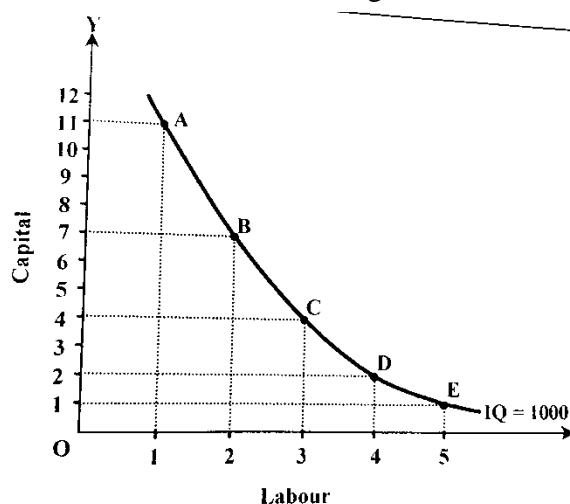


Isoquant

- ✧ Isoquant is defined the locus of different combinations of any two inputs (say labour and capital) which yield same level of output. In other word, it is the curve which represents combinations of any two inputs but constant output. This curve is also known as equal product curve or production indifference curve.
- ✧ ‘Isoquant’ → ‘iso’ (Greek word) means equal ‘quant’ (Latin word) means quantity.
- ✧ The concept of isoquant is based on following **assumptions**:
 - a) Only two inputs i.e. Labour (L) and Capital (K) are employed to product output.
 - b) Two inputs are imperfect substitute.
 - c) L and K can be substituted only up to a certain limit.
 - d) L and K are perfectly divisible and can be substituted in any small quantity. It means production function is continuous.
- ✧ Isoquant can be explained with the help of following table and figure.

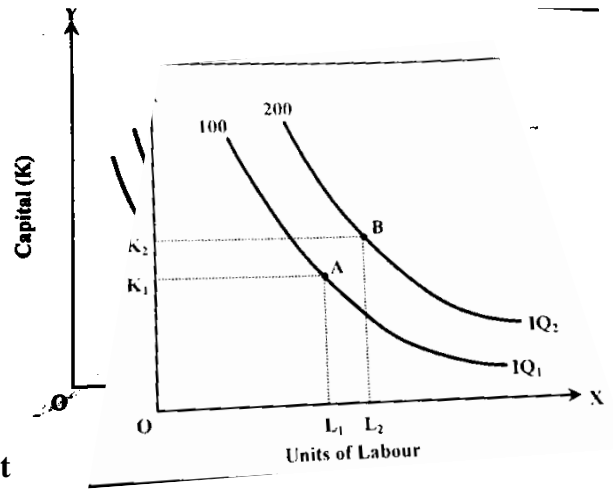
Combinations	Labours	Capital	Output
A	1	11	2,000
B	2	7	2,000
C	3	4	2,000
D	4	2	2,000
E	5	1	2,000

- In the above table, the different combinations of two inputs labour and capital are shown which depicts constant output.
- There are five combinations: A, B, C, D, E. Combination A has a smaller number of labours and a greater number of capita whereas combination E has a greater number of labours and less capital. All these different combinations give constant level of output i.e. 2,000 units. It can be shown in figure as well.
- In figure, X-axis represents number of labour and Y-axis represents capital.
- The points A, B, C, D and E are different combinations of two inputs which yield same level of output 2,000 units.
- Isoquant (IQ) curve is downward slopping and convex to origin which is due to the diminishing marginal rate of technical substitution.



Isoquant Map

- The set of isoquants is called isoquant map.
- A higher isoquant represents higher level of output and lower isoquant represents a lower level of output.
- IQ_1, IQ_2, IQ_3, IQ_4 and IQ_5 in the following figure represents isoquant map. The lowest isoquant represents lowest quantity of output and highest isoquant represents highest quantity of output.



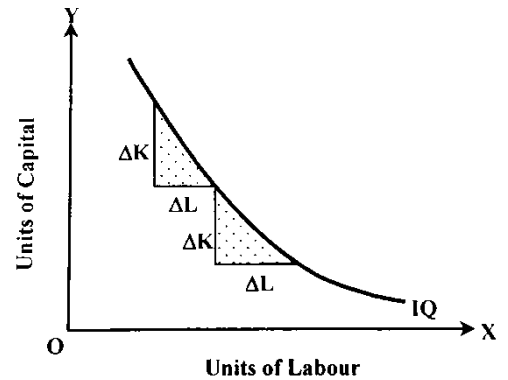
Properties/Features/Characteristics of Isoquant

1. Isoquant has negative slope.

The isoquant is negatively sloped which represents substitutability between two inputs labour and capital. It means to increase one input; another must be reduced and vice-versa.

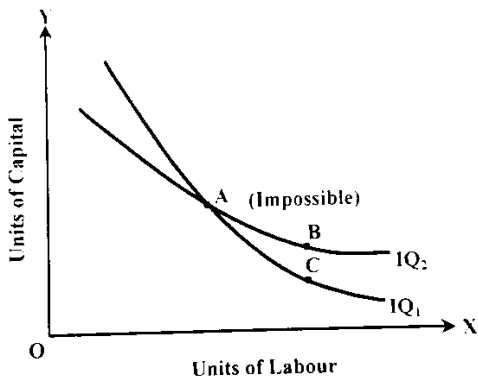
2. Isoquant is convex to the origin.

Isoquant is convex to the origin due to the operation of law of diminishing marginal rate of technical substitution (MRTS).



3. Isoquant never intersect each other.

Isoquant never intersect each other because if they intersect, this represent different level of output which is not possible.



4. Higher the isoquant, higher will be output.

Higher the isoquant represents higher level of output in comparison to lower isoquant. It is possible due to higher units of at least one factor of production in higher isoquant.

Marginal Rate of Technical Substitution (MRTS)

The marginal rate of technical substitution is the rate at which one input can be substituted for another keeping output constant.

In other word, MRTS of labour for capital means the number of units of capital which can be replaced by one unit of labour keeping the output constant.

MRTS is slope of the isoquant which can be written as:

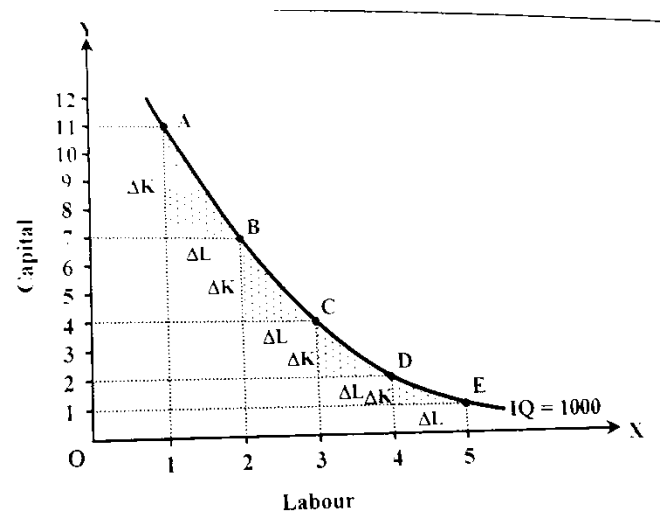
$$\text{MRTS}_{L, K} = -\frac{dK}{dL} = \frac{MP_L}{MP_K}$$

Where,

$\text{MRTS}_{L, K}$ = Marginal rate of technical Substitution of labour for capital

MP_L = Marginal productivity of labour

MP_K = Marginal productivity of capital



Isocost line/Price line

- Isocost line is defined as the locus of various combinations of any two inputs which the producer can get from a certain amount of money at a given prices of the factor inputs.
- In other words, isocost line is the locus of various combinations of any two inputs which a producer can produce by given outlay. Outlay (total cost) is the sum of total expenditure made to purchase to inputs i.e. L and K.

Total Outlay (C) = Total expenditure on labour + Total expenditure on capital

$$C = P_L \cdot L + P_K \cdot K$$

$$C = w \cdot L + r \cdot K \quad \dots(i)$$

Where,

C = Outlay

r = rate of interest (price of capital)

w = Wage rate (Price of labour)

K = Capital

L = Labour

P_L = Price of Labour

P_K = Price of capital

To illustrate isocost line, let's take an example.

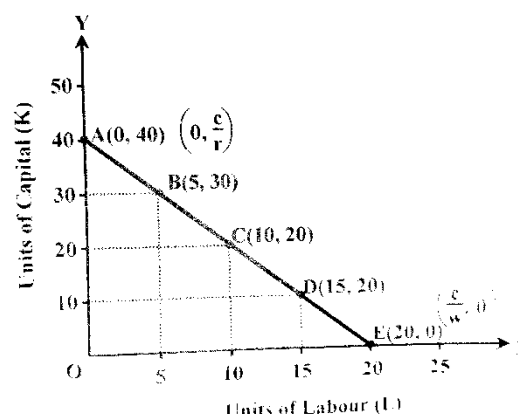
Different combinations of labour and capital

Combinations	Price of Labour (w)	Units of Labour (L)	Price of Capital (r)	Units of capital (K)	Cost Outlay (C = w.L+r.K)
A	Rs.100	0	Rs. 50	40	100×0+50×40=Rs.2000
B	Rs.100	5	Rs. 50	30	Rs.2000
C	Rs.100	10	Rs. 50	20	Rs.2000
D	Rs.100	15	Rs. 50	10	Rs.2000
E	Rs.100	20	Rs. 50	0	Rs.2000

On the basis of above table, the isocost line can be drawn as follows:

In the figure,

- X-axis shows units of labour and Y-axis shows units of capital.
- The downward sloping AE line is isocost line which shows various combinations of any two inputs that can be purchased with given cost outlays and give price of inputs.
- The Combination A shows zero units of labour and 40 units of capital where as point E shows the combinations of 20 units of labour and zero units of capital. Other point B, C, D also represents the different combinations of factor inputs in the given cost.
- By joining the points A, B, C, D, E; AE line is obtained which represents isocost line.
- The slope of isocost line is the ratio between the price of labour and price of capital.



Symbolically,

$$\text{Slope of isocost line} = \left(- \frac{\text{Price of Labour } (P_L)}{\text{Price of Capital } (P_K)} \right) = \left(- \frac{w}{r} \right)$$

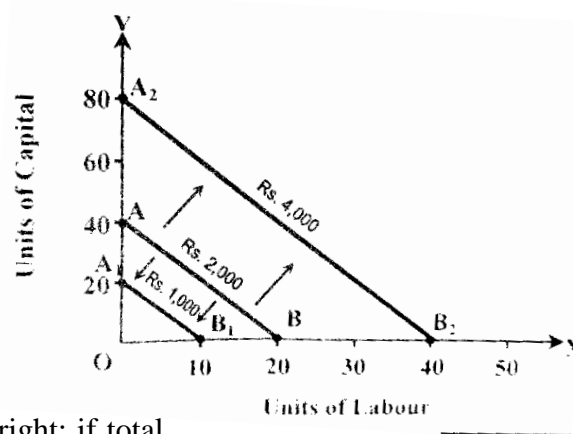
Here, price of labour represents wage rate and price of capital represents rate of interest.

Change in isocost line

Isocost line deviates from its original position when there are changes in total outlay or price of factors of production. Such changes are explained as:

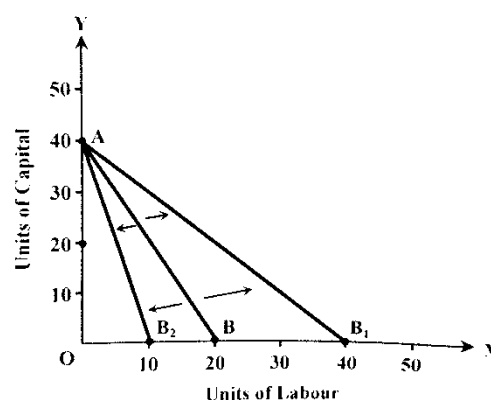
1. Effect of change in total outlay → Shift in isocost line

- If the total outlay of the firm changes, price of labour and capital remaining constant, there will be shift in isocost line.
- If total outlay increases, isocost line shifts towards right; if total outlay decreases, isocost line towards left or inward.



2. Effect of change in price of inputs or factors of production → Swing in isocost line

- The isocost line will swing if factor price changes without changing total outlay.
- If price of labour decreases, the isocost line will swing rightward at constant price of capital and total outlay.
- Similarly, if price of labour increases, the isocost line will swing leftward at constant price of capital and total outlay.
- On the otherhand, if price of capital decreases remaining the price of labour and total outlay constant, the isocost line will swing towards y-axis, or away from the origin and vice versa.



Please solve and understand example 5.5 [Page no. 227]