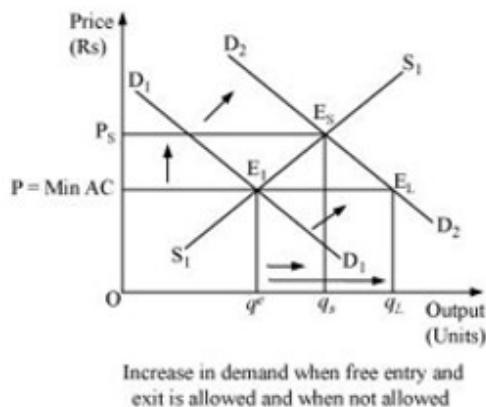


# NCERT Solution

## Chapter-05 (Microeconomics) (Part – II)

### Market Equilibrium

Ans14:



The above figure depicts the cases when the number of firms is fixed (in the short run) and when the number of firms is not fixed (in the long run). 'P = min AC' represents the long run price line,  $D_1D_1$  and  $D_2D_2$  represent the demands in the short run and the long run. The point  $E_1$  represents the initial equilibrium where the demand curve and the supply curve intersect each other. Now, let us suppose that the demand curve shifts under the assumption that the number of firms are fixed; thus, the new equilibrium will be at  $E_s$  (in the short run), where the supply curve  $S_1S_1$  and the new demand curve  $D_2D_2$  intersect each other. The equilibrium price is  $P_s$  and equilibrium quantity is  $q_s$ .

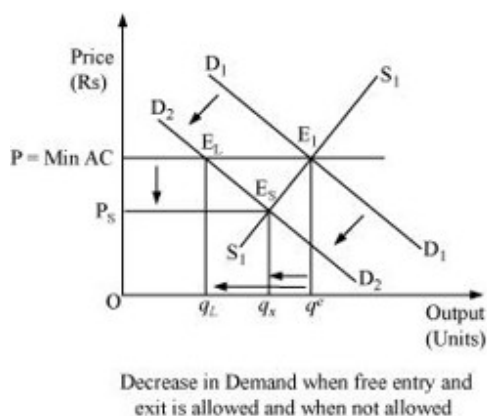
Now let us analyse the situation under the assumption of free entry and exit.

The increase in demand will shift the demand curve rightwards to  $D_2D_2$ . The new equilibrium will be at  $E_2$ . It is the long run equilibrium with equilibrium price (P) = min AC and equilibrium quantity  $q_l$ .

Therefore, on comparing both the cases, we find that when the firms are given the freedom of entry and exit, the equilibrium price remains same and the price is lower than the short run equilibrium price ( $P_s$ ); whereas, the long run equilibrium quantity  $q_L$  is more than that of the short run equilibrium ( $q_s$ ).

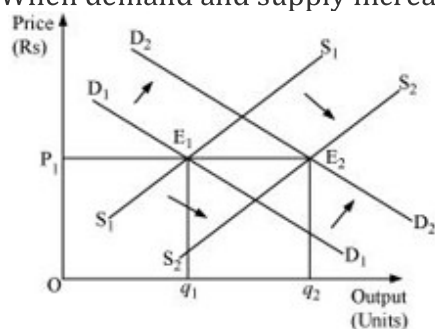
Similarly, for leftward demand shift, it can be noted that the short run equilibrium price ( $P_s$ ) is less than the long run equilibrium price and the short run equilibrium quantity ( $q_s$ ) is less than the long run equilibrium quantity  $q_L$ .

## NCERT Solution



**Ans15:**

**(a)** When demand and supply increase in the same proportion:



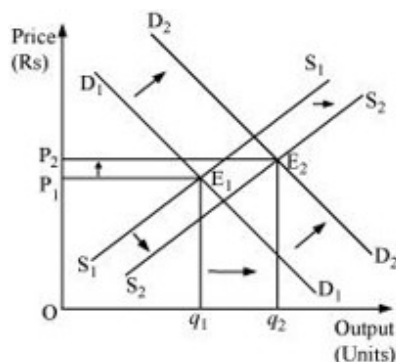
$E_1$  is the initial equilibrium with equilibrium price  $P_1$  and equilibrium output  $q_1$ .

Now, let us suppose that the demand increases to  $D_2D_2$  and the supply increase to  $S_2S_2$  by the same proportion. The new demand and new supply curve intersect at  $E_2$ , which is the new equilibrium, with a new equilibrium output  $q_2$ , but the same equilibrium price  $P_1$ . Thus, an increase in the demand and the supply by the same proportion leaves the equilibrium price unchanged.

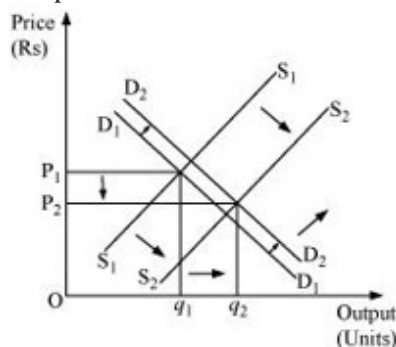
**(b)** When demand increases more than the increase in supply: The original demand and supply curves intersect each other at  $E_1$  with initial equilibrium price  $P_1$  and initial equilibrium output  $q_1$ .

Now, let us suppose that the demand increases and thereby the demand curve shifts to  $D_2D_2$ ; the supply curve also shifts rightwards to  $S_2S_2$ . However, the increase in supply is less than the increase in demand. The new supply curve and the new demand curve intersect each other at point  $E_2$  with higher equilibrium price  $P_2$  and higher equilibrium output  $q_2$ .

## NCERT Solution



- (c) When the increase in demand is less than the increase in supply: Let the initial equilibrium be at  $E_1$  with the equilibrium price  $P_1$  and equilibrium output  $q_1$ . Now, let us suppose that the demand increases to  $D_2D_2$  and the supply increases to  $S_2S_2$ ; where the increase in supply is more than that of demand. The new demand curve  $D_2D_2$  and the new supply curve  $S_2S_2$  intersect at  $E_2$ . Thus, the greater increase in supply curve as compared to the demand curve will lead the equilibrium price to fall and equilibrium output to rise.



Ans16:

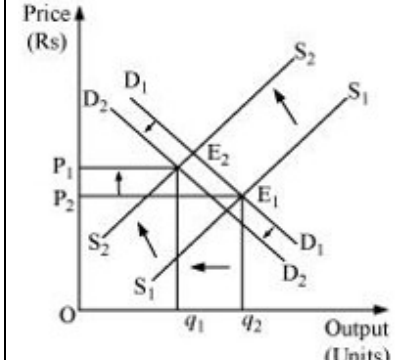
(a) both demand and supply curves shift in the same direction

| Cases                                  | Equilibrium Price | Equilibrium Quantity | Figure |
|----------------------------------------|-------------------|----------------------|--------|
| 1) Increase in Dd = Increase in supply | Unchanged         | Increases            |        |

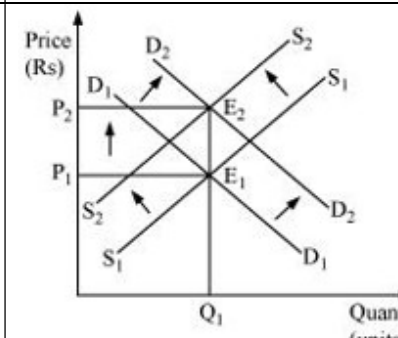
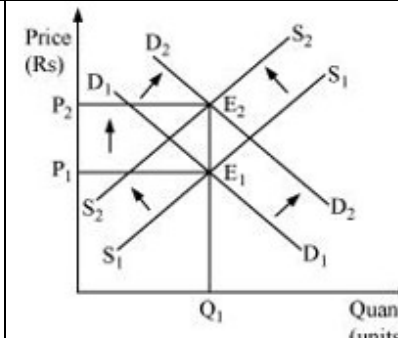
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|                                            |           |           |                                                                                                                                                                                                                        |
|--------------------------------------------|-----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2) Increase in Dd more than increase S     | Increases | Increases | <p>Price (Rs)</p> <p>Output (Units)</p> <p>Equilibrium moves from <math>E_1</math> to <math>E_2</math>, resulting in a higher price (<math>P_2 &gt; P_1</math>) and higher output (<math>q_2 &gt; q_1</math>).</p>     |
| 3) Increase in Dd less than increase in SS | Falls     | Increases | <p>Price (Rs)</p> <p>Output (Units)</p> <p>Equilibrium moves from <math>E_1</math> to <math>E_2</math>, resulting in a lower price (<math>P_2 &lt; P_1</math>) and higher output (<math>q_2 &gt; q_1</math>).</p>      |
| 4) Decrease in Dd = decrease in SS         | Unchanged | Falls     | <p>Price (Rs)</p> <p>Output (Units)</p> <p>Equilibrium moves from <math>E_1</math> to <math>E_2</math> along the same price level (<math>P_2 = P_1</math>), resulting in lower output (<math>q_2 &lt; q_1</math>).</p> |
| 5) Decrease in Dd more than decrease in SS | Falls     | Falls     | <p>Price (Rs)</p> <p>Output (Units)</p> <p>Equilibrium moves from <math>E_1</math> to <math>E_2</math>, resulting in a lower price (<math>P_2 &lt; P_1</math>) and lower output (<math>q_2 &lt; q_1</math>).</p>       |

## NCERT Solution

|                                                  |           |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6) Decrease in $D_d$ less than decrease in $S_S$ | Increases | Falls |  <p>The graph shows a coordinate system with Price (Rs) on the vertical axis and Output (Units) on the horizontal axis. There are two downward-sloping demand curves, <math>D_1</math> and <math>D_2</math>, where <math>D_2</math> is to the left of <math>D_1</math>. There are two upward-sloping supply curves, <math>S_1</math> and <math>S_2</math>, where <math>S_2</math> is to the left of <math>S_1</math>. The initial equilibrium <math>E_1</math> is at the intersection of <math>D_1</math> and <math>S_1</math>, corresponding to price <math>P_1</math> and quantity <math>q_1</math>. The new equilibrium <math>E_2</math> is at the intersection of <math>D_2</math> and <math>S_2</math>, corresponding to a higher price <math>P_2</math> and a lower quantity <math>q_2</math>. Arrows indicate the shifts from <math>D_1</math> to <math>D_2</math> and from <math>S_1</math> to <math>S_2</math>.</p> |
|--------------------------------------------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

(b) demand and supply curves shift in opposite direction

| Cases                                    | Equilibrium Price | Equilibrium Quantity | Figure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Increase in $D_d$ = decrease in $S_S$ | Increase          | Unchanged            |  <p>The graph shows a coordinate system with Price (Rs) on the vertical axis and Quantity (units) on the horizontal axis. There are two downward-sloping demand curves, <math>D_1</math> and <math>D_2</math>, where <math>D_2</math> is to the right of <math>D_1</math>. There are two upward-sloping supply curves, <math>S_1</math> and <math>S_2</math>, where <math>S_2</math> is to the left of <math>S_1</math>. The initial equilibrium <math>E_1</math> is at the intersection of <math>D_1</math> and <math>S_1</math>, corresponding to price <math>P_1</math> and quantity <math>Q_1</math>. The new equilibrium <math>E_2</math> is at the intersection of <math>D_2</math> and <math>S_2</math>, corresponding to a higher price <math>P_2</math> and the same quantity <math>Q_1</math>. Arrows indicate the shifts from <math>D_1</math> to <math>D_2</math> and from <math>S_1</math> to <math>S_2</math>.</p>  |
| 2. Decrease in $D_d$ = increase in $S_S$ | Unchanged         | Increase             |  <p>The graph shows a coordinate system with Price (Rs) on the vertical axis and Quantity (units) on the horizontal axis. There are two downward-sloping demand curves, <math>D_1</math> and <math>D_2</math>, where <math>D_2</math> is to the left of <math>D_1</math>. There are two upward-sloping supply curves, <math>S_1</math> and <math>S_2</math>, where <math>S_2</math> is to the right of <math>S_1</math>. The initial equilibrium <math>E_1</math> is at the intersection of <math>D_1</math> and <math>S_1</math>, corresponding to price <math>P_1</math> and quantity <math>Q_1</math>. The new equilibrium <math>E_2</math> is at the intersection of <math>D_2</math> and <math>S_2</math>, corresponding to a higher price <math>P_2</math> and the same quantity <math>Q_1</math>. Arrows indicate the shifts from <math>D_1</math> to <math>D_2</math> and from <math>S_1</math> to <math>S_2</math>.</p> |

## NCERT Solution

|                                           |          |          |  |
|-------------------------------------------|----------|----------|--|
| 3. Decrease in $D_d <$ increase in supply | Decrease | Increase |  |
| 4. Decrease in $D_d >$ increase in supply | Decrease | Decrease |  |
| 5. Increase in $D_d <$ decrease in SS     | Increase | Decrease |  |
| 6. Increase in $D_d >$ decrease in SS     | Increase | Increase |  |

**Ans17:** The supply and demand curves in the labour market differ from those in the goods market in the following ways:

## NCERT Solution

- 1) In a goods market, the demand for goods is made by consumers or households; while in a labour market, the demand for labour is made by firms.
  - 2) In a goods market, the supply of goods is made by firms; while in a labour market, the supply of labour is made by households.
- So, in a goods market, firms act as suppliers; in a labour market, households act as suppliers.

**Ans18:** A profit maximising firm will employ labour up to the point where the extra cost incurred by employing the last unit of labour (wage) equals the additional benefit it earns by employing that unit of labour.

That is, Marginal cost of labour = Marginal benefit by labour

Or, Wage rate = Marginal Revenue Product

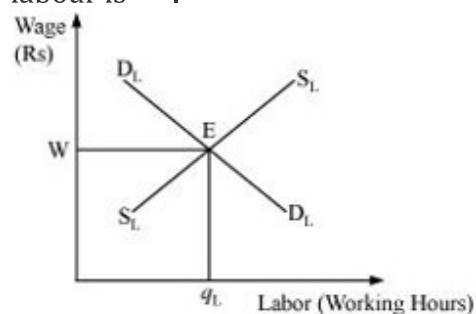
$$\text{Or, } w = MRP_L$$

$$\text{Or, } w = MR \times MP_L \text{ (as } MRP_L = MR \times MP_L)$$

$$\text{Or, } w = P \times MP_L \text{ (in Perfect Competition Price = MR)}$$

$$\text{Or, } w = VMP_L \text{ (because } VMP_L = P \times MP_L)$$

The demand for labour is derived from  $VMP_L$  and the supply of labour is positively sloped. The equilibrium exists at E, where the demand for labour and the supply of labour intersect each other. The equilibrium wage rate is  $w$  and optimal amount of labour is  $q_L$ .



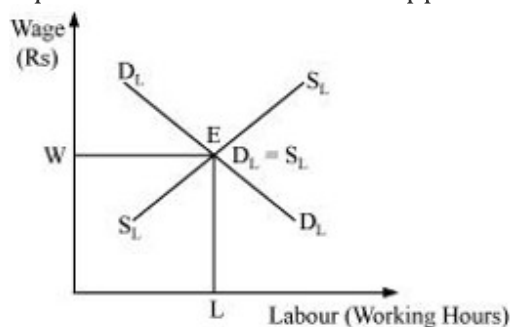
**Ans19:** Similar to a goods market, wage rate in a labour market is determined by the intersection of demand for labour and supply of labour. The rate at which the demand equals the supply is called the equilibrium wage rate. Corresponding hours of labour are demanded and supplied in the labour market at the equilibrium wage rate. The

demand for labour is derived from the value of marginal product of labour ( $VMP_L$ ). We know that a particular firm will employ labour up to a point where marginal cost of employing the last unit of labour hired equals the marginal benefit earned by the firm by hiring that unit of labour.

Labour is supplied by those households, who need to trade-off between working hours (labour) or leisure. The supply of labour is a positive function of wage up to a point beyond which the supply curve becomes backward bending supply curve.

## NCERT Solution

The intersection of demand for labour and the supply of labour occur at the wage rate  $w$ . Here, the equilibrium takes place at  $E$  where  $D_L D_L$  equals  $S_L S_L$  and the equilibrium units of labour supplied and demanded is  $L$ .

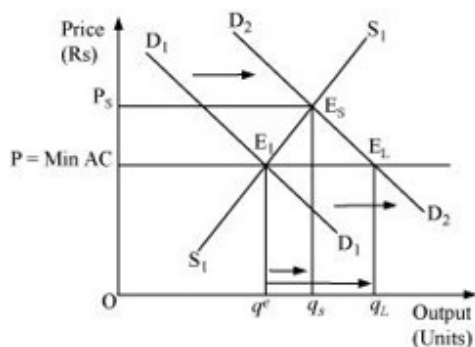


**Ans20:** In India, there are many goods on which government has imposed price ceiling, in order to keep them available within the reach of the BPL (below poverty line) people. These goods are kerosene, sugar, wheat, rice, etc.

The following are the consequences of price ceiling:

- 1) Excess demand - Due to artificially imposed price, cutting lower than the equilibrium price leads to the emergence of the problem of excess demand.
- 2) Fixed Quota - Each consumer gets a fixed quantity of good (as per the quota). The quantity often falls short of meeting the individual's requirements. This further leads to the problem of shortage and the consumer remains unsatisfied.
- 3) Inferior goods - Often it has been found that the goods that are rationed are usually inferior goods and are adulterated.
- 4) Black marketing - The needs of a consumer remain unfulfilled as per the quota laid by the government. Consequently, some of the unsatisfied consumers get ready to pay higher price for the additional quantity. This leads to black-marketing and artificial shortage in the market.

**Ans21:**



The above figure depicts both the cases when the number of firms is fixed (in short run) and when the number of firms is not fixed (in long run).  $P = \min AC$  represents the long run price line;  $D_1 D_1$  and  $D_2 D_2$  represents the demand in the short run and the long run respectively.

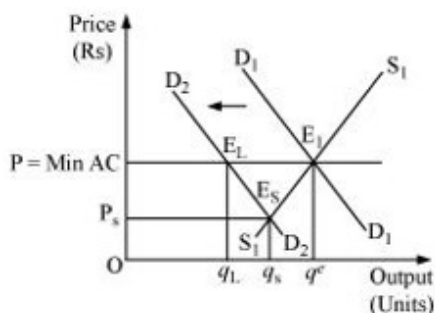
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The point  $E_1$  represents the initial equilibrium, where the demand and the supply intersect each other.

Let us suppose that the demand curve shifts, assuming that the number of firms is fixed. Now, the new equilibrium will be at  $E_s$  (as it is short run equilibrium), where the supply curve and the demand curve  $D_2D_2$  intersect each other. The equilibrium price is  $P_s$  and equilibrium quantity is  $q_s$ .

On the other hand, under the assumption of free entry and exit, an increase in demand will shift the demand curve rightwards to  $D_2D_2$ . The new equilibrium will be at  $E_2$  (as it is a long run equilibrium) with the equilibrium price  $P = \min AC$  and equilibrium quantity  $q_L$ . Therefore, on comparing both the cases, we find that when the firms are given the freedom of entry and exit, the equilibrium price remains the same. The price is lower than that of the short run equilibrium price ( $P_s$ ); whereas, the long run equilibrium quantity ( $q_L$ ) is more than that of the short run equilibrium quantity ( $q_s$ ).

Similarly, for the leftward demand shift, it can be found that the short run equilibrium price ( $P_s$ ) is lower than the long run equilibrium price and the short run equilibrium quantity ( $q_s$ ) is less than the long run equilibrium quantity ( $q_L$ ).



**Ans22:** It is given that;

$$q_d = 700 - p$$

$$q_s = 500 + 3p \text{ for } p > \text{Rs } 15$$

$$= 0 \text{ for } 0 \leq p < 15$$

The market supply is zero for any price from Rs 0 to Rs 15, this is because, for price between 0 to 15, no individual firm will produce any positive level of output (as the price is less than the minimum of AVC). Consequently, the market supply curve will be zero.

At equilibrium  $q_d = q_s$

$$700 - p = 500 + 3p$$

$$-p - 3p = 500 - 700$$

$$-4p = -200$$

$$p = 50$$

Equilibrium price is Rs 50.

## NCERT Solution

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$$\text{Quantity} = q_s = 500 + 3p$$

$$= 500 + 3(50)$$

$$= 500 + 150$$

$$= 650$$

Therefore, the equilibrium quantity is 650 units.

**Ans23:**  $q_f^s = 8 + 3p$  for  $P \geq \text{Rs } 20$

$$= 0 \text{ for } 0 \leq p < \text{Rs } 20.$$

$$q_d = 700 - p$$

(a) For the price between 0 to 20, no firm is going to produce anything as the price in this range is below the minimum of LAC. So, at the price of Rs 20, the price line is equal to the minimum of LAC.

(b) As there exists the freedom of entry and exit of firms, the minimum of AVC is at Rs 20, also, the price of Rs 20 is the equilibrium price. This is because in the long run, all firms earn zero economic profit, which implies that the price of Rs 20 is the equilibrium price and at any price lower than Rs 20, the firm will move out of the market.

(c) At equilibrium price of Rs 20

$$\text{Quantity supplied} = q_s = 8 + 3p$$

$$= 8 + 3(20)$$

$$q_s = 68 \text{ units}$$

$$\text{Quantity demanded } q_d = 700 - p$$

$$= 700 - 20$$

$$q_d = 680$$

$$\text{Number of firms (n)} = \frac{q_d}{q_f^s}$$

$$n = \frac{680}{68}$$

$$n = 10 \text{ firms}$$

Therefore, the number of firms in the market is 10 and the equilibrium quantity is 680 units.

**Ans24:**  $q^D = 1000 - p - (1)$

$$q^S = 700 + 2p - (2)$$

(a) At equilibrium

$$q^D = q^S$$

$$1000 - p = 700 + 2p$$

$$300 = 3p$$

$$100 = p$$

$$p = \text{Rs } 100$$

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## NCERT Solution

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$$q^d = 1000 - 100 \text{ [Substituting the value of } p \text{ in equation (1)]}$$

$$= 900 \text{ units}$$

So, the equilibrium price is Rs 100 and equilibrium quantity is 900 units.

(b) New quantity supplied  $q'_s$

$$q'_s = 400 + 2p$$

$$\text{At equilibrium } q^d = q'_s$$

$$1000 - p = 400 + 2p$$

$$600 = 3p$$

$$200 = p$$

$$p = \text{Rs } 200$$

Prior to the increase in the price of input, the equilibrium price was Rs 100, and after the rise in input's price, the equilibrium price is Rs 200.

So the change in the equilibrium price is Rs 100 (200 - 100).

$$q^d = 1000 - 200 \text{ [Substituting the value of } p \text{ in equation (1)]}$$

$$= 800 \text{ units}$$

The change in the equilibrium quantity is 100 units (i.e. 900 - 800 units).

Yes, this change is obvious, as due to the change in the input's price, the cost of producing salt has increased that will shift the marginal cost curve leftward and move the supply curve to the left. A leftward shift in the supply curve results in a rise in the equilibrium price and a fall in the equilibrium quantity.

(c) The imposition of tax of Rs 3 per unit of salt sold will raise the cost of producing salt. This will shift the supply curve leftwards and the quantity supplied equation will become

$$y^s = 700 + 2(p - 3)$$

At equilibrium

$$y^d = y^s$$

$$1000 - p = 700 + 2(p - 3)$$

$$1000 - p = 700 + 2p - 6$$

$$306 = 3p$$

$$\frac{306}{3} = p$$

$$p = \text{Rs } 102$$

Substituting the value of  $p$  in equation (1)

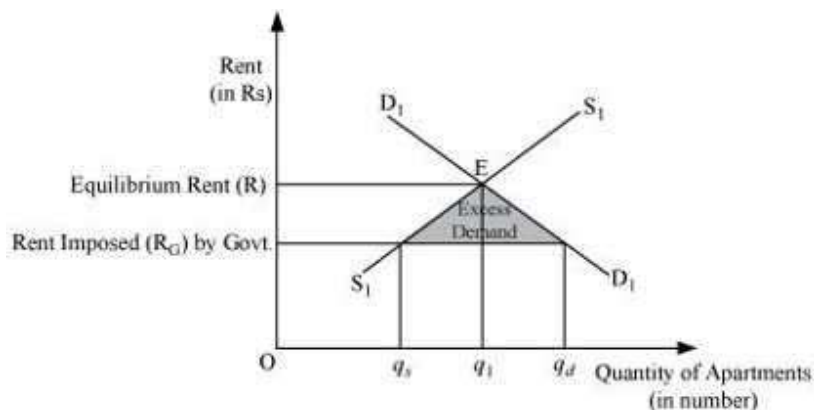
$$y^d = 1000 - p$$

$$y^d = 1000 - 102$$

$$y^d = 898 \text{ units}$$

Thus, the imposition of tax of Rs 3 per unit of salt sold will result in an increase in the price of salt from Rs 100 to Rs 102. The equilibrium quantity falls from 900 units to 898 units.

## NCERT Solution



The above figure depicts an equilibrium and an effect of price ceiling (maximum rent). The market demand for apartments is depicted by the  $D_1D_1$  curve and the supply of apartments is depicted by  $S_1S_1$ . The equilibrium price determined is  $R$  and the equilibrium quantity is  $q$ .

If the government steps in and imposes rent ceiling (maximum rent) equivalent to  $R_G$ , then at this rent, there will be an excess demand. The quantity of apartments demanded will be  $q_d$ . Whereas, the quantity of apartments supplied is  $q_s$ . So, there exists an excess demand equivalent to  $q_d - q_s$ . At the rate  $R_G$ , common people can afford apartments to live in, which earlier they were not able to. However, besides this positive effect of imposition of maximum rent, it might happen that some landlords indulge in the practice of black marketing and offer apartments for rent at comparatively higher price.