

QUESTION:

Consider the Arrhenius equation given below and mark the correct option $k = Ae^{-E_a/RT}$.

- A Rate constant increases exponentially with increasing activation energy and decreasing temperature
- B Rate constant decreases exponentially with increasing activation energy and decreasing temperature
- C Rate constant increases exponentially with decreasing activation energy and decreasing temperature
- D Rate constant increases exponentially with decreasing activation energy and increasing temperature

ANSWER:

Correct option is D)

$$k = Ae^{-E_a/RT} \dots (i)$$

$$\Rightarrow \ln k = \ln (Ae^{-E_a/RT})$$

$$\Rightarrow \ln k = \ln (A) + \ln (e^{-E_a/RT})$$

$$\Rightarrow \ln k = \ln (A) - \frac{E_a}{RT} \ln (e)$$

$$\Rightarrow \ln k = \ln (A) - \frac{E_a}{RT}$$

So from this equation,

$$k \propto \frac{1}{E_a} \text{ and } k \propto T$$

k increases if E_a decreases and increases if T increases.

Moreover, the relation in exponential can be seen in (i)

Option D is correct.