61.(A) Keeping [A] constant, doubling [B] increases rate of reaction two times. So, rate of reaction depends linearly on [B].
Similarly, keeping [B] constant, tripling [A] increases rate of reaction 9 times. So order with respect to [A] is 2. Overall order = 2 + 1 = 3.

62.(D) $\%B = \frac{k_1}{k_1 + k_2} \times 100 = \frac{12.6 \times 10^{-5}}{(12.6 + 3.8)10^{-5}} \times 100 = 76.83\%$, Therefore $\%C = 100 - 76.83 = 23.17\%$

63.(B) $r = k\,[A]^n$

$2.4 = k \times (2.2)^n$ **...(i)** and $0.6 = k \times (1.1)^n$ **...(ii)**

(i)/(ii) $\Rightarrow$ $4 = (2)^n \Rightarrow n = 2$

64.(A) Rate $\propto [A]^1[B]^{-1}$ net order of the reaction = 0.

65.(D) $r = k\,[A]^m\,[B]^n$

$$r' = \frac{r}{4} = k[A]^m\left(2[B]\right)^n \quad \Rightarrow \quad \frac{r}{r'} = 4 = \left(\frac{1}{2}\right)^n \quad \Rightarrow \quad n = -2$$

66.(D) $r = k \times [A] \Rightarrow 2 \times 10^{-5} = k \times 0.01 \Rightarrow k = 2 \times 10^{-3}$

Half life, $t_{1/2} = \frac{0.693}{2 \times 10^{-3}} = \frac{693}{2}$ sec ≈ 347 sec.

67.(C) For IInd order reaction, unit of k is $L\ mol^{-1}\,sec^{-1}$ only

68.(A) Zero order reaction requires finite time to complete the reaction.

69.(D) $\frac{-d[B]}{dt} = 2 \times \left(\frac{-d[A]}{dt}\right) = 2 \times 5 \times 10^{-4} = 1 \times 10^{-3}\ mol\,L^{-1}\,s^{-1}$

70.(C) $\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{a_2}{a_1}\right)^{n-1} \Rightarrow \frac{120}{240} = \left(\frac{4 \times 10^{-2}}{8 \times 10^{-2}}\right)^{n-1} \Rightarrow n = 1 = 1 \Rightarrow n = 2$

71.(D) For $2N_2O_5 \longrightarrow 4NO_2 + O_2$

$$-\frac{1}{2}\frac{d[N_2O_5]}{dt} = \frac{1}{4}\frac{d[NO_2]}{dt} = \frac{d[O_2]}{dt}$$

72.(C) For $Cl_2 + 2I^- \longrightarrow I_2 + 2Cl^-$

$r = k[I^-]^2 = 2.5 \times 10^{-2} \times (0.2)^2 = 2.5 \times 0.04 \times 10^{-2} = 1 \times 10^{-3}$ mol / L sec

But $\frac{d[I_2]}{dt} = r = 1 \times 10^{-3}$

73.(B) For $3A \longrightarrow 2B$

$$-\frac{1}{3}\frac{d[A]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$$

$$\frac{d[B]}{dt} = \frac{2}{3}\left(\frac{-d[A]}{dt}\right)$$

74.(B) $\frac{d[NH_3]}{dt} = \frac{2}{3}\left(\frac{-d[H_2]}{dt}\right) = \frac{2}{3} \times 0.3 \times 10^{-4} = 0.2 \times 10^{-4}$ M / s.

75.(D) $r = k[SO_2]^2[O_2] = k \times \left(\frac{n_{SO_2}}{V}\right)^2 \left(\frac{n_{O_2}}{V}\right) = \frac{k \times n_{SO_2}^2 \times n_{O_2}}{V^3}$

$$r' = \frac{k n_{SO_2}^2 n_{O_2}}{(2V)^3}$$

$r : r' = 8 : 1.$