J(A) (Kinetics)

(1) For 1st order: $A_t = A_0 e^{-kt}$: → Option: A ✓

$t_{1/2} = \frac{\ln 2}{K} \Rightarrow K = A e^{-E_a/RT}$.

$T \uparrow \Rightarrow K \uparrow \Rightarrow t_{1/2} \downarrow$ → Option: B ✓

$t_{1/2}$ does not depend on initial conc.

(2) $t_{1/8} = \frac{2.303}{K}\log\left(\frac{1}{1/8}\right)$; $\frac{t_{1/8}}{t_{1/10}} \times 10 = 9$ Ans

$t_{1/10} = \frac{2.303}{K}\log\left(\frac{1}{1/10}\right)$

(3) For 'Q' the graph given is of zero-order

For 'P' given: $t_{75\%} = 2 \times t_{50\%}$, that means 1st order in P

$$\text{rate} = K[P]^1[Q]^0$$

(4) rate increases by factor '8', hence,

$$\text{rate} = K[M]^3 \quad (3^{rd} \text{ order})$$

(5) $$[Fe(C_2O_4)_2(H_2O)_2]^{-2} + MnO_4^- + 8H^+ \longrightarrow Mn^{+2} + 2Fe^{+3} + 4CO_2 + 6H_2O$$

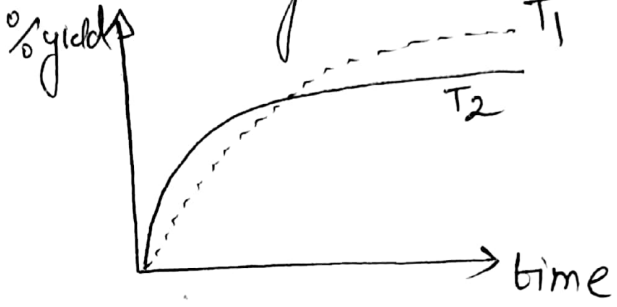
$$-\frac{d[MnO_4^-]}{dt} = -\frac{1}{8}\frac{d[H^+]}{dt}$$

$$\frac{d[H^+]/dt}{d[MnO_4^-]/dt} = 8 \text{ Ans.}$$

(6) Since, the reaction is exothermic, hence, as temperature increases the equilibrium amount of product decreases.

However, initially due to increase in temperature the rate of reaction increases resulting in greater amount of product initially.

So correct graph is:



(7) High activation energy means slower reaction.

As: $T \uparrow \Rightarrow k \uparrow$ due to increasing number of collisions crossing the energy barrier.

As $E_a \uparrow$, the temperature dependence of rate constant becomes more stronger.

Pre-exponential factor gives a measure of rate at which collisions occur.

(8) Steric factor comes from Orientation barrier which has nothing to do with Activation energy.

Since steric factor is greater than 1, hence, experimental value of Pre-exponential factor is more.