

1. How does perfect competition differ from other basic market models?

Ans: The other basic market models are pure monopoly, oligopoly, and monopolistic competition. These market models differ from each other on the basis of: (1) the number of firms; (2) the type of product; (3) control over price; (4) entry conditions; and (5) non-price competition.

Perfect competition is a market structure with a large number of independent firms selling a standardized product. The individual firms are “price takers” and have no control over price because they must accept the market price for the product. Non-price competition is not present because firms are selling a standardized product at the market price. The conditions of entry into this industry are relatively easy.

Monopoly is just the opposite of perfect competition in many ways. First, there is only one firm, not many individual firms. Second, the firm produces a unique product for which there are no close substitutes, not a standardized product that can be produced by many firms. Third, the firm has considerable control over price, and operates as a “price maker” rather than a “price taker.” Fourth, there are extensive barriers to entry into the industry and some degree of non-price competition.

Oligopoly is more similar to pure monopoly in its operation and therefore differs markedly from pure competition. Under oligopoly there are a few large firms that dominate an industry rather than a large number of relatively small firms. The firms can produce a standardized or a differentiated product rather than just a standardized product. Oligopolistic firms have some degree of price making power, although it is limited by the mutual interdependence in the industry. The entry obstacles are high and non-price competition is present with oligopolies producing differentiated products.

Monopolistic competition is the market structure that is closest to perfect competition, although it differs from pure competition in several respects. Monopolistic competitors sell differentiated products rather than standardized products, and therefore use non-price competition along with some limited price competition to sell products. There are many monopolistically competitive firms, in part because entry conditions tend to be relatively easy, but the number of firms is substantially less than the thousands found in pure competition where the entry conditions are easier.

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Learning Objective: 7.1

2. What are some examples of the four different market structures?

Ans: Examples of perfect competition can be found in the market for agricultural products and in financial markets. Retail stores and restaurants provide examples of monopolistic competition. Standardized oligopolies would be found in the production of aluminum, steel, copper, and other metal products. Differentiated oligopolies would be found producing automobiles and large household appliances such as refrigerators. Monopoly would be exemplified by local utilities such as electric, gas, or phone companies.

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Learning Objective: 7.1

3. What are four characteristics of perfect competition?

Ans: The four are: (1) the presence of a large number of sellers that act independently in a market; (2) the production and sale of a standardized or homogeneous product; (3) the individual firms are “price takers” in the sense that the seller must accept the going market price for the sale of output; and (4) new firms can easily enter the market and existing firms can easily exit the market.

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Learning Objective: 7.1, 7.2

4. How would you describe the demand curve for the perfectly competitive firm and for the industry as a whole?

Ans: The demand curve for the individual competitive firm is perfectly elastic. The firm can sell all the output it can produce at the competitive market price because each firm accounts for only a negligible share of the market. There is no reason for the firm to lower price to sell more, nor can the firm obtain a higher price by restricting output. The market or industry demand curve, however, is down-sloping. Consumers will only purchase greater output for the entire industry at a lower price, but less output can be sold to consumers at a higher price.

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Learning Objective: 7.2

5. Why does a perfectly competitive firm not charge a price above the market price? Why does it not charge a price below the market price?

Ans: The demand for a perfectly competitive firm's output is perfectly elastic. If the firm charges an above market price, it would lose all of its customers to other firms that are producing the identical product. The firm also does not charge a below market price because it is able to sell all of its current output at the market price. There is no benefit from setting a below market price

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Learning Objective: 7.2

6. What is the difference between average, total, and marginal revenue? What is the shape of the total and marginal revenue curves for the individual competitive firm?

Ans: Average revenue is the amount of money the firm receives per unit of sale. Total revenue is the market price times the quantity that the firm can sell. Marginal revenue is the change in total revenue from selling one more unit of output. The marginal revenue curve for the individual competitive firm is a horizontal straight line because there is a constant change in total revenue from selling one more unit of output. The total revenue curve is an up-sloping straight line. Market price is constant and multiplied by an increasing amount of quantity sold.

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Learning Objective: 7.2

7. Why does price equal marginal revenue for the perfectly competitive firm? What is the relationship to the demand curve for the firm?

Ans: The perfectly competitive firm is a “price-taker” in the market. The price it receives for its output is constant and does not vary across its range of output. Marginal revenue is defined as the change in total revenue from selling one more unit of output. One more unit of output will be sold at a constant, market-determined price. Thus, price will be equal to the marginal revenue for the firm. Also, the firm's demand curve will be perfectly elastic because no matter how much or how little the firm produces it will receive the same price per unit (average revenue) of output. Thus, demand equals price (average revenue) and marginal revenue.

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Learning Objective: 7.2

8. Below is a demand schedule facing an individual firm. Complete the table by computing average revenue, total revenue, and marginal revenue. Then answer the following two questions: (a) How can you tell whether a firm is operating in a market that is perfectly competitive? (b) What relationship exists between average revenue and marginal revenue?

<u>Price</u>	<u>Quantity demanded</u>	<u>Average revenue</u>	<u>Total revenue</u>	<u>Marginal revenue</u>
\$30	0	\$ _____	\$ _____	_____
30	1	_____	_____	\$ _____
30	2	_____	_____	_____
30	3	_____	_____	_____
30	4	_____	_____	_____
30	5	_____	_____	_____
30	6	_____	_____	_____

Ans:

<u>Price</u>	<u>Quantity demanded</u>	<u>Average revenue</u>	<u>Total revenue</u>	<u>Marginal revenue</u>
\$30	0	\$0	\$0	_____
30	1	30	30	30
30	2	30	60	30
30	3	30	90	30
30	4	30	120	30
30	5	30	150	30
30	6	30	180	30

(a) The data indicate that the demand curve for this individual firm is perfectly elastic. Therefore, the firm is operating in a purely competitive market because it can sell all of its output at the going market price of \$30. Product price is constant for the firm under pure competition.

(b) Marginal revenue and average revenue are the same under perfect competition. Marginal revenue and average revenue are also equal to price. Marginal revenue is constant under perfect competition because additional units can be sold at a constant price (\$30). Because the seller receives a constant amount per unit (\$30), the revenue per unit (or average revenue) is also equal to price.

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Learning Objective: 7.2

9. What quantity should the perfectly competitive firm produce to maximize profits? Analyze from a total revenue and total cost perspective and a marginal revenue and marginal cost perspective.

Ans: From an MC-MR perspective, the firm should produce where MR or price equals MC. From a TC-TR perspective, the firm should produce where the excess of TR over TC is a maximum or where the excess of TC over TR is a minimum (and less than total fixed costs).

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Learning Objective: 7.3

10. Explain the marginal revenue and marginal cost approach to profit maximization and use it to describe profit, loss, and shut down situations for the perfectly competitive firm.

Ans: The perfectly 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. 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. First, the firm will maximize profits when  $MR=MC$  at an output level where price is greater than average total cost. Second, the firm will minimize losses when  $MR=MC$  at that output level where price is greater than the minimum average variable cost (but less than average total cost). Third, the firm will shut down when  $MR=MC$  at an output level where price is less than average variable cost.

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Learning Objective: 7.3

11. Why is the level of output at which marginal revenue equals marginal cost the profit-maximizing output?

Ans: The easiest way to explain this is to explain why it cannot be otherwise. If marginal revenue exceeds marginal cost, then the firm can add to its profits by expanding production until marginal revenue no longer exceeds marginal cost (either because the price declines eventually or diminishing returns set in and marginal cost rises or both). If, on the other hand, marginal revenue is below marginal cost, it would not be rational for the firm to expand production to this level. Why add more to your costs than you add to your revenues since that means smaller profits?

If the firm would not produce when marginal revenue exceeds marginal cost, or when marginal revenue is less than marginal cost, then it must maximize profits where marginal revenue equals marginal cost.

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Learning Objective: 7.3

12. Suppose a bridge for automobiles was constructed across a river and all the costs associated with its construction have been paid. The amount of traffic is such that there are no foreseeable problems of overcrowding in the use of the bridge. Assume, also, that the extra cost associated with traffic crossing the bridge is for all practical purposes equal to zero. What toll should be charged to achieve the most efficient use of the bridge?

Ans: No toll should be charged because the marginal cost for each vehicle using the bridge is zero. Efficient use occurs where price (marginal revenue) is equal to marginal cost. Therefore, the toll should not be charged.

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Learning Objective: 7.3

13. What conditions are necessary to determine if the perfectly competitive firm should produce in the short run? State the marginal revenue and marginal cost conditions and the total revenue and total cost conditions.

Ans: From TC-TR perspective, the firm should produce if TR exceeds TC, or if TC exceeds TR by some amount less than total fixed cost. From an MC-MR perspective, the firm should produce if price is equal to, or greater than, the minimum average variable cost.

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Learning Objective: 7.3

14. Under what conditions will a perfectly competitive firm realize an economic profit? Give a response from a marginal revenue and marginal cost perspective and from a total revenue and total cost perspective.

Ans: From an MC-MR perspective, the firm will realize an economic profit if price exceeds average total cost. It will experience economic losses if average total cost exceeds price. From a TC-TR perspective, the firm will realize an economic profit if TR exceeds TC. It will experience economic losses if TC exceeds TR.

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Learning Objective: 7.3

15. An airline is flying between two cities. The airline has the following costs associated with the flight:

Crew	\$4,000	Plane daily depreciation	\$2,000
Fuel	1,000	Plane daily insurance	2,000
Landing fee	1,000		

The airline has an average of 40 passengers paying an average of \$200 for this flight. Do you think the airline should be flying between the two cities? Evaluate from a short-run and long-run perspective.

Ans: Yes, from a short-run perspective, the airline should make this flight between the two cities. The total variable costs are \$6,000 ( $\$4,000 + \$1,000 + \$1,000$ ). The total revenue is \$8,000. Thus the flight covers total variable cost and leaves \$2,000 to apply against \$4,000 of total fixed cost. If the plane did not fly, the firm would lose the entire \$4,000 of total fixed cost.

The average variable costs are \$150 per passenger ( $\$6,000/40$  passengers). The price or average revenue of \$200 is greater than the average variable cost of \$150. The airline received enough revenue to cover average variable costs and also \$50 per passenger to offset fixed costs that average \$100.

On the other hand, in the long-run the airline should cancel the flight. The price of \$200 is less than ATC of \$250 ( $\$10,000/40$ ). The airline is losing \$50 per passenger, or \$2,000 per flight and cannot afford to take this loss on each flight in the long run.

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Learning Objective: 7.3

16. Assume that a perfectly competitive firm has the schedule of costs given in the table below.

<u>Output</u>	<u>TFC</u>	<u>TVC</u>	<u>TC</u>
0	\$500	\$0	\$500
1	500	150	650
2	500	200	700
3	500	260	760
4	500	340	840
5	500	450	950
6	500	590	1,090
7	500	770	1,270
8	500	1,000	1,500
9	500	1,290	1,790
10	500	1,650	2,150

(a) Complete the table below to show the total revenue and total profit of the firm at each level of output the firm might produce. Assume market prices of \$50, \$150, and \$250.

<u>Output</u>	<u>Market price = \$50</u>		<u>Market price = \$150</u>		<u>Market price = \$250</u>	
	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>
0	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
1	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____	_____
9	_____	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____	_____

(b) Indicate what output the firm would produce and its profits in the following table.

<u>Quantity</u>	<u>Profit (+) or loss (-)</u>	
<u>Price</u>	<u>supplied</u>	<u>or loss (-)</u>
\$50	_____	_____
150	_____	_____
250	_____	_____

Ans:

<u>Output</u>	<u>Market price = \$50</u>		<u>Market price = \$150</u>		<u>Market price = \$250</u>	
	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Revenue</u>	<u>Profit (+) or loss (-)</u>	<u>revenue</u>	<u>Profit (+) or loss (-)</u>



0	\$0	\$-500	\$0	\$-500	\$0	\$-500
1	50	-600	150	-500	250	-400
2	100	-600	300	-400	500	-200
3	150	-610	450	-310	750	-10
4	200	-640	600	-240	1,000	+160
5	250	-700	750	-200	1,250	+300
6	300	-790	900	-190	1,500	+410
7	350	-920	1,050	-220	1,750	+480
8	400	-1,100	1,200	-300	2,000	+500
9	450	-1,340	1,350	-440	2,250	+460
10	500	-1,650	1,500	-650	2,500	+350

(a) *See table above.*

(b) *See table below.*

Price	Quantity Supplied	Profit (+) or loss (-)
\$50	0	\$-500
150	6	-190
250	8	+500

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Learning Objective: 7.3

17. Assume that a perfectly competitive firm has the schedule of total fixed and total variable costs given in the table below. Fill in the total cost column.

<u>Output</u>	<u>TFC</u>	<u>TVC</u>	<u>TC</u>
0	\$500	\$0	\$ _____
2	500	200	_____
4	500	340	_____
6	500	590	_____
8	500	1,000	_____
10	500	1,650	_____

- (a) Complete the table below to show the total revenue and total profit of the firm at each level of output the firm might produce. Assume market prices of \$50, \$150, and \$250.

<u>Output</u>	<u>Market price = \$50</u>		<u>Market price = \$150</u>		<u>Market price = \$250</u>	
	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>
0	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
2	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____	_____

- (b) Indicate what output the firm would produce and its profits in the following table.

<u>Price</u>	<u>Quantity supplied</u>	<u>Profit (+) or loss (-)</u>
\$50	_____	_____
150	_____	_____
250	_____	_____

Ans:

<u>Output</u>	<u>TFC</u>	<u>TVC</u>	<u>TC</u>
0	\$500	\$0	\$500
2	500	200	700
4	500	340	840
6	500	590	1,090
8	500	1,000	1,500
10	500	1,650	2,150

<u>Output</u>	<u>Market price = \$50</u>		<u>Market price = \$150</u>		<u>Market price = \$250</u>	
	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>	<u>Total revenue</u>	<u>Profit (+) or loss (-)</u>
0	0	500	\$	0	500	-500

2	100	600	300	-400	500	-200
4	200	640	600	-240	1,000	+160
6	300	790	900	-190	1,500	+410
8	400	1,100	1,200	-300	2,000	+500
10	500	1,650	1,500	-650	2,500	+350

(a) See table above.

Price	Quantity Supplied	Profit (+) or loss (-)
\$ 50	0	\$-500
150	6	-190
250	8	+500

(b) See table above.

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Learning Objective: 7.3

18. What is the largest loss a perfectly competitive firm would be willing to incur in the short run?

Ans: If a firm chooses to shut down in the short run, it will incur a loss equal to its fixed cost. Therefore, the size of the firm's fixed cost is the largest loss that a firm would be willing to incur in the short run.

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Learning Objective: 7.3

19. A perfectly competitive firm is producing an output that results in an economic loss. Should the firm shut down?

Ans: The answer depends on whether the firm is minimizing its loss. If the firm is not currently producing where  $MR = MC$ , it can reduce the size of its loss by changing its level of production until  $MR = MC$ . If  $MR$  currently exceeds  $MC$ , the firm can reduce its loss by increasing its output. On the other hand, if  $MC$  currently exceeds  $MR$ , the firm can decrease its loss by decreasing its output.

Even if the firm is currently producing where  $MR = MC$ , the firm may be better off by remaining in production with the loss than by shutting down. If  $P > AVC$ , the firm is minimizing its loss. If the firm shuts down, it will still incur its fixed costs and thus make a larger loss.

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Learning Objective: 7.3

20. Each of the following describes the situation currently faced by a perfectly competitive firm. In each situation, determine the firm's profit and whether the firm is maximizing profit. If the firm is not maximizing profit, determine how the firm must respond to increase its profit.

(a)

$$\begin{array}{lll} P = \$5 & TVC = \$1500 & MC = AVC \\ Q = 500 & AFC = \$1 & \end{array}$$

(b)

$$\begin{array}{lll} AR = \$10 & TC = \$2000 & MC = \$10 \\ Q = 100 & TVC = \$1500 & \end{array}$$

(c)

$$\begin{array}{lll} TR = \$5000 & AFC = \$10 & MC = \$40 \\ P = \$50 & AVC = \$20 & \end{array}$$

(d)

$$\begin{array}{ll} TR = \$4000 & ATC = \$6 \\ Q = 1000 & MC = \$5 \end{array}$$

(e)

$$\begin{array}{lll} TR = \$1000 & ATC = \$14 & MC = \$10 \\ Q = 100 & AFC = \$2 & \end{array}$$

Ans: Since the firm described in each of the situations is perfectly competitive,  $P = AR = MR$ . To determine whether the firm is maximizing profit, you must determine if  $MR = MC$ . If  $MR$  does not equal  $MC$ , the firm must alter its output. As a price taker, it cannot alter the price.

$$\begin{aligned} \text{(a)} \quad TR &= P \times Q = \$5 \times 500 = \$2500; \quad TFC = AFC \times Q = \$1 \times 500 = \$500; \\ TC &= TFC + TVC = \$500 + \$1500 = \$2000; \quad \text{Profit} = TR - TC = \$2500 - \$2000 = \$500. \end{aligned}$$

$MR = P = \$5$ ;  $MC = AVC = TVC/Q = \$1500/500 = \$3$ ; Since  $MR > MC$ , the firm can increase profit by increasing output.

$$\text{(b)} \quad P = MR = AR = \$10; \quad TR = P \times Q = \$10 \times 100 = \$1000; \quad \text{Profit} = TR - TC = \$1000 - \$2000 = -\$1000 \text{ (loss).}$$

Although  $MR = MC$ , the firm is not maximizing profit/minimizing loss. Currently  $TR < TVC$ . The firm would make a smaller loss if it produced zero output. If the firm produced zero output, its loss =  $TFC = TC - TVC = \$500$ . Therefore, the firm must produce zero output to minimize its loss.

$$\begin{aligned} \text{(c)} \quad Q &= TR/P = \$5000/\$50 = 100; \quad ATC = AFC + AVC = \$10 + \$20 = \$30; \quad TC = \\ &ATC \times Q = \$30 \times 100 = \$3000; \quad \text{Profit} = TR - TC = \$5000 - \$3000 = \$2000. \end{aligned}$$

$MR = P = \$50$ ; Since  $MR > MC$ , the firm can increase profit by increasing output.

(d)  $TC = ATC \times Q = \$6 \times 1000 = \$6000$ ; Profit =  $TR - TC = \$4000 - \$6000 = -\$2000$  (loss).

$MR = P = TR/Q = \$4000/1000 = \$4$ ; Since  $MR < MC$ , the firm can decrease its loss by producing less output. Note: there is not enough information to determine whether the firm should produce zero output.

(e)  $TC = ATC \times Q = \$14 \times 100 = \$1400$ ; Profit =  $TR - TC = \$1000 - \$1400 = -\$400$  (loss).

$MR = P = TR/Q = \$1000/100 = \$10$ ;  $AVC = ATC - AFC = \$14 - \$2 = \$12$ ;  
Although  $MR = MC$ , the firm is not maximizing profit/minimizing loss. Currently  $P < AVC$ . The firm would make a smaller loss if it produced zero output. If the firm produced zero output, its loss =  $TFC = AFC \times Q = \$2 \times 100 = \$200$ .  
Therefore, the firm must produce zero output to minimize its loss.

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Learning Objective: 7.3

21. What is the relationship between marginal cost and the supply curve for the perfectly competitive firm?

Ans: There are several relationships between marginal cost and the supply curve for the perfectly competitive firm. First, the short-run supply curve for the perfectly competitive firm is the portion of the marginal cost curve that lies above average variable cost. Second, there are links between 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 product) if it expands output. If marginal revenue is greater than marginal cost, the firm has an incentive to expand production because it adds to the firm's profits. Third, 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), thus increasing the supply curve for the firm. Given a fixed marginal revenue, output will expand until marginal cost equals marginal revenue under the new conditions.

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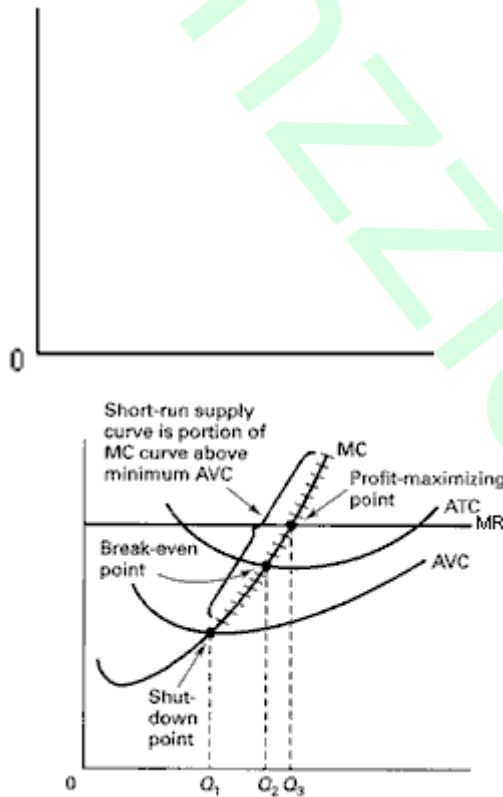
22. Will a perfectly competitive firm be willing to produce an output where it is experiencing diminishing returns?

Ans: A purely competitive firm's supply curve corresponds to the upward sloping portion of its marginal cost curve that lies above average variable cost. The marginal cost is upward sloping because of diminishing returns and declining marginal product. Therefore, the firm is willing to produce an output where diminishing returns occur. Only by doing so will the firm maximize economic profit.

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Learning Objective: 7.4

23. Draw a graph of the short-run cost curves for a perfectly competitive firm that shows a short-run supply curve for the individual firm. Identify the shutdown point, the break-even point, the profit-maximizing point, and the levels of output associated with those points.



Ans:

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Learning Objective: 7.4

24. How will the marginal and average cost curves of the typical perfect competitor shift or change as a result of the following events: (a) an increase in wages of all labour; (b) an increase in the rental payments on office machinery; (c) a technological advance; (d) an increase in sales taxes; (e) an increase in property taxes; and (f) a decline in the price of a basic raw material?

Ans: (a) An increase in variable cost: AVC, ATC, and MC will shift upward.

(b) It depends on whether or not the office machinery is fixed or variable. If fixed, it will shift AFC and ATC upward. If variable, it will shift AVC, ATC, and MC upward.

(c) A decrease in variable cost. Assuming no new fixed costs are incurred, this will shift AVC, ATC, and MC downward as it means labour is more productive.

(d) An increase in variable cost: AVC, ATC, and MC will shift upward.

(e) An increase in fixed cost: AFC and ATC will shift upward.

(f) A decrease in variable cost: AVC, ATC, and MC will shift downward.

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Learning Objective: 7.4

25. The agricultural market for corn can be characterized as a perfectly competitive industry. How might the following events affect the short-run cost curves and output for a firm in the industry?

- (a) A reduction in the cost of fertilizer that is sold to corn farmers.
- (b) The Canada Customs and Revenue Agency (CCRA) changes tax laws, which increase the amount of depreciation that farmers can deduct for equipment.
- (c) The market price of corn falls.

Ans: (a) The fall in fertilizer costs will reduce variable costs for each firm. AVC, ATC, and MC will fall. Output will expand for each firm because the MC curve will shift to the right along the existing MR curve. MR or price or marginal revenue stays constant because the firm is a price taker in a purely competitive industry.

(b) The tax law change affects depreciation. Depreciation is a fixed cost that must be paid irrespective of the level of output. Thus the fixed cost for farmers has decreased. This change means that AFC and ATC falls, but output stays the same and is set where  $MC = MR$ .

(c) This change will lower MR but will not change the short-run cost curve. Output will fall because the lower MR or price will be equal to MC at a lower output level.

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Learning Objective: 7.4



26. Assume a single firm in a perfectly competitive industry has variable costs as indicated in the following table in column 2. Complete the table and answer the questions.

(1) Total Product	(2) Total var. cost	(3) Total cost	(4) AFC	(5) AVC	(6) ATC	(7) MC
0	\$ 0	\$40	—	—	—	—
1	55	_____	\$ _____	\$ _____	\$ _____	\$ _____
2	75	_____	_____	_____	_____	_____
3	90	_____	_____	_____	_____	_____
4	110	_____	_____	_____	_____	_____
5	135	_____	_____	_____	_____	_____
6	170	_____	_____	_____	_____	_____
7	220	_____	_____	_____	_____	_____
8	290	_____	_____	_____	_____	_____

- (a) At a product price of \$52, will this firm produce in the short run? Explain. What will be its profit or loss?
- (b) At a product price of \$28, will this firm produce in the short run? Explain. What will be its profit or loss?
- (c) At a product price of \$22, will this firm produce in the short run? Explain. What will be its profit or loss?
- (d) Complete the following short-run supply schedule for this firm.

<u>Product Price</u>	<u>Quantity supplied</u>	<u>Profit (+) or loss (-)</u>
\$72	_____	_____
52	_____	_____
45	_____	_____
28	_____	_____
22	_____	_____
15	_____	_____

Assume there are 500 identical firms in this industry, that they have identical cost data as the firm above, and that the industry demand schedule is as follows:

<u>Price</u>	<u>Quantity demanded</u>	<u>Quantity Supplied</u>
\$72	2,500	
52	3,500	
45	4,000	
28	5,200	
22	5,900	
15	6,700	

- (e) Solve for the equilibrium price by completing the table above.
- (f) What will the equilibrium output for each firm be?
- (g) What will profit or loss be per unit?
- (h) What will profit or loss be per firm?

Ans:

(1) Total product	(2) Total var. cost	(3) Total Cost	(4) AFC	(5) AVC	(6) ATC	(7) MC
0	\$0	\$40	—	—	—	—
1	55	95	\$40	\$55	\$95	\$55
2	75	115	20	37.50	57.50	20
3	90	130	13.33	30	43.33	15
4	110	150	10	27.50	37.50	20
5	135	175	8	27	35	25
6	170	210	6.67	28.33	35	35
7	220	260	5.71	31.43	37.14	50
8	290	330	5	36.25	41.25	70

(a) The firm will produce 7 units (MR=P=\$52 is closest to rising MC without exceeding it), at a profit of \$14.86 per unit [ $P - ATC = 52 - 37.14$ ] or total profit of  $7 \times \$14.86 = \$104.02$ .

(b) The firm will produce 5 units (MR=P=28 is closest to rising MC without exceeding it and price covers AVC) at a loss of \$7 per unit [ $28 - 35$ ] or  $5 \times \$7 = \$35$  total loss which is less than \$40 fixed cost loss incurred by shutting down in the short run.

(c) The minimum AVC is \$27, so at a price of \$22 the firm will shut down in the short run and absorb the fixed cost loss of \$40. There is no output level where price covers AVC.

(d) We have done P=\$52, \$28, and \$22. We have also worked out that if  $P < \$27$ , the firm will shut down in the short run. Calculating the profit or loss is done by using the following formula  $[P - ATC] \times Q$  assuming the firm does not shut down. In the case of shutting down, the loss is equal to the fixed cost.

Product Price	Quantity Supplied	Profit (+) or loss (-)
\$72	8	\$246
52	7	\$104.02
45	6	\$60
28	5	-\$35
22	0	-\$40
15	0	-\$40

Assume there are 500 identical firms in this industry, that they have identical cost data as the firm above, and that the industry demand schedule is as follows:

<u>Price</u>	<u>Quantity demanded</u>	<u>Quantity Supplied</u>
\$72	2,500	4,000
<b>52</b>	<b>3,500</b>	<b>3,500</b>
45	4,000	3,000
28	5,200	2,500
22	5,900	0
15	6,700	0

(e) *See table above.* The equilibrium price is the price at which  $Q_D = Q_S$  which is  $P = \$52$ .

(f) *See two tables above.* At the equilibrium price of \$52, each firm will produce 7 units.

(g) At  $P = \$52$  each firm produces  $Q = 7$  for a total firm profit of \$104.52. Profit per unit is then \$14.86 [ $104.02 \div 7$ ] or can be found in the first table. Another calculation that solves for per unit profit (loss) is  $P - ATC$ .

(h) *See two tables above.* At the equilibrium price of \$52, each firm will produce 7 units for a firm profit of \$104.02.

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Learning Objective: 7.4

27. Assume that a perfectly competitive firm has the schedule of average and marginal costs given in the table below.

<u>Output</u>	<u>AFC</u>	<u>AVC</u>	<u>ATC</u>	<u>MC</u>
0				
1	\$600	\$200	\$800	\$200
2	300	150	450	100
3	200	140	340	120
4	150	145	295	160
5	120	160	280	220
6	100	180	280	280
7	86	206	291	360
8	75	238	313	460
9	67	276	342	580
10	60	320	380	720

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

<u>Price</u>	<u>Quantity supplied</u>	<u>Profit (+) or loss (-)</u>
\$580	_____	_____
460	_____	_____
360	_____	_____
280	_____	_____
220	_____	_____
160	_____	_____
120	_____	_____

- (b) If there are 100 firms in the industry and all have the same cost schedule, complete the market supply schedule in the table below.

<u>Quantity Demanded</u>	<u>Price</u>	<u>Quantity supplied</u>
500	\$580	_____
600	460	_____
700	360	_____
800	280	_____
900	220	_____
1,000	160	_____
1,100	120	_____

Answer the following questions: (1) What will the equilibrium price and quantity of the product be? (2) What will the profits of each firm be? (3) Will firms tend to enter or leave the industry in the long run? Explain.

Ans:

<u>Price</u>	<u>Quantity Supplied</u>	<u>Profit (+) or loss (-)</u>
\$580	9	\$+2,140
460	8	+1,180

360	7	+480
280	6	0
220	5	-300
160	4	-540
120	0	-600

(a) *See table above.*

Quantity Demanded	Price	Quantity supplied
500	\$580	900
600	460	800
700	360	700
800	280	600
900	220	500
1,000	160	400
1,100	120	0

(b) *See table above.* (1) The equilibrium price will be \$360 and the equilibrium quantity will be 700 units. (2) Each firm will make \$480 in profit. (3) Firms will tend to enter the industry in the long run because economic profits are being made.

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Learning Objective: 7.3-7.5

28. Assume that in a perfectly competitive industry: (1) the entry and exodus of firms are the only long-run adjustments; (2) firms in the industry have identical cost curves; and (3) the industry is a constant cost industry. Explain how long-run equilibrium is eventually achieved in the industry when there are initially economic profits and losses.

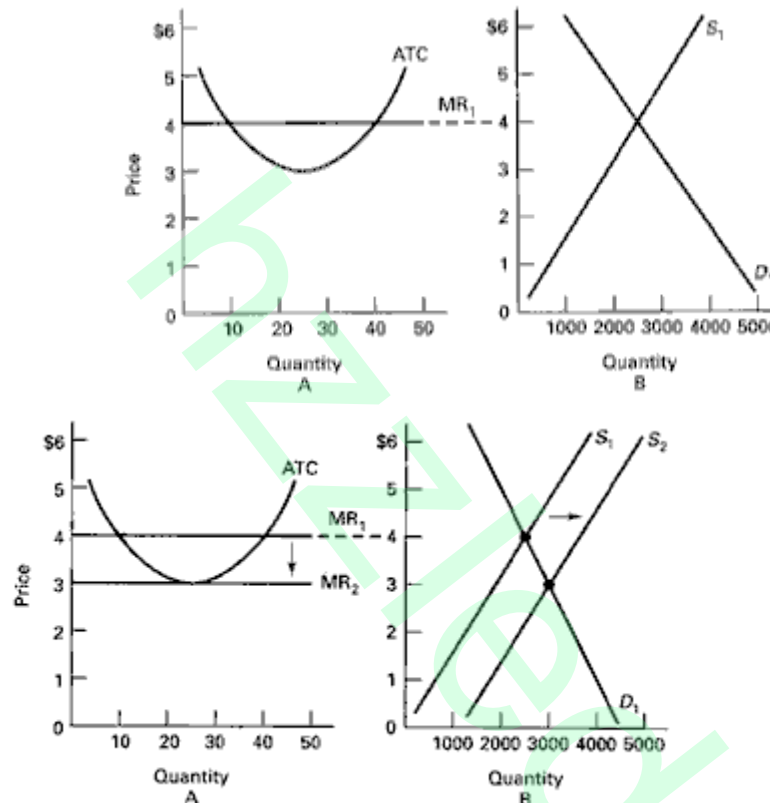
Ans: When long-run equilibrium is achieved, the product price will be exactly equal to, and production will occur at, the minimum average total cost for each firm. Firms seek profits and want to avoid losses. Firms may freely enter and exit the industry. If economic profits are being earned in the industry, then marginal revenue (= price) is above the minimum of average total cost for the representative firm. New firms will enter the industry, which increases the market supply, causing the marginal revenue line or product price to fall to the equilibrium price where zero economic profits are earned ( $MR = P = \text{minimum ATC}$ ). If losses are incurred in the short-run by the representative firm, then marginal revenue (= P) is below the minimum ATC. Firms will leave the industry, which decreases the market supply, causing the marginal revenue to rise until losses disappear and normal profits are earned. The outcome from the model is one of zero economic profits. Yet, this situation allows for a normal profit to be made by each firm in the long-run.

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Learning Objective: 7.5

29. Consider the two diagrams below. Diagram A represents a typical firm in a perfectly competitive industry. Diagram B represents the supply and demand conditions in that industry.

- Describe the price, output, and profit situation for the individual firm in the short run.
- Describe what will happen to the individual firm and the industry in the long run. Show the changes on diagrams A and B.



Ans:

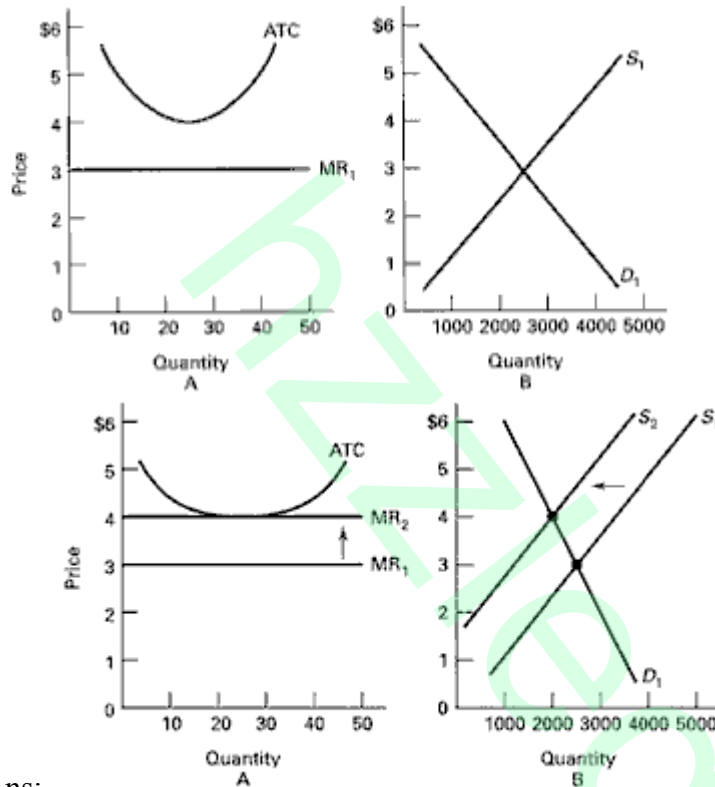
- The firm will sell its output for a price of \$4.00 per unit. It is making a profit because MR of \$4.00 is greater than ATC.
- In the long run, firms will enter the industry because existing firms are making economic profits. This increase in the number of firms will shift the supply curve for the industry to the right and lead to a decrease in the market price to \$3.00. At this price, the individual firm will neither be making an economic profit nor taking an economic loss. It will be in equilibrium. *See graphs above.*

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Learning Objective: 7.5

30. Consider the two diagrams below. Diagram A represents a typical firm in a perfectly competitive industry. Diagram B represents the supply and demand conditions in that industry.

- Describe the price, output, and profit situation for the individual firm in the short run.
- Describe what will happen to the individual firm and the industry in the long run. Show the changes on diagrams A and B.



Ans:

(a) The firm will sell its output for a price of \$3.00 per unit. It is taking an economic loss because MR of \$3.00 is less than ATC.

(b) In the long-run, firms will leave the industry because existing firms are taking economic losses. This decrease in the number of firms will shift the supply curve for the industry to the left and lead to an increase in the market price to \$4.00. At this price, the individual firm will neither be making an economic profit nor taking an economic loss. It will be in equilibrium. *See graphs above.*

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Learning Objective: 7.5



31. “The long-run industry supply curve in a constant-cost industry graphs is a horizontal line.” Explain.

Ans: This is true because no matter what the size of the firm, and how many firms enter the industry, the average total cost or unit cost does not change by definition. Therefore, in a competitive industry the price will equal this average cost no matter what the level of output, and graphically this is a straight horizontal line.

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Learning Objective: 7.5

32. What is the relationship between the long-run supply curve in a constant-cost industry and elasticity?

Ans: For the graph, quantity or output will be on the horizontal axis and price will be on the vertical axis. The long-run supply curve for a constant cost industry will be perfectly elastic. This means it will be horizontal, showing that the level of output will not affect the price in the long-run. Firms can obtain all the resources they need at different output levels without affecting the minimum average total cost of production.

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Learning Objective: 7.5

33. Describe the graph for a long-run supply curve in an increasing-cost industry. Why does it have this slope?

Ans: For the graph, quantity or output for the industry will be on the horizontal axis and price will be on the vertical axis. The slope of the graph for a long-run supply curve in an increasing-cost industry will be up-sloping. It shows that shows that an increase in the level of output is associated with an increase in the price of the product. The reason for the upward slope is that as firms increase output, they bid up resource prices, and this increases the minimum average total cost of the product.

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Learning Objective: 7.5

34. Describe the graph for a long-run supply curve in a decreasing-cost industry. Why does it have this slope?

Ans: For the graph, quantity or output for the industry will be on the horizontal axis and price will be on the vertical axis. The slope of the graph for a long-run supply curve in a decreasing-cost industry will be down-sloping. It shows that an increase in the level of output is associated with a decrease in the price of the product. The reason for the downward slope is that as firms increase output, they demand more resource inputs. The increased demand for resource inputs gives firms the opportunity supplying those inputs to achieve more economies of scale and thus reduce the resource prices. As the resource price falls, this decreases the minimum average total cost of the product for firms in the industry.

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Learning Objective: 7.5

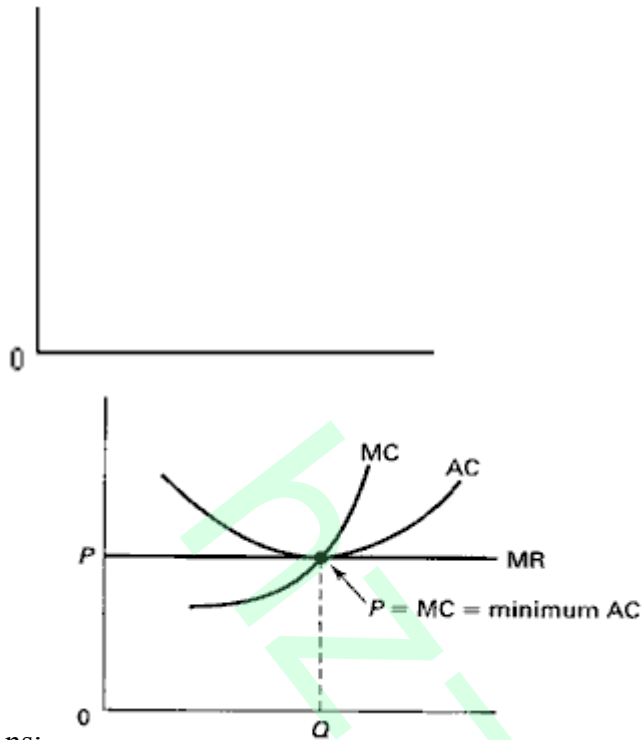
35. What economic conditions are necessary to achieve productive and allocative efficiency under perfect competition?

Ans: Productive efficiency requires that each good be produced in the least costly way. In the long run, competition forces firms to produce at the point of minimum average total cost and to charge a price which is just equal to those costs. Allocative efficiency means that resources are distributed among firms such that a mix of products is produced that is most desired by society. The price of any product is society's measure of its perceived marginal benefit from consumption of the product. The marginal cost measures the relative value of the resources that were used to produce the product. Perfect competition is allocatively efficient because  $P$  equals  $MC$ , or society's perceived marginal benefit from the consumption of the product just equals the opportunity cost of the resources used to produce the product.

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Learning Objective: 7.6

36. Draw a graph on the below diagram showing the long-run equilibrium position of a competitive firm. Write a formula to express the equalities in the graph.



Ans:

The formula is  $P = \text{minimum ATC} = MC$ , or price is equal to the minimum of average total cost and also equal to marginal cost.

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Learning Objective: 7.6

37. Explain what allocative efficiency is and how it is achieved in perfect competition.

Ans: Allocative efficiency occurs where  $P = MC$ . Product price is a measure of society's relative worth of a product at the margin, or its marginal benefit. The marginal cost of producing a product measures the relative worth of the other goods that could have been produced by the resources used in producing an extra unit of the product. Thus, product price measures the benefit that society gets from additional units of a product. The marginal cost of this unit of a product measures what society has to give up in other products to produce more of this one.

If  $P > MC$ , then society wants more units of this product than alternative products that could be produced with the resources. In this case, resources are under-allocated to the production of the product. If  $P < MC$ , then society wants more units of other products than of this one. In this case, resources are over-allocated to the production of the product. Efficient allocation occurs when  $P = MC$  because the marginal benefits to society are just equal to the marginal cost of that additional production. This condition will be achieved in pure competition.

Allocative efficiency can also be examined in terms of consumer and producer surplus. When the sum of consumer and producer surplus is maximized, allocative efficiency is achieved. In perfect competition, equilibrium occurs where the market demand and market supply. At the equilibrium output level, the sum of consumer and producer surplus is at its greatest.

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Learning Objective: 7.6

38. How would a perfectly competitive industry adjust and restore allocative efficiency when there is an increase in the demand for a product?

Ans: Perfect competition is a dynamic market structure that can easily accommodate change and restore equilibrium. Dynamic adjustments will occur automatically in pure competition from changes in demand, changes in resource supplies, or from changes in technology. If demand for a product increases, the price of the product will increase ( $P > MC$ ). This situation means there is an underallocation of resources to the production of the product. It will create temporary economic profits for representative firms in the industry. The economic profits will attract new firms to the industry to supply output. This increased supply will result in a decline in price until the equilibrium of  $P = MC$  is restored.

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Learning Objective: 7.6

39. What is producer surplus?

Ans: Producer surplus is the difference between what sellers receive for their product and the marginal cost of producing the product.

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Learning Objective: 7.6

40. What is consumer surplus?

Ans: Consumer surplus is the difference between what buyers pay to purchase a product and the buyers' maximum willingness to pay. It is the area beneath the demand curve and above the price line.

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Learning Objective: 7.6

41. If all the assumptions about a perfectly competitive market are true, then at the equilibrium, what is true about the consumer and producer surplus?

Ans: At the perfectly competitive equilibrium (assuming all of our assumptions are true) the sum of the consumer and producer surplus is at a maximum. All mutually beneficial trades are made and the market is efficient.

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Learning Objective: 7.6

42. How does the "invisible hand" work in a competitive market system?

Ans: Businesses and resource suppliers seek to further their own self-interests. Businesses seek to maximize profits and in doing so they make efficient use of society's scarce resources. Thus the competitive market system directs activity with an "invisible hand" that promotes the social interest. Resources are allocated to their best use and the result produces the greatest amount of consumer satisfaction.

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Learning Objective: 7.6

43. How does the introduction of new generic drugs affect drug prices, consumer surplus and in what way does this generate an efficiency gain for society?

Ans: Generic drugs replace patent controlled drugs which are supplied by monopolistic producers with comparable and competitive drugs produced by competitive producers at much lower cost. Consequently the price falls and consumers gain consumer surplus. The gain in both consumer and producer surplus represents an efficiency gain by society.

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Learning Objective: Last Word