These problems are intended to ***supplement*** the problems in the textbook, not ***replace*** them.

Questions

Consider this reaction: $2\ O_3\ (g) \rightarrow 3\ O_2\ (g)$

The rate of reaction is 9.0×10^{-7} M/s at a particular temperature.

1. What is the rate of disappearance of ozone at this temperature?
2. What is the rate of appearance of oxygen at this temperature?

Consider this reaction: $4\ PH_3\ (g) \rightarrow P_4\ (g) + 6\ H_2\ (g)$

The rate of appearance of hydrogen is 0.0115 M/s at a particular temperature.

3. What is the rate of disappearance of phosphine, PH_3 at this temperature?
4. What is the rate of appearance of phosphorus, P_4 at this temperature?
5. What is the rate of reaction at this temperature?

Consider this reaction: $2\ NO_2\ (g) \rightarrow 2\ NO\ (g) + O_2\ (g)$

The following data were collected at a particular temperature:

time (s)	0	10.0	15.0	20.0	30.0	50.0	80.0	120.0	240.0
$[O_2]$ (M)	0	0.080	0.100	0.113	0.135	0.160	0.174	0.180	0.182

6. What is the average rate of appearance of oxygen over the interval 0 to 240.0 seconds?
7. What is the average rate of appearance of oxygen from 10.0 to 50.0 seconds?
8. What is the average rate of disappearance of nitrogen dioxide from 10.0 to 50.0 seconds?
9. What is the average rate of reaction from 10.0 to 50.0 seconds?
10. Graphically determine the instantaneous rate of appearance of oxygen at 40.0 seconds.

Consider this reaction: $2\ N_2O_5\ (g) \rightarrow 4\ NO_2\ (g) + O_2\ (g)$

The following data were collected at a particular temperature:

time (s)	0	200	400	600	800
P_{N2O5} (atm)	0.0958	0.0352	0.0130	0.0048	0.0018

11. What is the average rate of disappearance of dinitrogen pentoxide from 0 to 800 seconds?
12. What is the average rate of disappearance of dinitrogen pentoxide from 200 to 600 seconds?
13. What is the average rate of appearance of nitrogen dioxide from 200 to 600 seconds?
14. What is the average rate of reaction from 200 to 600 seconds?
15. Graphically determine the instantaneous rate of disappearance of dinitrogen pentoxide at 250 seconds.

Consider this reaction: $NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)$

The following data were collected at a particular temperature:

Expt #	Initial Concentrations (M)		Initial Reaction Rate (M/s)
	$[NO_2]$	[CO]	
1	0.050	0.060	0.018
2	0.100	0.060	0.018
3	0.050	0.030	0.0090

16. Determine the rate law, including a value for the rate constant (with its correct units).
17. What will be the initial reaction rate in an experiment with $[NO_2]_0 = 0.075$ M and $[CO]_0 = 0.050$ M?

Consider this reaction:

$$3\ I^-(aq) + H_3AsO_4(aq) + 2\ H^+(aq) \rightarrow I_3^-(aq) + H_3AsO_3(aq) + H_2O(l)$$

The following data were collected at a particular temperature:

Expt #	Initial Concentrations (M)			Initial Reaction Rate (M/s)
	$[I^-]$	$[H_3AsO_4]$	$[H^+]$	
1	0.100	0.100	0.100	6.0×10^{-10}
2	0.200	0.100	0.100	1.2×10^{-9}
3	0.200	0.200	0.100	2.3×10^{-9}
4	0.200	0.100	0.300	1.1×10^{-8}

18. Determine the rate law, including a value for the rate constant (with its correct units).
19. What will be the initial reaction rate in an experiment with $[I^-]_0 = 0.250$ M, $[H_3AsO_4]_0 = 0.300$ M and $[H^+]_0 = 0.125$ M?

Consider this reaction: $2\ ICl(g) + H_2(g) \rightarrow I_2(g) + 2\ HCl(g)$

The following data were collected at a particular temperature:

Expt #	Initial Concentrations (M)		Initial Reaction Rate (M/s)
	[ICl]	$[H_2]$	
1	0.10	0.10	0.0015
2	0.20	0.10	0.0060
3	0.10	0.050	0.000188

20. Determine the rate law, including a value for the rate constant (with its correct units).
21. What will be the initial reaction rate in an experiment with $[ICl]_0 = 0.45$ M and $[H_2]_0 = 0.35$ M?
22. What will be the initial rate of disappearance of ICl in that same experiment?

Answers

If you cannot figure out how to get the correct answer, go to your instructor, Science Tutoring Center, etc.

Note: Answers obtained graphically should be similar to those listed here, but probably will not be exactly equal.

1. 1.8×10^{-6} M/s
2. 2.7×10^{-6} M/s
3. 0.00767 M/s
4. 0.00192 M/s
5. 0.00192 M/s
6. 7.58×10^{-4} M/s
7. 0.0020 M/s
8. 0.0040 M/s
9. 0.0020 M/s
10. 0.0013 M/s
11. 1.18×10^{-4} atm/s
12. 7.60×10^{-5} atm/s
13. 1.52×10^{-4} atm/s
14. 3.80×10^{-5} atm/s
15. 1.3×10^{-4} atm/s
16. rate = 0.30 s^{-1} [CO]
17. 0.015 M/s
18. rate = 6.0×10^{-6} $M^{-3}\cdot s^{-1}$ $[I^-][H_3AsO_4][H^+]^2$
19. 7.0×10^{-9} M/s
20. rate = 1.5×10^{2} $M^{-4}\cdot s^{-1}$ $[ICl]^2[H_2]^3$
21. 1.3 M/s
22. 2.6 M/s