CHAPTER 3

Production and Cost

Exercise Questions

Question 1. Explain the concept of a production function.
Answer: The relationship between physical input and physical output of a firm is generally referred to as production function.
The general form of production
function is, q = f (x1 : x2)
where, q = output, x1 = 1 input like labour, x2 = another input like machinery

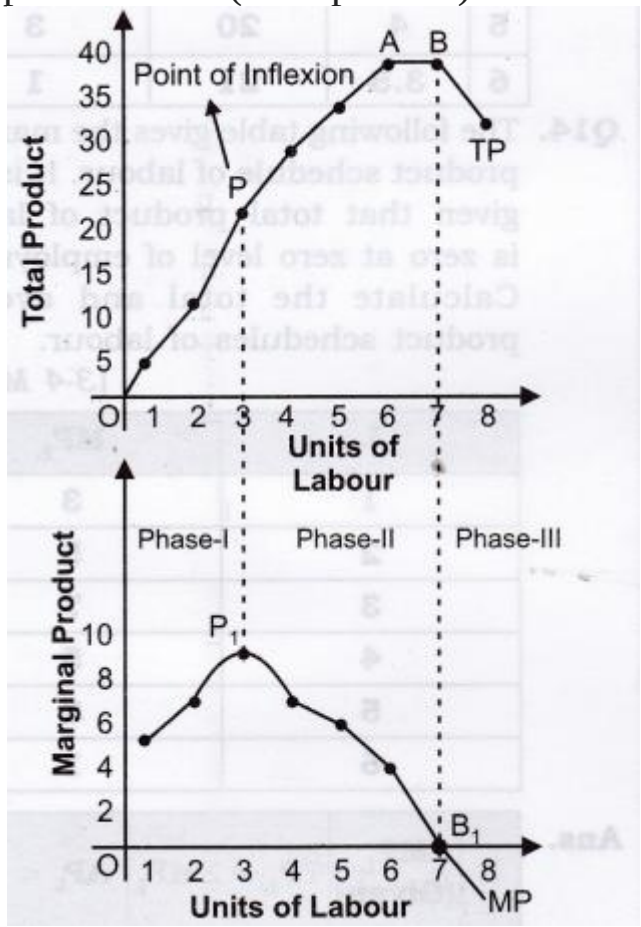
Question 2. What is the total product of an input?
Answer: Total product of an input refers to total volume of goods and services produced by a firm with the given inputs during a specified period of time.

Question 3. What is the average product of an input?
Answer: Average Product of an input is per unit product of variable factors. It is calculated by dividing the total Product by the units of variable factor.
Average Product =Total Product Unit of Variable Factor

Question 4. 'What is the marginal product of an input?
Answer: Marginal Product of an input is an addition to the total product when an additional unit of a variable factor is employed.
MP=Change in output Change in input = ΔqΔL

Question 5. Explain the relationship between the marginal products and the total product of an input.
Answer: According to the Law of Variable Proportion when only one input is increased while all other inputs are kept constant, Marginal Product and Total Product behave in the following manner:

1. When Marginal product rises (till Point P1), Total product increases at an increasing rate (convex shape) (till point P).
2. When Marginal product falls and remains positive (Till point B1), total product increases at a diminishing rate (concave shape) (till point A),
3. When Marginal Product is zero (at point B1), Total Product is at its maximum and constant (At point B),
4. When Marginal product becomes negative (after point B1), total product falls (after point B).



Question 6. Explain the concepts of the short run and the long run.

Answer:

1. **Short run:**
   (a) A short run refers to the period of time in which a firm cannot change some of its factors like plant, machinery, building, etc. due to insufficiency of time but can change any variable factor like labour, raw material, etc.

(b) Thus, in short run, there will be some factors of production that are fixed at predetermined levels, e.g., a farmer may have fixed amount of land,

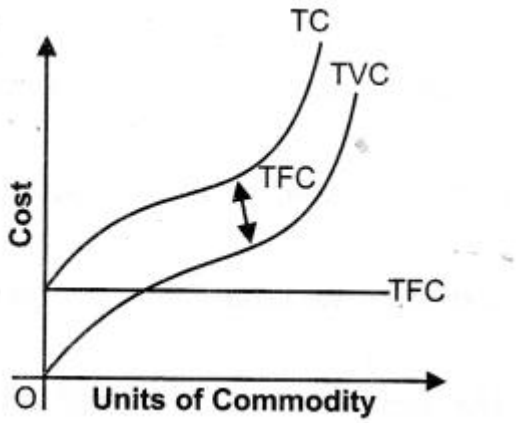
2. **Long run:**
   (a) A long run is a time period during which a firm can change all its factors of production including machines, building, organization, etc.
   (b) In other words, it is a period of time during which supplies can adjust itself to change in demand.
   Note:
   (i) Mind, here the terms long run and short run are functional and do not refer to a calendar month or a year,
   (ii) This distinction depends merely upon how quickly factor inputs can be change by producers in an industry.

Question 7. What is the law of diminishing marginal product?
Answer: The Law of diminishing marginal product states that when we applied more and more units of variable factor to a given quantity of fixed factor, total product increases at a diminishing rate and marginal product falls.

Question 8. What is the law of variable proportions?
Or
Define the law of variable proportion.
Answer: The law of variable proportion states that as we increase the quantity of only one input, keeping other inputs fixed, the total product increases at an increasing rate in the beginning, then increases at decreasing rate and after a level the output ultimately falls.

Question 9. Briefly explain the concept of the cost function
Answer: Cost function shows functional relationship between output and cost of production. It gives the least cost combination of inputs corresponding to different levels of output. Cost function is given as:
C = f(X), ceteris paribus,
where, C = Cost and X = Output

Question 10. What are total fixed cost, total variable cost and total cost of a firm? How are they related?
Or
Draw TVC, TC, and TFC curves in a single diagram.
Answer: (i) TC is divided into two parts TFC and TVC such that TC = TFC + TVC.
(ii) TFC is the overhead cost and it remains constant or fixed whatever be the level of output. TFC curve is a horizontal line parallel to the x-axis.
(iii) TVC is cost due to increased use of variable factors like raw material, labour, etc. TVC is inverse S-shaped starting from the origin due to law of variable proportion.
(iv) TC is aggregate of TFC and TVC. TC curve is inverse S-shaped starting from the level of fixed cost. The reason behind it shape is the law of variable proportion.



Question 11. What are the average fixed cost, average variable cost and average cost of a firm? How are they related?
Answer: AFC: The per unit cost incurred on fixed factors of production is known as average fixed cost.
AFC=TFCQ
AFC always decreases as the firm increases the level of production.
AVC: It is variable cost per unit of output produced.
AC=TCQ It is obtained by dividing the total variable cost by the quantity of output.
AVC initially decreases. But after reaching the stage of minimum cost it starts increasing. AVC is U-Shaped. AC: It is cost per unit of output produced. It can be obtained by dividing the total cost by the quantity

of output produced.
Relationship between AFC, AVC and AC. There is a unique relationship among AC, AFC and AVC. AC is the sum of AFC and AVC, i.e.,
AC = AFC + AVC.

Question 12. Can there be some fixed cost in the long run? If not, why?
Answer: No, there are no fixed costs in the long run as all the factors become variable. Fixed cost exists only in short run.

Question 13. What does the average fixed cost curve look like? Why does it look so?
Answer: The shape of AFC is downward sloping Rectangular hyperbola. AFC
falls as output increases because TFC=TFC Output and TFC remains Output constant. So, as output increases, TFC remains constant, but AFC falls.

Question 14. What do the short run marginal cost, average variable cost and short run average cost curves look like?
Answer: The Short run marginal cost, average variable cost and short run average cost curves are U-shaped because of Law of variable proportion.

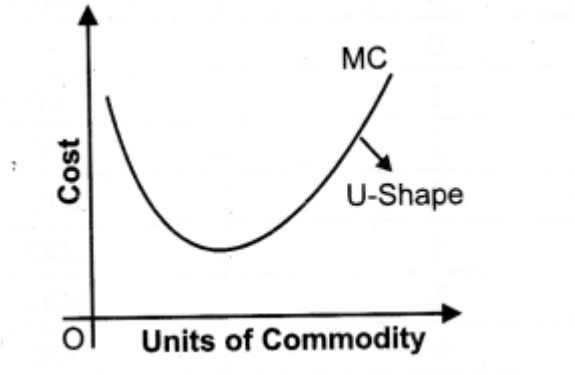
Question 15. Why does SMC curve cut AVC curve at the minimum point of AVC curve?
Answer: (i) It happens because when AVC falls, SMC is less than AVC.
(ii) When AVC starts rising, SMC is more than AVC.
(iii) So, it is only when AVC is constant and at its minimum point, that SMC is equal to AVC. Therefore, SMC curve cuts AVC curve at its minimum point.

Question 16. At which point does the SMC curve cut the SAC curve? Give reason in support of your answer.

Answer: (i) It happens because when SAC falls, SMC is less than SAC.
(ii) When SAC starts rising, SMC is more than SAC.
(iii) So, it is only when SAC is constant and at its minimum point, that SMC is equal to SAC. Therefore, SMC curve cuts SAC curve at its minimum point.

Question 17. Why is the short run marginal cost curve U-Shaped?

Answer: Marginal cost is U-shaped because of Law of variable proportion:



(i) As we know the shape of MC depends on the shape of TVC or TC. Let us suppose TVC.
(ii) Initially, TVC increases at a diminishing rate (Total Product increases at Increasing rate), which makes the gap of TVC, i.e. MC to fall.
(iii) Thereafter, TVC increases at an increasing rate(Total Product increases at diminishing rate) which makes the marginal cost to rise.
(iv) So, from inverse S-shape TVC curve, we derive U-shape MC curve.

Question 18. The following table shows the total cost schedule of a firm. What is the total fixed cost schedule of this firm? Calculate the TVC, AFC, AVC, SAC and SMC schedules of the firm.

Q	TC
0	10
1	30
2	45
3	55
4	70
5	90
6	120

Answer: The total fixed cost will be the same at all the levels of output ranging from zero to six. For zero output, total cost is ? 10. At zero output, total variable cost will be zero. Hence, Rs. 10 represents total fixed cost at all levels of output.

Q	TC (Given)	TFC	AFC = $\frac{TFC}{Output}$	TVC = TC – TFC	AVC = $\frac{TVC}{Output}$	SAC = $\frac{TC}{Output}$	SMC = $\frac{\Delta TC}{\Delta Output}$ OR $\frac{\Delta TVC}{\Delta Output}$
0	10	10	–	0	–	–	–
1	30	10	10	20	20	30	20
2	45	10	5	35	17.5	22.5	15
3	55	10	3.33	45	15	18.33	10
4	70	10	2.5	60	15	17.5	15
5	90	10	2	80	16	18	20
6	120	10	1.67	110	18.33	20	30

2MARKS

Question 1. Give the meaning of production function. Or Define production function.
Answer: The relationship between physical input and physical output of a firm is generally referred to as production function.

Question 2. In which run some factors of production are fixed and others are variable?
Answer: Short run.

Question 3. What change will take place in marginal product when total product increases at a diminishing rate?
Answer: Marginal product will decline but remains positive.

Question 4. In which phase of Law of Variable Proportions a rational firm aims to operate?
Answer: Diminishing returns to a factor (Phase 2).

Question 5. What is meant by diminishing returns to a factor?
Answer: Diminishing returns to a factor refer to a phase when total product increases at a decreasing rate and marginal product falls, but remains positive with the increase in variable factor.

Question 6. What is the general shape of the AP and MP curves?
Answer: AP and MP curves are inversely U-shaped.

Question 7. How does fall in marginal production affect total output?
Answer: Fall in marginal product affects the total output in the following two manners:

1. When marginal product falls, but remains positive, total product increases at a diminishing rate.
2. When marginal product falls and become zero, total product falls in its absolute terms.

Question 8. Why MP curve cuts AP curve at its maximum point?
Answer: It happens because when AP rises, MP is more than AP. When AP falls, MP is less than AP. So, it is only when AP is constant and at its maximum point that MP is equal to AP. Therefore, MP curve cuts AP curve at its maximum point.

Question 9. Can AP rise when MP starts declining?
Answer: Yes, AP can rise when MP starts declining. It can happen as long as falling MP is more than AP. However, when MP becomes equal to AP, further decline in MP will also reduce AP.

Question 10. What is the shape of AP and MP?
Answer: Inverse U-Shaped.

Question 11. Give meaning of "Return to a Factor".
Answer: Return to a factor states that change in the physical output of a good when only the quantity of one input is increased, while that of other input is kept constant.

Question 12. Give the meaning of cost. Or
What is meant by cost in economics?
Or
What does 'cost' mean in economics?
Answer: Cost of producing a good, in economics, is the sum total of explicit cost, implicit cost and certain minimum profit (normal profit).

Question 13. Give two examples of fixed cost.
Answer: (i) Rent of the building.
(ii) Salary of permanent employees.

Question 14. Give two examples of variable costs.
Answer: (i) Raw materials.
(ii) Labour engaged on production.

Question 15. Why is average total cost greater than average variable cost?
Answer: Because AC is sum total of AFC and AVC.

Question 16. What is meant by total cost?
Answer: During production the expenditure incurred on various factors of production is known as total cost.

Question 17. Why are TC and TVC curves parallel to each other?
Answer: TC and TVC curves are parallel to each other because the vertical gap
between them represents TFC which remains constant at all levels of output.

Question 18. How does the total fixed cost change when output changes?
Answer: Total fixed cost does not change with the change in output.

Question 19. Give the meaning of marginal cost.
Answer: The cost incurred on additional unit of output is known as Marginal cost.

Question 20. How is MC related to TFC?
Answer: MC is independent (not related) of TFC and is affected by change in only TVC.

Question 21. How is TVC derived from MC schedule?
Answer: TVC = SMC

Question 22. What does the area under marginal cost curve show?
Answer: Area under marginal cost curve shows total variable cost.

Question 23. Can AC be less than MC when AC is rising?
Answer: Yes, AC can be less than MC, when AC is rising, as long as MC is more than AC.

Question 24. When AC curve slopes downwards, what will be the position of MC curve?
Answer: MC curve is below AC curve.

Question 25. What happens to AC when MC is equal to AC?
Answer: AC is constant and at its minimum point.

Question 26. Can AC and AVC curves touch each other?
Answer: No, because difference between AC and AVC is AFC and AFC can never be zero.

Question 27. Give two examples of explicit cost.
Answer: The two examples are: (i) Wages to worker by a firm, and (ii) rent to landlord by a firm.

Question 28. Give two examples of implicit cost of a firm.
Answer: The two examples are: (i) imputed cost of the seller's self-owned shop; and (ii) imputed cost of family labour being used free by the seller.

Question 29. What is the behaviour of Total Variable Cost, as output increases?
Answer: TVC first increases at a diminishing rate and then increases at an increasing rate.

Question 30. If it is given that the total variable cost for producing 15 units of output is Rs. 3000 and for 16 units is Rs. 3,500. Find the value of Marginal Cost.
Answer: $MC_n = TVC_n - TVC_{n-1}$
$MC_{16} = TVC_{16} - TVC_{15}$
$= 3500 - 3000 = 500$

5MARKS

Question 1. Differentiate between Short Period and Long Period.

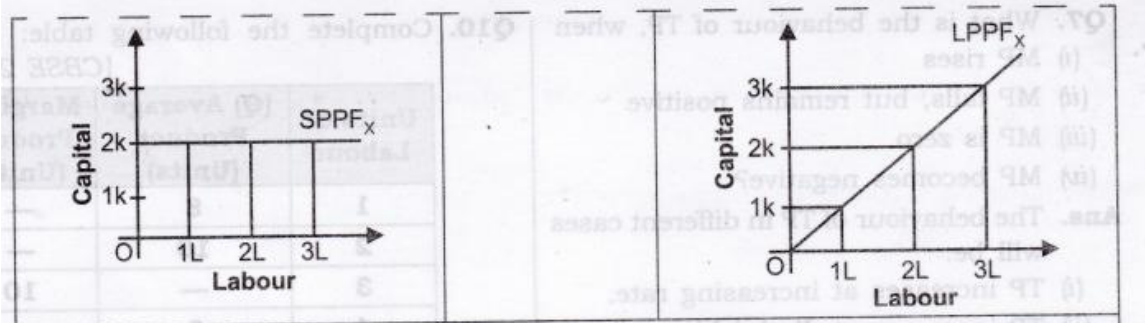
Answer:

Short Period	Basis	Long Period
A short period refers to the period of time in which a firm cannot change some of its factors like plant, machinery, building, etc. due to insufficiency of time but can change any variable factor like labour, raw material, etc.	**Meaning**	A long period, on the other hand, is a time period during which a firm can change all factors of production including machines, building, organization etc.
Output can only be increased by changing the quantity of variable factors.	**Output**	Output can be increased by making changes in the quantity of both fixed as well as the variable factor inputs.
Factors of production here can be grouped in two categories: * Fixed Factors * Variable Factors	**Classification**	In the long period, the distinction between the fixed and the variable factors disappear.
Demand here plays a dominant role in the determination of price of a commodity	**Effects**	In the long period, supply can be adjusted to any change in demand. So, demand and supply play equal role in price determination.

Question 2. Differentiate between Short Period production and Long Period production function.

Answer:

Short Period Production Function (SPPF)	Basis	Long Period Production Function (LPPF)
It is a production function in which factor ratio changes with the level of output.	**Meaning**	It is the production function in which factor ratio remains constant.
Output can only be increased by changing the quantity of variable factors.	**Output**	Output can be increased by making changes in the quantity of both the fixed as well as the variable factor inputs.
Scale of production does not change with the change in the level of output.	**Scale of Production**	Scale of production tends to change with the change in the level of output.

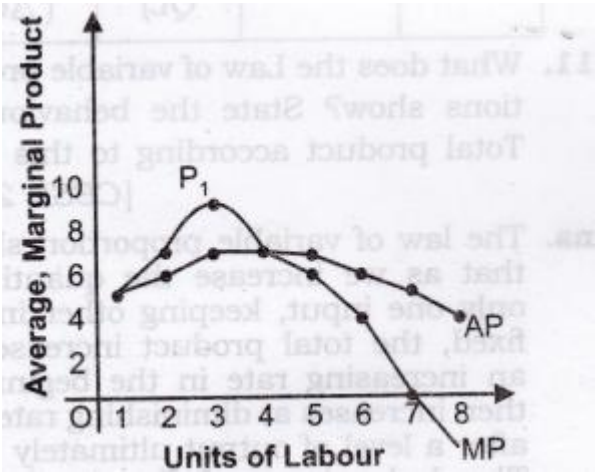


Note: Scale of production means changing both the factors simultaneously. During short period scale of production do not change because only variable factor changes and fixed factor remains constant. But in Long run all the factors change simultaneously. So, scale of production changes in long period.

Question 3. Explain the relationship between Marginal product and Average Product. Or
State the relation between Marginal product and average product. Use diagram.

Answer:

1. Average Product increases as long as Marginal Product (MP) > Average Product (AP). Alternatively, when MP > AP, AP rises.
2. Average Product is maximum and constant when Average Product (AP) = Marginal Product (MP). Alternatively, when AP = MP, AP is maximum.
3. Average Product falls when Marginal Product < Average product.
4. Marginal Product can be zero and negative but Average product is never zero.



Question 4. Explain the relationship between Total Product and Average Product.
Answer:

1. When Total Product increases at an increasing rate, Average Product also increases.
2. When Total Product increases at a diminishing rate, Average Product declines.
3. Since Total Product is always positive, Average Product also remains throughout positive.

Question 5. Explain the relationship between Total Product, Average Product and Marginal Product.
Answer:

1. In the beginning Total Product, Average Product and Marginal Product all increase, but Marginal Product > Average Product and Total Product > Marginal Product.
2. When Marginal Product = 0, Total Product is maximum and constant and Average Product is decreasing.
3. Thereafter, both Average Product and Marginal Product continue to decline, but Marginal Product < Average Product and Total Product declines at an absolute term.
4. Marginal Product can be zero and negative but Average Product and Total Product can never be zero.

Question 6. What is the reaction of AP, when:

1. **MP is more than AP.**
2. **MP is less than AP.**
3. **MP is equal to AP.**

Answer: The reaction of AP in different cases will be:

1. AP will rise.
2. AP will fall but it will remain positive.
3. AP will be constant and at its maximum point.

Question 7. What is the behaviour of TP, when

1. **MP rises**
2. **MP fails, but remains positive**
3. **MP is zero**
4. **MP becomes negative?**

Answer: The behaviour of TP in different cases will be:

1. TP increases at increasing rate.
2. TP increases at diminishing rate,
3. TP is at its maximum and constant.
4. TP decreases.

Question 8 . Complete the following table.

Units of labour	TP	MP_L	AP_L
1	20	–	–
2	–	22	–
3	–	–	22

Answer:

Units of labour	TP	$MP_L = \frac{\Delta TP_L}{\Delta L}$	$AP_L = \frac{TP_L}{L}$
1	20	20	20
2	42	22	21
3	66	24	22

Question 9. Complete the following table.

Units of labour	0	1	2	3	4	5
Total product	–	–	–	–	–	–
Average product	–	–	–	–	–	–
Marginal product	0	10	12	14	14	12

Answer:

Units of labour	0	1	2	3	4	5
Total product = ΣMP_L	0	10	22	36	50	62
Average Product = $\frac{TP_L}{L}$	–	10	11	12	12.5	12.4
Marginal product	0	10	12	14	14	12

Question 10. Complete the following table:

Units of Labour	(Q) Average Product (Units)	Marginal Product (Units)
1	8	—
2	10	—
3	—	10
4	9	—
5	—	4
6	7	—

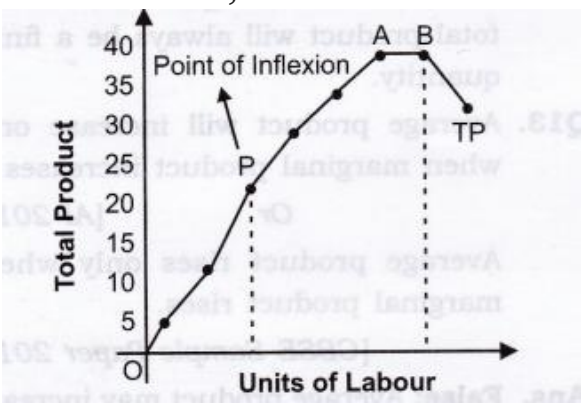
Answer:

Units of Labour (QL)	Average Product (AP) (Units)	Total Product (TP) (Units)	Marginal Product (MP) (Units)
1	8	8 (AP × QL)	$8\left(\frac{\Delta TP_L}{\Delta QL}\right)$
2	10	20 (AP × QL)	$12\left(\frac{\Delta TP_L}{\Delta QL}\right)$
3	$10\left(\frac{TP_L}{QL}\right)$	30 (AP × QL)	10
4	9	36 (AP × QL)	$6\left(\frac{\Delta TP_L}{\Delta QL}\right)$
5	$8\left(\frac{TP_L}{QL}\right)$	40 (ΣMP)	4
6	7	42 (AP × QL)	$2\left(\frac{\Delta TP_L}{\Delta QL}\right)$

Question 11. What does the Law of variable proportions show? State the behaviour of Total product according to this Law.

Answer: The law of variable proportion shows that as we increase the quantity of only one input, keeping other inputs fixed, the total product increases at an increasing rate in the beginning, then increases at diminishing rate and after a level of output ultimately falls. The behaviour of Total product according to this law is as under:

1. TP increases continuously from points O to A.
2. It increases at an increasing rate (convex shape) from O to P and at a diminishing rate (concave shape) from P to A.
3. TP is maximum at A and remains so up to point B.
4. After Point B, Total Product falls.



Question 12. Complete the following table:

Units of Labour	TPP (in ₹)	APP (in ₹)	MPP (in ₹)
1	100	—	—
2	—	—	140
3	—	140	—
4	480	—	—

Answer:

Units of Labour (QL)	TPP (in ₹)	APP (in ₹)	MPP (in ₹)
0	0	—	—
1	100	100 (TPP/QL)	100 (ΔTPP/QL)
2	240 (ΣMPP)	120 (TPP/QL)	140
3	420 (APP×QL)	140	180 (ΔTPP/QL)
4	480	120 (TPP/QL)	60 (ΔTPP/QL)

Question 13. Define total fixed cost (Supplement/ Indirect/overhead cost).

Answer: (i) Fixed costs are those costs of production which do not change with a change in output.
(ii) These are the costs incurred on fixed factors, like rent of land and building, interest, etc. These are unavoidable contractual costs.
(iii) Fixed costs are also called overhead costs or general costs because these are common for all the units produced. These costs are also called supplementary costs or indirect costs.
(iv) The shape of Total fixed Cost is horizontal (Parallel to X-Axis). They have to be incurred when the output is large or small or even zero.

Question 14. What is meant by variable (prime) cost of a firm? Give examples.

Answer: (i) The cost incurred on variable factors of production is known as TVC.
(ii) TVC is very much related with the production and fluctuates with the fluctuation in production.
(iii) In case of zero level of production, TVC would also be zero.

(iv) For example, Wages of casual labour, payment for raw material, etc.

Question 15. Explain the behaviour of average fixed cost using numerical example.

Answer: (i) The per unit cost incurred on fixed factors of production is known as average fixed cost.

Units of commodity	TFC	AFC
0	60	–
1	60	60
2	60	30
3	60	20
4	60	15
5	60	12

AFC falls as output increases because
AFC=TFC Output and TFC remains constant. So, as output increases, TFC remains constant, AFC falls.

Question 16. Distinguish between variable cost and fixed cost. Give two examples of each.

Answer:

Total Variable Costs	Basis	Total Fixed Costs
The cost incurred on variable factors of production is known as TVC.	**Meaning**	Fixed cost are those costs of production that do not change with a change in output.
It can be changed in the short run.	**Changed**	It cannot be changed in the short run.
It is zero when there is no production	**Cost at zero output**	It can never be zero even if there is no production.
It is incurred on variable factors like labour, raw material etc.	**Factors of Production**	It is incurred on fixed factors like land, buildings etc.

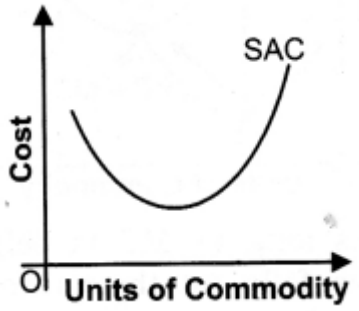
TVC is inversely S-shaped as variable cost initially increases at a diminishing, and then increases at an increasing rate.	**Shape of the curve**	TFC is a straight line parallel to the X-axis as fixed cost remains the same at all levels of output.
Wages of casual labour, payment for raw material, etc.	**Example**	Salary of permanent staff, insurance premium, building rent, etc.

Question 17. Why is AC curve U-shaped in short run? Or Why is AC curve U-shaped?

Answer: Average Cost is U-Shaped because of Law of variable proportion:

(i) The shape of average cost (AC) depends upon total cost (TC).

(ii) Initially, total cost (TC) increases at a diminishing rate (Total Product increases at Increasing rate), which makes its average, i.e., average cost (AC) to fall, then reaches its minimum point.



(iii) Thereafter, total cost (TC) increases at increasing rate (Total Product increases at diminishing rate), which makes the average cost (AC) to rise. This type of production behaviour shows operation of law of variable proportion.

Question 18. An individual is both the owner and the manager of a shop taken on rent. Identify implicit cost and explicit cost from this information. Explain.

Answer: (i) For producing a commodity, a firm requires factor inputs (like services of land, labour, capital etc.) and non-factor inputs (like raw material, electricity, fuel etc.).

(ii) Actual money spent by a firm on buying and hiring of factor and non-factor inputs is called explicit cost. As per question, rent paid for the shop is an explicit cost.

(iii) Implicit cost is the imputed or estimated value of inputs supplied

by the owner of the firm himself. As, per question, imputed salary of the owner working as manager, imputed interest on self-supplied capital, etc. are implicit costs.
cost and implicit cost.

Question 19. State the distinction between explicit each. Give an example of each?

Answer:

Explicit Cost	Basis	Implicit Cost
It refers to the actual money expenditure of a firm on purchasing goods or hiring factor services and non-factor inputs (like raw material, electricity, fuel etc.)	**Meaning**	Implicit cost is the imputed or estimated value of inputs supplied by the owner of the firm himself.
It is explicitly shown in the firm's book of accounts and is thus, called accounting cost.	**Account Book**	It does not enter in the firm's book of accounts.
It is payment concept.	**Concept**	It is a receipt concept, i.e., the payments are received by producer for self-supplied services.
Wages, rent, interest, insurance, etc.	**Examples**	Wages of self-supplied labour, rent for self-owned premises, etc.

Question 20. A producer starts a business by investing his own savings and hiring the labour. Identify implicit and explicit costs from this information. Explain.

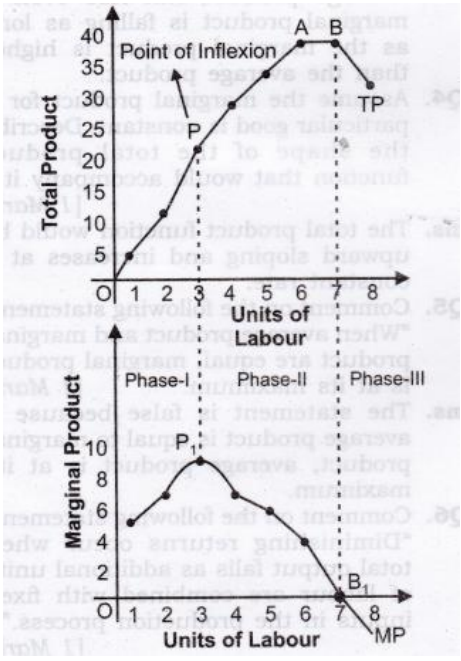
Answer: (i) For producing a commodity, a firm requires factor inputs (like services of land, labour, capital etc.) and non-factor inputs (like raw material, electricity, fuel etc.).
(ii) Actual money spent by a firm on buying and hiring of factor and non-factor inputs is called explicit cost. As per question, a producer is hiring the labour, than the wages and salary paid to labour is a explicit cost.
(iii) Implicit cost is the imputed or estimated value of inputs supplied

by the owner of the firm himself. As, per question, if a producers start a business by investing his own savings, than the imputed interest on self-supplied capital he earned is a implicit cost.

7MARKS

Question 1. State the behaviour of marginal product in the law of variable proportions. Explain the causes of this behaviour.
Answer: The behaviour of Marginal product in the law of variable proportion is as under:

1. When Marginal product rises (till Point P1), Total product increases at an increasing rate (convex shape) (till point P).
2. When Marginal product falls and remains positive (Till point B1), total product increases at a diminishing rate (concave shape) (till point A),
3. When Marginal Product is zero (at point B1), Total Product is at its maximum and constant (At point B).
4. When Marginal product becomes negative (after point B1), total product falls (after point B).



Causes or Reasons of this Behaviour is as Under:

1. **Phase I**
   (a) Proper utilization of the fixed factor
   • In the initial stage of production the units of variable input (i.e., labour) is so less that fixed inputs cannot be effectively utilized.
   • Proper utilization of the fixed factor can be attained when more and more units of variable factor (labour units) are applied to the fixed factor (land), the fixed factor will be used intensively and output will increase rapidly.
   (b) Specialization and division of labour
   • Initially there was only one labour working on all the 5 acres of land ploughing, watering, etc.
   • As the number of labour units increases, each worker specialized in a particular activity leads to specialization of the variable units and this resulted in increased output.
2. **Phase II**
   (a) The non-optimal combination of variable factor with the fixed factor
   • When a given quantity of a fixed factor is combined with more and more units of variable factor, the additional units of variable factor will have smaller and smaller quantity of fixed factor to work with them.
   • As many workers share the same fixed factor, the share of each would obviously fall. Therefore, the cooperation of the fixed factor is not available to the same extent. Thus, an increase in the variable factor would add less and less to total output.
   (b) Imperfect Substitutes
   • Diminishing return to factor occurs because variable factor and fixed factor are imperfect substitutes to each other.
   • Technically speaking, there is a limit to which variable factor can be applied to fixed factor and that limit depends upon the efficiency of fixed factor. So, variable factor and fixed factor are imperfect substitutes to each other.
3. **Phase III**
   (a) Efficiency of Variable Factor Fall

• In this stage the amount of variable factor becomes excessive relative to the fixed factor. This happens when too many LABOUR are engaged in cultivating on a given piece of land.
• Instead of helping each other in production they cause overcrowding and chaos and thus hamper each other's work. In such a case, the contribution of additional labour to production is bound to be negative.
• Thus, the marginal returns become negative and the total returns start diminishing.
(b) Efficiency of Fixed Factor Fall
• Too much of a variable factors may also lead to the inefficiency of the fixed factor as well.
• In case of capital-, which is a fixed factor, too much of labour may cause lot of wear and tear of machinery, frequent breakdowns and excessive cost of maintenance. This is bound to affect total production adversely.
• In such a situation it is advisable to reduce the units of the variable factor than to increase it with a view for getting maximum production.

Multiple Choice Questions

Question 1. The marginal product of a variable input is best described as:
(a) Total product divided by the number of units of variable input.
(b) The additional output resulting from one unit increase in the variable input.
(c) The additional output resulting from one unit increase in both the variable and fixed inputs.
(d) The ratio of the amount of the variable input that is being used to the amount of the fixed input that is being used.
Answer: (b)

Question 2. Diminishing marginal returns implies:
(a) Decreasing average variable costs.
(b) Decreasing marginal costs.
(c) Increasing marginal costs.
(d) Decreasing average fixed costs.
Answer: (c)

Question 3. The short run, as economists use the phrase, is characterized by:
(a) At least one fixed factor of production and firms neither leaving nor entering the industry.
(b) A period where the law of diminishing returns does not hold.
(c) No variable inputs that is all the factors of production are fixed.
(d) All inputs being variable.
Answer: (a)

Question 4. The marginal, average, and total product curves encountered by the firm producing in the short run exhibit all of the following relationships except:
(a) When total product is rising, average and marginal product may be either rising or falling.
(b) When marginal product is negative, total product and average product are falling.
(c) When average product is at its maximum, marginal product equals average product, and total product is rising.
(d) When marginal product is at a maximum, average product equals marginal product, and total product is rising.
Answer: (d)

Question 5. To economists, the main difference between short run and long run is that:
(a) In short run all inputs are fixed, while in long run all inputs are variable.
(b) In short run the firm varies all of its inputs to find the least cost combination of inputs.
(c) In short run, at least one of the firm's input level is fixed.

(d) In long run, the firm is making a constrained decision about how to use existing plant and equipment efficiently.
Answer: (c)

Question 6. Which one of the following statements is the best definition of production function?
(a) The relationship between market price and quantity supplied.
(b) The relationship between the firm's total revenue and the cost of production.
(c) The relationship between the quantities of inputs needed to produce a given level of output.
(d) The relationship between the quantity of inputs and the firm's marginal cost of production.
Answer: (c)

Question 7. Diminishing returns occur:
(a) When units of a variable input are added to a fixed input and total product falls.
(b) When units of a variable input are added to a fixed input and marginal product falls.
(c) When the size of the plant is increased in the long run.
(d) When the quantity of the fixed input, is increased and returns to the variable input falls.
Answer: (b)

Question 8. If the marginal product of labour is below the average product of labour, it must be true that:
(a) The marginal product of labour is negative.
(b) The marginal product of labour is zero.
(c) The average product of labour is falling.
(d) The average product of labour is negative.
Answer: (c)

Question 9. The average product of labour is maximized when marginal product of labour:
(a) Equals the average product of labour.
(b) Equals zero.

(c) Is maximized.
(d) None of these.
Answer: (a)

Question 10. The law of variable proportions is drawn under all of the assumptions mentioned below except the assumption that:
(a) The technology is changing.
(b) There must be some inputs whose quantity is kept fixed.
(c) We consider only physical inputs and not economically profitability in monetary terms.
(d) The technology is given and stable.
Answer: (a)

Question 11. Average product is defined as:
(a) Total product divided by the total cost.
(fa) Total product divided by the marginal product.
(c) Total product divided by the variable input.
(d) Marginal product divided by the variable input.
Answer: (c)

Question 12. The change in the total product resulting from a change in a variable input is:
(a) Average cost (b) Average product
(c) Marginal cost (d) Marginal product
Answer: (d)

Question 13. Marginal product, mathematically, is the slope of the
(a) Total product curve
(b) Average product curve
(c) Marginal product curve
(d) Implicit product curve
Answer: (a)