

**Question** ● According to the Arrhenius equation,

**A.** A high activation energy usually implies a fast reaction

**B.** Rate constant increases with an increase in temperature. This is due to a greater number of collisions whose energy exceeds the activation energy.

**C.** Higher the magnitude of activation energy, the stronger is the temperature dependence of the rate constant.

**D.** The pre-exponential factor is a measure of the rate at which collisions occur, irrespective of their energy.

**Solution:** (B, C and D)

According to Arrhenius Equation

$$K = Ae^{-E_a / RT}$$

Therefore at  $T \rightarrow 0$

$$e^{-E_a / RT} \rightarrow 0$$

Therefore rate constant decreases with temperature.

And as  $T \rightarrow \infty$   $K \rightarrow A$ .

Thus, as temperature increases, the rate constant increases and approaches a value close to the Arrhenius constant.

Now

$$dK / dT = -E_a A / RT e^{-E_a / RT}$$

Hence,

Higher the activation energy higher is the required temperature for reaction to occur, and hence greater is the temperature dependency of the rate constant.