Kinetics Worksheet 3

(1) H_2O_2: $\frac{\text{trial 3 } [H_2O_2]}{\text{trial 1 } [H_2O_2]} = \frac{.2}{.1} = 2$ $\qquad \frac{\text{rate 3}}{\text{rate 1}} = \frac{.0152}{.0076} = 2$

HI: $\frac{\text{trial 2 } [HI]}{\text{trial 1 } [HI]} = \frac{.2}{.1} = 2$ $\qquad \frac{\text{rate 2}}{\text{rate 1}} = \frac{.0152}{.0076} = 2$

$\text{Rate} = k[H_2O_2][HI]$ $\qquad (.0076) = k(.1)(.1)$

$k = 0.76$

$k = 0.76 \text{ L/mol·s}$

(2) H_2: $\frac{\text{trial 3 } [H_2]}{\text{trial 2 } [H_2]} = \frac{2.0}{1.0} = 2$ $\qquad \frac{\text{rate 3}}{\text{rat 2}} = \frac{.8}{.4} = 2$

I_2: $\frac{\text{trial 2 } [I_2]}{\text{trial 1 } [I_2]} = \frac{2.0}{1.0} = 2$ $\qquad \frac{\text{rate 2}}{\text{rate 1}} = \frac{0.4}{0.2} = 2$

$\text{Rate} = k[H_2][I_2]$ $\qquad (.2) = k(1)(1)$

$k = .2 \text{ L/mol·s}$

(3) NO_2: $\frac{\text{trial 2 } [NO_2]}{\text{trial 1 } [NO_2]} = \frac{2.0}{1.0} = 2$ $\qquad \frac{\text{rate 2}}{\text{rate 1}} = \frac{2\times10^{-4}}{1\times10^{-4}} = 2$

F_2: $\frac{\text{trial 3 } [F_2]}{\text{trial 1 } [F_2]} = \frac{2.0}{1.0} = 2$ $\qquad \frac{\text{rate 3}}{\text{rate 2}} = \frac{2\times10^{-4}}{1\times10^{-4}} = 2$

$\text{Rate} = k[NO_2][F_2]$ $\qquad (1\times10^{-4}) = k(1)(1)$

$k = 1\times10^{-4} \text{ L/mol·min}$

(4) NO: $\frac{\text{trial 2 [NO]}}{\text{trial 1 [NO]}} = \frac{2.0}{1.0} = 2$ $\frac{\text{rate 2}}{\text{rate 1}} = \frac{5.20 \times 10^{-3}}{1.3 \times 10^{-3}} = 4$

Br_2: $\frac{\text{trial 3 } [Br_2]}{\text{trial 1 } [Br_2]} = \frac{2.0}{1.0} = 2$ $\frac{\text{rate 3}}{\text{rate 1}} = \frac{4.16 \times 10^{-2}}{1.3 \times 10^{-3}} = 32$

$\text{Rate} = k[NO]^2[Br_2]^4$ $\quad 1.3 \times 10^{-3} = k(1)^2(1)^4$

$k = 1.3 \times 10^{-3}$ L/mol·hr

(5) ClO^{3-}: $\frac{\text{trial 3 } [ClO^{3-}]}{\text{trial 2 } [ClO^{3-}]} = \frac{.2}{.1} = 2$ $\frac{\text{rate 3}}{\text{rate 2}} = \frac{4x}{2x} = 2$

I^-: $\frac{\text{trial 2 } [I^-]}{\text{trial 1 } [I^-]} = \frac{.2}{.1} = 2$ $\frac{\text{rate 2}}{\text{rate 1}} = \frac{2x}{x} = 2$

H^+: $\frac{\text{trial 4 } [H^+]}{\text{trial 3 } [H^+]} = \frac{.2}{.1} = 2$ $\frac{\text{rate 4}}{\text{rate 3}} = \frac{16x}{4x} = 4$

$\text{Rate} = k[ClO^{3-}][I^-][H^+]^2$ $\quad x = k(.1)(.1)(.1)^2$

$k = \frac{x}{1 \times 10^{-4}}$ or $(1 \times 10^4)x$

(6) (a) doubled (b) four times (c) half (d) increases
(e) decreases (f) increases (g) double (h) half

(7) (a) no change (b) nine times (c) four times (d) increases
(e) decreases (f) increases (g) 8 times (h) two times
(i) 27 times.