 Pure Competition

FILL-IN QUESTIONS

- a.* pure competition; *b.* pure monopoly; *c.* monopolistic competition; *d.* oligopoly (any order *a–d*)
- number, standardized, differentiated, enter
- a.* a large number of sellers; *b.* a standardized product; *c.* firms are price takers; *d.* free entry and exit of firms
- taker, elastic
- revenue, average, total, marginal
- is constant, equal to
- minus, equal to, break-even
- maximum, minimum, equal to
- variable
- marginal, above
- sum, short-run
- quantity supplied, quantity supplied
- fixed, variable
- average, average, minimum
- normal, economic, losses
- an increasing-, upsloping
- a decreasing-, downsloping
- average, minimum
- marginal
- efficiency, maximizes, maximizes

TRUE-FALSE QUESTIONS

- | | |
|--------------------|-------------------------|
| 1. F, p. 177 | 14. T, pp. 181–182, 184 |
| 2. F, p. 177 | 15. F, pp. 181–184 |
| 3. T, pp. 177–178 | 16. T, pp. 181–184 |
| 4. T, p. 177 | 17. T, pp. 186–187 |
| 5. F, p. 177 | 18. F, pp. 186–188 |
| 6. T, pp. 178–179 | 19. T, pp. 190–191 |
| 7. F, p. 178 | 20. T, pp. 192–193 |
| 8. F, pp. 178–179 | 21. T, pp. 193–194 |
| 9. T, pp. 179–181 | 22. T, p. 195 |
| 10. F, p. 180 | 23. T, p. 195 |
| 11. T, pp. 180–181 | 24. T, p. 195 |
| 12. T, pp. 181–182 | 25. F, pp. 195, 197 |
| 13. F, pp. 181–182 | |

MULTIPLE-CHOICE QUESTIONS

- | | |
|--------------------|--------------------|
| 1. d, p. 177 | 16. d, pp. 182–183 |
| 2. a, pp. 177–178 | 17. c, pp. 186–187 |
| 3. a, p. 178 | 18. c, pp. 188–189 |
| 4. b, pp. 177–178 | 19. b, pp. 187–188 |
| 5. c, p. 178 | 20. b, pp. 188–189 |
| 6. c, pp. 178–179 | 21. c, pp. 191–192 |
| 7. b, pp. 178–179 | 22. c, pp. 192–193 |
| 8. b, pp. 181–182 | 23. a, p. 192 |
| 9. a, pp. 182–185 | 24. d, p. 193 |
| 10. d, pp. 182–185 | 25. c, pp. 192–193 |
| 11. a, pp. 182–185 | 26. a, pp. 190–194 |
| 12. c, pp. 182–185 | 27. a, p. 195 |
| 13. c, pp. 182–185 | 28. b, pp. 195–196 |
| 14. b, pp. 182–185 | 29. d, p. 195 |
| 15. c, pp. 180–184 | 30. a, p. 197 |

PROBLEMS

1. Number of firms: d, a, c, b; Type of product: e, n, f, e, or f; Control over price: m, h, g, g; Conditions of entry: i, j, k, l; Nonprice competition: m, g, h, g, or h

2. a. Average revenue: all are \$10.00; Total revenue: \$0, 10.00, 20.00, 30.00, 40.00, 50.00, 60.00; Marginal revenue: all are \$10.00; b. yes, because price (average revenue) is constant and equal to marginal revenue; c. infinity; d. they are equal; e. see Figure 9.1 of the text for an example; f. horizontal, \$10; g. constant, constant

3. a. see following table; b. 7, 380; c. see Figure 9.2 of the text for an example

Market price = \$200		
Output	Revenue	Profit
0	\$ 0	\$ -300
1	200	-200
2	400	-50
3	600	90
4	800	210
5	1000	300
6	1200	360
7	1400	380
8	1600	350
9	1800	260
10	2000	100

4. a. 0, 5, 7, (last answer is the same as 3b); b. average total cost, output; (1) \$146, ($\$200 - \$146 = \54), ($\$54 \times 7 = \378), (2) \$140, ($\$120 - \$140 = -\20), ($-\$20 \times 5 = -\100); c. see Figure 9.3 of the text for an example

5. a. see following table; b. (1) Quantity supplied: 1000, 900, 800, 700, 600, 500, 400, (2) (a) 180, (b) 7, (c) 238, (d) enter, profits in the industry will attract them into the industry

Price	Quantity supplied	Profit
\$360	10	\$ 1700
290	9	1071
230	8	592
180	7	238
140	6	0
110	5	-150
80	4	-272
60	0	-300

6. a. 140; b. 6; c. $133 = 800$ [the total quantity demanded at \$140 divided by 6 (the output of each firm)]; d. $150 = 900$ divided by 6

7. a. The curve is a horizontal line (see Figure 9.10 in the text); b. the curve slopes upward (see Figure 9.11 in the text)

SHORT ANSWER AND ESSAY QUESTIONS

- | | | |
|----------------|-----------------|-----------------|
| 1. p. 177 | 8. pp. 182-183 | 15. pp. 192-193 |
| 2. pp. 177-178 | 9. pp. 183-185 | 16. p. 195 |
| 3. p. 177 | 10. pp. 186-188 | 17. p. 195 |
| 4. pp. 178-179 | 11. pp. 188-189 | 18. p. 195 |
| 5. pp. 179-181 | 12. p. 182 | 19. p. 197 |
| 6. pp. 179-182 | 13. pp. 188-189 | 20. pp. 195-197 |
| 7. p. 182 | 14. pp. 190-192 | |