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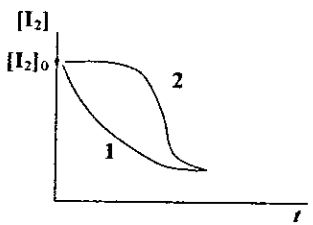
8. Since the enol (E) formation is the stage limiting the entire process, we can suppose that $k_2/k_3 << 1$. Then, we can apply the quasi-stationary approach towards enol as an intermediate (A is acetone):

$\frac{d[E]}{dt} = k_2[HA^+] - k_3[E][I_2] = 0$, whereas $[HA^+] = K_b[A][H^+]$, and the reaction rate $w = -\frac{d[I_2]}{dt} = k_3[E][I_2]$, thus, taking into account the quasi-stationary state of the enol:

$$w = k_3[E][I_2] = k_2[HA^+] = k_2K_b[A][H^+].$$

9. Since $k_2/k_3 << 1$, the effective constant is $k' = k_2K_b$.

10.



Shape of the kinetic curves of acetone iodination in an acidic medium (1) and acid-free solution (2) (the self-acceleration of the reaction must be shown for curve (2)).

11. The constants of carbonyl compound halogenation rate with chlorine, bromine, and iodine are the same, though the compounds differ in their reaction capacity.

12. The iodine reaction with acetone in an alkaline medium (iodoform formation):

$$R\text{-}CO\text{-}CH_3 + OH^- + I_2 = CHI_3 + RCOO^-$$

13. The method is not selective, since different substances including all methyl ketones and ethanol would react with iodine in an alkaline medium. So the reaction must be similar to that shown in item 12. Ethanol forms aldehyde first, which is further halogenated.

14.