

**Q.** A raindrop of mass  $1.00 \text{ g}$  falling from a height of  $1 \text{ km}$  hits the ground with a speed of  $50 \text{ m s}^{-1}$ . Calculate

(a) the loss of PE of the drop.

(b) the gain in KE of the drop.

(c) Is the gain in KE equal to loss of PE? If not why?

Take,  $g = 10 \text{ ms}^{-2}$ .

**Ans.** Given, mass of the rain drop ( $m$ ) =  $1.00 \text{ g}$   
 $= 1 \times 10^{-3} \text{ kg}$

Height of falling ( $h$ ) =  $1 \text{ km} = 10^3 \text{ m}$

$$g = 10 \text{ m/s}^2$$

Speed of the rain drop ( $v$ ) =  $50 \text{ m/s}$

(a) Loss of PE of the drop =  $mgh$   
 $= 1 \times 10^{-3} \times 10 \times 10^3 = 10 \text{ J}$

(b) Gain in KE of the drop =  $\frac{1}{2}mv^2$   
 $= \frac{1}{2} \times 1 \times 10^{-3} \times (50)^2$   
 $= \frac{1}{2} \times 10^{-3} \times 2500$   
 $= 1.250 \text{ J}$

(c) No, gain in KE is not equal to the loss in its PE, because a part of PE is utilised in doing work against the viscous drag of air.