Kinetics Answers

1.

a. 8.3×10^{-4} mol.s^{-1}
b. $2HCl + CaCO_3 \rightarrow H_2CO_3 + CaCl_2$
c. 8.3×10^{4} mol.s^{-1}
d. Nope

2. It removes the complication of the reverse reaction if you measure the rate before significant amounts of product have built up.

3.
a. 2
b. 3
c. 2×10^{-38} molecules^{-2}.cm^{9}.s^{-1}
d. 5.68×10^{18} molecules/cm^{3} s^{-1}

4.
a. 1
b. 0
c. 1
d. Rate = k' $[CH_3COCH_3][H^+]$; where $k' = k[Br_2]$

5.
a. 3
b. 3.6×10^{-3} mol.L^{-1}.s^{-1} for both
c. None
d. Decrease; none.

6. m = 1, n = 1; k = 6.21×10^{-4} M^{-1}.s^{-1}
7. L$^{1/2}$.mol$^{-1/2}$.s^{-1}
8. $n(OCl^-) = 1$, $n(I^-) = 1$, $n(OH^-) = -1$, $k = 60.5$ s^{-1}
9. $n = 2$, $k = (9.3 \pm 0.3) \times 10^{7}$ mL mol^{-1} s^{-1}
10. $n = 1$, $k = (2.99 \pm 0.06) \times 10^{-2}$ min^{-1}
11. $k = (1.93 \pm 0.01) \times 10^{-2}$ min^{-1}
12.
a. $[I]_{120} = 1.05 \times 10^{-2}$ M
b. 8.93 s
13.
a. 5.18 hr
b. 0.669
14. 6.64 times
15. 32.7% decomposed
16. 87 min
17. 20 min
18. 23.7 M^{-1} min^{-1}
19. 2.5×10^{-6} s

20.

a. $rate = \frac{k_3 k_2 [NO]^2 [O_2]}{k_{-2}}$

b. $rate = k_2 [NO]^2$

21.

a. $\frac{d[C]}{dt} = \frac{k_2 k_1 [A]^2}{k_{-1}[A] + k_2}$

b. The concentration of the intermediate remains constant – the rate of production and consumption of the intermediate are equal.

c. When $k_2 << k_{-1}$

22.

a. The second step (equilibria are usually fast)

b. $rate = \frac{k_2 k_1 [H_2][NO]^2}{k_{-1}}$

c. When $[NO] >> [H_2]$

23.

a. You should be able to do that

b. You need to prove that 1/[A] vs t is a straight line

c. $k_2 = 1.16 \times 10^{-1}\ M^{-1}s^{-1}$

d. $2.96 \times 10^{-18}\ s^{-1}$

24.

a. $E_a = 41.5\ kJ.mol^{-1}$; $A = 9.50 \times 10^{15}$

b. $k = 0.500\ M^{-1}.s^{-1}$

25.

a. $E_a = 105\ kJ.mol^{-1}$

b. $A = 8.17 \times 10^{13}\ s^{-1}$

c. $k_{338} = 5.20 \times 10^{-3} s^{-1}$

26. $51.2\ kJ.mol^{-1}$

27. $E_a = 101\ kJ.mol^{-1}$; $A = 3.14 \times 10^{15}\ s^{-1}$