1. The processes a firm uses to turn inputs into outputs of goods and services is called
A) technology.
B) technological change.
C) marginal analysis.
D) positive economic analysis.

2. A firm has successfully adopted a positive technological change when
A) it can produce more output using the same inputs.
B) it produces less pollution in its production process.
C) can pay its workers less yet increase its output.
D) it sees an increase in worker productivity.

3. Which of the following is *not* a source of technological advancement for a producer?
A) better trained workers
B) more efficient physical capital
C) higher skill level of managers
D) outsourcing some aspect of production

4. Which of the following statements best describes the economic short run?
A) It is a period of one year or less.
B) It is a period during which firms are free to vary all of their inputs.
C) It is a period during which at least one of the firm's inputs is fixed.
D) It is a period during which fixed inputs become variable inputs because of depreciation.

5. A characteristic of the long run is
A) there are fixed inputs.
B) all inputs can be varied.
C) plant capacity cannot be increased or decreased.
D) there are both fixed and variable inputs

6. In the long run which of the following is true?
A) Total cost = fixed cost + variable cost.
B) The size of a firm's physical plant can be changed but the firm cannot adopt new technology.
C) There are no fixed costs.
D) The firm can vary its explicit costs but not its implicit costs.
7. Which of the following statements is true?
A) Opportunity cost = explicit cost - implicit cost.
B) Total cost = fixed cost + implicit cost.
C) Total cost = fixed cost + variable cost.
D) Variable cost = wages + salaries + benefits.

8. Bill owns "Bill's Home of Blues" a store that specializes in selling CDs and DVDs of blues musicians of the 1960s and 1970s. Bill took out a loan from his bank to pay for his store and its initial inventory. Bill pays the bank $900 per week for his loan. The $900 bank payment
A) is a long-run implicit cost.
B) is a fixed cost.
C) is a short-run implicit cost.
D) is a variable cost.

9. Sally quit her job as an auto mechanic earning $50,000 per year to start her own business. To save money she operates her business out of a small building she owns which, until she started her own business, she had rented out for $10,000 per year. She also invested her $20,000 savings (which earned a market interest rate of 5% per year) in her business. You are given the following information about the first year of her operations.

<table>
<thead>
<tr>
<th>Total revenue</th>
<th>$120,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of labor</td>
<td>40,000</td>
</tr>
<tr>
<td>Cost of materials</td>
<td>15,000</td>
</tr>
<tr>
<td>Equipment rental</td>
<td>5,000</td>
</tr>
</tbody>
</table>

a. Calculate her economic costs.
b. Calculate her accounting costs.
c. Calculate her implicit costs.
d. Sally tells you that she would really like to move to a location closer to town but she decided against it because "right now I don't pay any rent and it will cost me $10,000 a year to rent near town." Do you agree with her reasoning?

10. The law of diminishing marginal returns states
A) that at some point, adding more of a fixed input to a given amount of variable inputs will cause the marginal product of the variable input to decline.
B) that at some point, adding more of a variable input to a given amount of a fixed input will cause the marginal product of the variable input to decline.
C) that in the presence of a fixed factor, at some point average product of labor starts to fall as more and more variable inputs are added.
D) average total costs of production initially fall and after some point starts to rise at a decreasing rate as output increases.
11. The law of diminishing marginal returns
A) sets in because not all workers are equally productive.
B) applies only in the short run.
C) holds even when there are no fixed factors.
D) ultimately explains why production displays diseconomies of scale.

12. The marginal product of labor is defined as
A) the change in total revenue that results when an additional unit of labor is hired.
B) the additional labor required to produce one more unit of output.
C) the additional labor cost of producing one more unit of output.
D) the change in output that a firm produces as a result of hiring one more worker.

13. Diminishing marginal product of labor occurs when adding another unit of labor
A) decreases output.
B) changes output by an amount smaller than the output added by the previous unit of labor.
C) increases output by an amount larger than the output added by the previous unit of labor.
D) decreases output by an amount smaller than the output added by the previous unit of labor.

14. Increases in the marginal product of labor result from
A) the use of new technology.
B) hiring more efficient workers.
C) the division of labor and specialization.
D) increasing the usage of all inputs.

15. As a firm hires more labor in the short run, the
A) level of total product stays constant.
B) output per worker rises.
C) extra output of another worker may rise at first, but eventually must fall.
D) costs of production are increasing at a fixed rate per unit of output.

16. If another worker adds 9 units of output to a group of workers who had an average product of 7 units, then the average product of labor
A) will remain the same.
B) will increase.
C) will decrease.
D) and what will happen to it cannot be determined.
17. **Table 11-1**

<table>
<thead>
<tr>
<th>Number of Workers</th>
<th>Apples per Day (bushels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>120</td>
</tr>
<tr>
<td>3</td>
<td>180</td>
</tr>
<tr>
<td>4</td>
<td>230</td>
</tr>
<tr>
<td>5</td>
<td>270</td>
</tr>
<tr>
<td>6</td>
<td>300</td>
</tr>
</tbody>
</table>

Table 11-1 summarizes production at the Crunchy Apple Orchard for the month of April 2005.

17. **Refer to Table 11-1.** What is the marginal product of the 4th worker?
   A) 230 bushels  
   B) 57.4 bushels  
   C) 50 bushels  
   D) 12.4 bushels

18. **Refer to Table 11-1.** What is the average product of labor when the orchard employs 5 workers?
   A) 270 bushels  
   B) 54 bushels  
   C) 40 bushels  
   D) 8 bushels

19. Marginal cost is equal to the
   A) change in total cost divided by the change in output.  
   B) change in average total costs divided by the change in output.  
   C) change in total product divided by the change in output.  
   D) change in average product divided by the change in output.

20. In the short run, if marginal product is at its maximum, then
   A) average cost is at its minimum.  
   B) average variable cost is at its minimum.  
   C) marginal cost is at its minimum.  
   D) total cost is at its maximum.

21. Which of the following explains why the marginal cost curve has a U shape?
   A) Initially, the marginal product of labor falls, then rises.  
   B) Initially, the average product of labor rises, then falls.  
   C) Initially, the marginal product of labor rises, then falls.  
   D) Initially, the average cost of production rises, then falls.
22. When a firm produces 50,000 units of output, its total cost equals $6.5 million. When it increases its production to 70,000 units of output, its total cost increases to $9.4 million. Within this range, the marginal cost of an additional unit of output is
   A) $41.43.
   B) $134.29.
   C) $135.
   D) $145.

23. If the 15th unit of output has a marginal cost of $29.50 and the average cost of producing 14 units of output is $30.23, what will happen to the average cost of production if the 15th unit is produced?
   A) Average cost increases as more is produced.
   B) Average cost will fall.
   C) Average cost could increase or decrease depending on what happens to variable cost.
   D) Average cost could increase or decrease depending on what happens to fixed cost.

24. When the marginal product of labor rises, ceteris paribus,
   A) the marginal cost of production will exceed the average total cost.
   B) the marginal cost of production also rises.
   C) the marginal cost of production falls.
   D) the average total cost of production also rises.

25. If fixed costs do not change, then marginal cost
   A) also remains constant.
   B) equals the change in variable cost divided by the change in output.
   C) equals the change in average variable cost divided by the change in output.
   D) equals the change in average fixed cost divided by the change in output.

26. Which of the following costs will not change as output changes?
   A) marginal cost
   B) total variable cost
   C) average variable cost
   D) total fixed cost

27. Which of the following equations is correct?
   A) $AVC - ATC = AFC$
   B) $AVC + ATC = AFC$
   C) $AFC + AVC = ATC$
   D) $ATC + AVC = AFC$
28. When the average total cost is $16 and the total cost is $800, then the number of units the firm is producing is
A) impossible to determined with the information given.
B) 12,800.
C) 784.
D) 50.

29. If the total cost of producing 20 units of output is $1,000 and the average variable cost is $35, what is the firm's average fixed cost at that level of output?
A) $65
B) $50
C) $15
D) It is impossible to determine without additional information.

30. If a firm produces 20 units of output and incurs a total cost of $1,000 and a variable cost is $700, calculate the firm's average fixed cost of production if it expands output to 25 units.
A) $300
B) $15
C) $12
D) It is impossible to determine without additional information.

31. If the marginal cost curve is below the average variable cost curve, then
A) average variable cost is increasing.
B) average variable cost is decreasing.
C) marginal cost must be decreasing.
D) average variable cost could either be increasing or decreasing.

32. Long-run cost curves are U-shaped because
A) of the law of demand.
B) of the law of diminishing returns.
C) of economies and diseconomies of scale.
D) of the law of supply.

33. If production displays economies of scale, the long-run average cost curve is
A) above the short-run average total cost curve.
B) downward-sloping.
C) upward sloping.
D) below the long-run marginal cost curve.
34. Over the past twenty years, the number of small family farms has fallen significantly and in their place there are fewer, but larger, farms owned by corporations. Which of the following best explains this trend?
A) diseconomies of scale in farming
B) economies of scale in farming
C) diminishing returns to labor in farming
D) declining productivity

35. The president of Toyota's Georgetown plant was quoted as saying, "Demand for high volumes saps your energy. Over a period of time, it eroded our focus [and] thinned out the expertise and knowledge we painstakingly built up over the years." This quote suggests that
A) Toyota was experiencing an excess demand for its automobiles which it had difficulty keeping up with.
B) as Toyota expanded its capacity, it experienced diseconomies of scale.
C) Toyota was focused on "churning" out cars for which it did not invest sufficiently in training its workers.
D) high demand for Toyota's cars prevented the company from focusing on its strength: auto design.
36. **Refer to the figure.** Identify the curves in the diagram.
A) $E = \text{average fixed cost curve}$; $F = \text{variable cost curve}$; $G = \text{total cost curve}$, $H = \text{marginal cost curve}$
B) $E = \text{marginal cost curve}$; $F = \text{total cost curve}$; $G = \text{variable cost curve}$, $H = \text{average fixed cost curve}$
C) $E = \text{average fixed cost curve}$; $F = \text{average total cost curve}$; $G = \text{average variable cost curve}$, $H = \text{marginal cost curve}$
D) $E = \text{marginal cost curve}$; $F = \text{average total cost curve}$; $G = \text{average variable cost curve}$; $H = \text{average fixed cost curve}$.

37. **Refer to the figure.** The vertical difference between curves $F$ and $G$ measures
A) average fixed costs.
B) marginal costs.
C) fixed costs.
D) sunk costs.

38. **Refer to the figure.** Curve $G$ approaches curve $F$ because
A) marginal cost is above average variable costs.
B) average fixed cost falls as output rises.
C) fixed cost falls as capacity rises.
D) total cost falls as more and more is produced.
<table>
<thead>
<tr>
<th>Quantity of workers</th>
<th>Quantity of foot massages per day</th>
<th>Fixed cost</th>
<th>Variable cost</th>
<th>Total cost</th>
<th>Average total cost</th>
<th>Marginal cost</th>
</tr>
</thead>
<tbody>
<tr>
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<td>70</td>
<td></td>
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</tr>
</tbody>
</table>

39. **Refer to the Table.** Alicia Gregory owns a foot massage business. She leases 4 computer-controlled massage booths, for which she pays $125 per day. She cannot increase the number of machines she leases without giving the manufacturer 3 months notice. She can hire as many workers as she wants at a cost of $75 per day per worker. These are the only two inputs she uses in her business. Use this information to fill in the columns in the above table.
Key
9. See below  22. D  35. B
13. D  26. D

9.a. $121,000 = 40,000 (labor) + 15,000 (materials) + 5,000 (equipment) + 10,000 (opportunity cost of building) + 1,000 (5% of 20,000, the opportunity cost of her savings) + 50,000 (opportunity cost of Sally's labor)
9.b. $60,000 = 40,000 (labor) + 15,000 (materials) + 5,000 (equipment)
9.c. $61,000 = 10,000 (opportunity cost of building) + 1,000 (5% of 20,000, the opportunity cost of her savings) + 50,000 (opportunity cost of Sally's labor)
9.d. No. Although she does not incur a monetary cost for her garage space now, it is an opportunity cost and part of the economic cost of doing business. Sally could just as well rent her space out now, collect the rent and move closer to town.

39.

<table>
<thead>
<tr>
<th>Quantity of workers</th>
<th>Quantity of foot massages per day</th>
<th>Fixed cost</th>
<th>Variable cost</th>
<th>Total cost</th>
<th>Average total cost</th>
<th>Marginal cost</th>
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