**16.(C)** Catalyst changes activation energy or it stabilise intermediates but not the reactant or product, so enthalpy of reaction remains unaffected.

**17.(B)** We know $k = Ae^{-E_a/RT}$ For two different temperatures $\log\left(\frac{k_2}{k_1}\right) = \frac{Ea}{2.303\,R}\left(\frac{T_2 - T_1}{T_1T_2}\right)$

**18.(C)** Catalyst affects both the reactions, i.e., forward and backward reactions, so equilibrium is established in lesser time.

**19.(A)** $r = k[C_6H_5N_2^+Cl^-]$

**20.(D)** Order can be zero, integer or fractional

**21.(C)** $1M \longrightarrow 0.6\,M \longrightarrow 0.36$

$\frac{1-0.6}{1} \times 100 = 40\%, \frac{0.6-0.36}{0.6} \times 100 = 40\%$

Since half life or life of a particular fraction for first order reaction is independent of initial concentration so all successive fractional lives are also same.

The time required to complete 40% reaction is 20 min, and $0.6 \to 0.36$ is also 40% of reaction so in both cases time taken will be equal i.e., 20 min.

**22.(D)** 3 half lives have passed in 8 seconds, $t_{1/2} = \frac{8}{3}s$

**23.(A)** Hydrolysis of ester is pseudo first order reaction.

$r = k[H^+][\text{ester}]$ ; $[H^+] = \text{constant}$

$r = k'[\text{ester}]$

So, rate constant, $k' = k\,[H^+]$

In the presence of $H_2SO_4$, $k'$ value is bigger which implies $H_2SO_4$ furnishes more concentration of $H^+$ ions and $H_2SO_4$ is stronger acid.

**24.(A)** All radioactive decay follows first order kinetics.

$t_{1/2} = 25$ min. So $\frac{N_t}{N_0} = \left(\frac{1}{2}\right)^{\frac{50}{25}} = \frac{1}{4}$.

**25.(B)** $0.08\,M \xrightarrow[t_{1/2}]{} 0.04\,M \xrightarrow[t_{1/2}]{} 0.02\,M \xrightarrow[t_{1/2}]{} 0.01\,M$

It will take three $t_{1/2}$ to reach 0.01 M

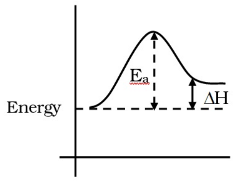
Time required $= 3 \times 10 = 30$ min.

**26.(D)** $r = k[A]\,[B] = \frac{k\,n_An_B}{V^2}$

Where $n_A$ and $n_B$ are moles of A and B respectively and V is volume.

$r' = \frac{k\,n_An_B}{(V/4)^2} = 16\,\frac{k\,n_An_B}{V^2} = 16r$ ; $\frac{r'}{r} = 16$

**27.(C)**



Hence, $E_a > \Delta H$

**28.(B)** 75% disappears in 1.388 hr. so 50% disappears in $\frac{1.388}{2}$hr

or 0.694 hr. $k = \frac{0.693}{t_1/2} = \frac{0.693}{0.694 \times 60 \times 60}\ \text{sec}^{-1} \approx \frac{100}{36} \times 10^{-4}\ s^{-1} = 2.8 \times 10^{-4} s^{-1}$

**29.(B)** $2NO_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} N_2O_4$

In this reaction $NO_2$ disappears in forward and appears in backward reaction. So rate of disappear once is (consider elementary reaction) $\frac{-d[NO_2]}{dt} = 2k_1[NO_2]^2 - 2k_2[N_2O_4]$

**30.(B)** For $T \to \infty$ $e^{-E_a/RT} \to 1$

Hence $k \to A$ ; $k = 6.0 \times 10^{14}\ s^{-1}$