Author: Akarsh Malavalli
Date: 11/25/26

I. Multiple Choice

1. In the short run, which of the following inputs is most likely to be fixed?
   A. Labor
   B. Raw materials
   C. Factory size
   D. Electricity

2. The law of diminishing marginal returns occurs because:
   A. Fixed costs increase with output
   B. Some inputs are fixed in the short run
   C. Labor always becomes less efficient over time
   D. Average product increases faster than total product

3. When the marginal product is negative:
   A. Total product is still rising
   B. Total product is constant
   C. Total product is falling
   D. Average product is rising

4. If total product increases from 100 to 130 units when labor increases from 5 to 6 workers, the marginal product of the 6th worker is:
   A. 5
   B. 10
   C. 20
   D. 30

5. The marginal product curve intersects the average product curve:
   A. At its minimum point
   B. When total product is zero
   C. At its maximum point
   D. When total product peaks

6. When a firm experiences diminishing marginal returns, the marginal cost of output:
   A. Rises
   B. Falls
   C. Remains constant
   D. Equals average total cost

7. Which of the following best describes Stage II of production?
   A. Total product falls

B. Marginal product is negative
C. Total product increases at a decreasing rate
D. Marginal product increases

8. If the marginal product of labor rises while all other inputs are fixed, then:
A. Marginal cost will rise
B. Average total cost will rise
C. Marginal cost will fall
D. Average variable cost will fall

9. Which of the following statements about the short run is true?
A. All resources are fixed
B. Firms cannot make economic profits
C. At least one resource is fixed
D. Firms can freely enter or exit the industry

10. The law of diminishing returns explains:
A. The upward slope of the long-run average cost curve
B. The shape of the marginal cost curve in the short run
C. Why the ATC curve is flat
D. Why firms expand in the long run

11. Which cost always decreases as output increases?
A. AVC
B. ATC
C. MC
D. AFC

12. The difference between ATC and AVC is equal to:
A. Marginal cost
B. Average fixed cost
C. Variable cost
D. Total cost

13. If marginal cost is below average total cost, then:
A. ATC is increasing
B. ATC is decreasing
C. ATC is at its minimum
D. ATC equals AVC

14. The marginal cost curve intersects:
A. The ATC and AVC curves at their highest points
B. The ATC and AVC curves at their minimum points
C. Only the ATC curve at its minimum point

D. Only the AVC curve at its minimum point

15. When total product increases at a decreasing rate, marginal cost will:
    A. Rise
    B. Fall
    C. Stay constant
    D. Equal average fixed cost

16. Fixed cost is represented by:
    A. The vertical intercept of the total cost curve
    B. The slope of the total variable cost curve
    C. The slope of the marginal cost curve
    D. The difference between TR and TC

17. If AVC = $10, AFC = $2, and output = 50, then total cost equals:
    A. $600
    B. $500
    C. $550
    D. $700

18. When output doubles and total cost also doubles, the firm is experiencing:
    A. Economies of scale
    B. Constant returns to scale
    C. Diseconomies of scale
    D. Diminishing marginal returns

19. In the long run, fixed costs:
    A. Stay constant
    B. Become variable
    C. Disappear entirely
    D. Equal marginal cost

20. The minimum efficient scale (MES) is the:
    A. Output level where average total cost is minimized
    B. Quantity where marginal cost equals zero
    C. Point where AVC = ATC
    D. Point of diminishing returns

21. Which of the following causes economies of scale?
    A. Duplication of management
    B. Poor communication
    C. Bulk purchasing and specialization
    D. Limited capital equipment

22. A firm experiences diseconomies of scale when:
    A. ATC rises as output expands
    B. MC decreases as output expands
    C. Fixed costs decrease
    D. Workers specialize

23. Constant returns to scale occur when:
    A. Average cost falls as output rises
    B. Average cost rises as output rises
    C. Average cost remains the same as output changes
    D. Marginal cost equals zero

24. The long-run average cost curve is called an “envelope curve” because:
    A. It surrounds the short-run cost curves
    B. It is independent of them
    C. It represents diminishing returns
    D. It only applies to monopolies

25. The shape of the long-run average cost curve is primarily due to:
    A. Changes in fixed cost
    B. The law of diminishing returns
    C. Economies and diseconomies of scale
    D. Changes in total product

26. A perfectly competitive firm is a price taker because:
    A. It controls supply
    B. Its product is unique
    C. Its individual output is small compared to the whole market
    D. It sets price to maximize profit

27. The demand curve for a perfectly competitive firm is:
    A. Downward sloping
    B. Vertical
    C. Upward sloping
    D. Perfectly horizontal

28. If P > ATC, the firm:
    A. Is earning an economic profit
    B. Is breaking even
    C. Should shut down
    D. Is incurring a loss

29. If P = ATC, the firm’s profit is:
    A. Positive

B. Zero
C. Negative
D. Maximized

30. If P < AVC, the firm should:
A. Continue producing
B. Increase output
C. Shut down immediately
D. Raise its price

31. The firm's short-run supply curve is:
A. The portion of the MC curve above the AVC curve
B. The portion of the MC curve below the AVC curve
C. The entire MC curve
D. The AVC curve itself

32. At the profit-maximizing output:
A. MR > MC
B. MR = MC
C. MR < MC
D. MR = ATC

33. If market demand increases in a perfectly competitive industry in the short run, firms will:
A. Reduce production
B. Earn economic profits
C. Shut down
D. Produce at a loss

34. The main reason economic profits disappear in the long run under perfect competition is:
A. Entry and exit of firms
B. Changes in fixed cost
C. Rising marginal cost
D. Falling demand

35. In long-run equilibrium for a perfectly competitive firm:
A. P = MR > MC
B. P = MC < ATC
C. P = MR = MC = min ATC
D. P = MR = MC > ATC

36. Productive efficiency occurs when:
A. P = MC
B. P = min ATC
C. MR = MC

D. P > ATC

37. Allocative efficiency occurs when:
    A. P = MC
    B. P = min ATC
    C. P = MR
    D. P = AVC

38. In the long run, perfectly competitive firms earn:
    A. Positive economic profit
    B. Negative economic profit
    C. Zero economic profit
    D. Increasing returns

39. Which of the following would shift a firm's cost curves upward?
    A. Decrease in input prices
    B. Increase in wages or rent
    C. Improvement in technology
    D. Economies of scale

40. In the long-run equilibrium of a perfectly competitive market, which statement is true?
    A. Firms produce at the lowest possible cost and price equals marginal cost
    B. Firms earn economic profit
    C. Firms produce less than the efficient level
    D. There is deadweight loss

II. True / False

1. In the short run, at least one input is fixed.

2. The long run is a time period when all inputs can be changed.

3. The law of diminishing marginal returns occurs because some inputs are fixed in the short run.

4. When marginal product (MP) is rising, total product (TP) must also be rising.

5. When MP is negative, total product is still increasing.

6. The average product (AP) curve reaches its highest point where it intersects the marginal product curve.

7. Stage II of production is known as the rational stage because output is still increasing but at a decreasing rate.

8. The law of diminishing returns applies only in the long run.
9. Fixed costs change with output.
10. Variable costs increase as output increases.
11. Average fixed cost (AFC) always falls as output rises.
12. Average total cost (ATC) equals average fixed cost plus average variable cost.
13. The marginal cost (MC) curve cuts both the AVC and ATC curves at their minimum points.
14. When marginal cost is below average total cost, average total cost is rising.
15. As marginal product increases, marginal cost decreases.
16. In the long run, all costs are variable.
17. Economies of scale occur when average total cost falls as output increases.
18. Diseconomies of scale occur when average total cost rises as output expands.
19. Constant returns to scale mean that doubling inputs doubles output and keeps cost per unit the same.
20. Minimum efficient scale (MES) is the smallest level of output where long-run average total cost is minimized.
21. A perfectly competitive firm is a price maker because it controls a small share of the market.
22. The demand curve facing a perfectly competitive firm is perfectly elastic.
23. Under perfect competition, price equals marginal revenue and average revenue.
24. A firm maximizes profit where marginal revenue equals marginal cost (MR = MC).
25. If price is below average variable cost, the firm should shut down in the short run.
26. In the short run, a perfectly competitive firm can make an economic profit, a loss, or break even.
27. In the long run, firms in a perfectly competitive market earn zero economic profit.
28. Perfect competition achieves both productive and allocative efficiency in the long run.

29. Productive efficiency occurs where P = min ATC.

30. Allocative efficiency occurs where P = MC.

III. Fill in the Blank

1. In the short run, at least one _____ input (such as capital) is fixed.

2. The total amount of output produced is called the firm's _____.

3. The extra output from adding one more unit of labor is the _____.

4. The law of _____ marginal returns states that additional variable inputs eventually reduce extra output.

5. When marginal product is below average product, the average product will _____.

6. Costs that do not vary with output are called _____ costs.

7. Costs that rise as output rises are called _____ costs.

8. Average total cost (ATC) equals _____ + _____.

9. The cost of producing one additional unit of output is the _____ cost.

10. The marginal cost curve intersects both AVC and ATC at their _____ points.

11. In the long run, all inputs are _____.

12. When LRATC decreases as output increases, the firm experiences _____ of scale.

13. When LRATC increases as output increases, the firm experiences _____ of scale.

14. The smallest level of output where LRATC is at its minimum is called the _____ _____ _____.

15. The LRATC curve is known as an _____ curve because it touches many SRATC curves.

16. A perfectly competitive firm is a price _____ because it cannot influence market price.

17. The demand curve facing a perfectly competitive firm is perfectly _____.

18. In perfect competition, _____ = _____ = _____.

19. A firm maximizes profit where marginal revenue equals _____.

20. If the market price falls below average variable cost, the firm will _____ in the short run.

21. Economic profit in a competitive industry causes firms to _____ the market.

22. Economic losses cause firms to _____ the market.

23. In long-run equilibrium, P = MR = MC = _____.

24. At long-run equilibrium, each firm earns _____ economic profit.

25. Entry and exit of firms ensure that the market reaches both _____ and _____ efficiency.

26. Total Revenue (TR) = _____ × _____.

27. Total Cost (TC) = _____ + _____.

28. Profit (π) = _____ − _____.

29. Marginal Cost (MC) = _____ TC ÷ _____ Q.

30. Average Total Cost (ATC) = _____ ÷ _____.

IV. Matching

1. Match the following terms to their corresponding definitions.

Term	Definition
1. Fixed Cost (FC)	A. Sum of fixed and variable costs
2. Variable Cost (VC)	B. Cost that does not change as output changes
3. Total Cost (TC)	C. Cost per unit of output; equal to TC ÷ Q
4. Average Total Cost (ATC)	D. Cost that changes as output changes
5. Marginal Cost (MC)	E. Cost of producing one additional unit

2. Match the following terms to their corresponding definitions.

Term	Definition

1. Total Product (TP)	A. The total quantity of output produced
2. Marginal Product (MP)	B. Output produced per unit of labor
3. Average Product (AP)	C. When adding more workers lowers the extra output each adds
4. Diminishing Marginal Returns	D. Output rises at a decreasing rate; rational stage of production
5. Stage II of Production	E. Change in output from one more unit of labor

3. Match the following terms to their corresponding definitions.

Term	Definition
1. Marginal Cost Curve	A. Intersects AVC and ATC at their minimum points
2. Average Variable Cost Curve	B. U-shaped due to the spreading of fixed and variable costs
3. Average Total Cost Curve	C. Reflects economies and diseconomies of scale
4. Long-Run Average Total Cost (LRATC)	D. Inversely related to the MC curve in the short run
5. Marginal Product Curve	E. Falls, then rises, because of the law of diminishing returns

V. Short Answer

1. A firm hires labor to produce a good while holding all other inputs constant.

(a) Explain what the law of diminishing marginal returns states.
(b) Using the concept of total product, marginal product, and average product, describe what happens to output as more labor is added.
(c) On a correctly labeled graph of marginal product (MP), show the point where diminishing marginal returns begin.
(d) Explain the relationship between the marginal product curve and the marginal cost curve.

2. A small bakery experiences the following costs at different output levels:

Output	Total Cost
0	$200

1	$260
2	$300
3	$360
4	$460

(a) Calculate the fixed cost, variable cost, and marginal cost of producing the 3rd unit.
(b) Explain the relationship between marginal cost and total cost.
(c) On a correctly labeled graph, draw and label MC, AVC, ATC, and AFC curves.
(d) Identify the output range where diminishing returns set in and explain why.

3. A firm is analyzing its long-run costs.

(a) Define economies of scale.
(b) Explain one reason a firm might experience economies of scale.
(c) Define diseconomies of scale.
(d) On a correctly labeled long-run average total cost curve (LRATC), show the regions of economies of scale, constant returns to scale, and diseconomies of scale.
(e) Identify the minimum efficient scale (MES) on your graph.

4. A perfectly competitive industry is initially in long-run equilibrium.

(a) Draw side-by-side graphs for the market and a representative firm in long-run equilibrium.
(b) Label the equilibrium price and quantity in both graphs.
(c) Suppose demand increases in the market. Show the short-run effects on both graphs.
(d) Explain what happens to profits for the individual firm in the short run.
(e) Describe the long-run adjustment process back to equilibrium.

5. A perfectly competitive firm faces a market price of $10. Its cost information is shown below:

Output	**ATC**	**AVC**
1	$15	$10
2	$12	$8
3	$10	$7
4	$9	$7
5	$10	$8

(a) At what output level does the firm maximize profit or minimize loss? Explain using MR and MC.
(b) Calculate the firm's total revenue and total cost at that output level.

(c) Is the firm earning profit, breaking even, or incurring a loss? Calculate the amount.
(d) Explain what will happen in the long run to this firm and to the market.

6. Suppose a perfectly competitive firm produces 100 units of output at a market price of $5. The firm's average variable cost is $6, and its average total cost is $8.

(a) Calculate the firm's total revenue, total variable cost, and total cost.
(b) Should the firm shut down in the short run? Explain using price and AVC.
(c) Describe what happens to the firm's losses if it shuts down versus continues operating.
(d) Explain how this situation affects long-run market supply.

7. Consider the relationships between marginal cost, average total cost, and average variable cost.

(a) Explain why the MC curve is U-shaped.
(b) Describe what happens to ATC and AVC when MC is below them.
(c) On a correctly labeled cost graph, show MC, ATC, and AVC.
(d) Identify the points of productive efficiency on the graph and explain why that point represents the lowest cost.

8. The perfectly competitive market for wheat is in short-run equilibrium where firms are earning positive economic profits.

(a) Using side-by-side graphs for the market and a representative firm, show the short-run situation.
(b) Explain what happens to the market supply as new firms enter.
(c) Describe the impact of entry on market price and individual firm output.
(d) Show and explain the long-run equilibrium condition.

9. A perfectly competitive industry reaches long-run equilibrium.

(a) Define allocative efficiency.
(b) Define productive efficiency.
(c) On a correctly labeled graph, show the long-run equilibrium where both conditions are met.
(d) Explain why a monopoly does not typically achieve both efficiencies.

10. Two firms produce identical products. Firm A operates at the minimum efficient scale (MES), while Firm B operates at an output level smaller than MES.

(a) Compare the average total costs of Firm A and Firm B.
(b) Explain how economies of scale affect the cost advantage of Firm A.
(c) If the market becomes perfectly competitive, predict which firm will survive in the long run and why.
(d) Describe how entry and exit will affect market price over time.