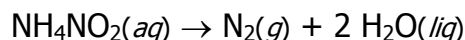


Unless otherwise specified, each question is worth 5 points.

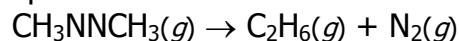
1. Ammonium nitrite, NH_4NO_2 , decomposes in solution, as shown here.



The concentration of NH_4^+ ion at the beginning of an experiment was 0.500 M . After 3.00 hours, it was 0.432 M . What is the average rate of NH_4NO_2 decomposition of during this time interval?

$$\mathbf{0.0227 \text{ mol/L}\cdot\text{hour}}$$

2. In experiments on the decomposition of azomethane:



the following data were obtained:

	Initial Concentration of Azomethane ($\frac{\text{moles}}{\text{liter}}$)	Initial Rate ($\frac{\text{mol}}{\text{liter}\cdot\text{sec}}$)
exp. 1	1.13×10^{-2}	2.8×10^{-6}
exp. 2	2.26×10^{-2}	5.6×10^{-6}

- (a) What is the rate law for this reaction? (3 points)
(b) What is the value of the rate constant, k ? (2 points)

$$\mathbf{(a) \text{ rate} = k [\text{CH}_3\text{NNCH}_3]^1}$$

$$\mathbf{(b) k = 2.5 \times 10^{-4} \text{ sec}^{-1}}$$

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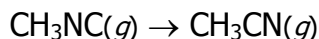
3. Sulfuryl chloride, SO_2Cl_2 , decomposes when heated:



This reaction is first order. In an experiment, the initial concentration of SO_2Cl_2 was 0.0248 mol/L. If the rate constant is $2.2 \times 10^{-5} \text{ sec}^{-1}$, what is the concentration of SO_2Cl_2 after 2.0 hours? *Be careful!*

0.0212 mol/L

4. Methyl isocyanide, CH_3NC , isomerizes when heated to give acetonitrile, CH_3CN .



This reaction is first order. At 230°C , the rate constant for this isomerization reaction is $6.3 \times 10^{-4} \text{ hour}^{-1}$. What is the half-life?

1,100 hours

Unless otherwise specified, each question is worth 5 points.

Abbreviated Periodic Table of the Elements

												13	14	15	16	17	18	
1												3A	4A	5A	6A	7A	8A	
H	2												5	6	7	8	9	10
1.008	2A												B	C	N	O	F	Ne
3	4												10.81	12.01	14.01	16.00	19.00	20.18
Li	Be												13	14	15	16	17	18
6.94	9.01												Al	Si	P	S	Cl	Ar
11	12	3	4	5	6	7	8	9	10	11	12	26.98	28.09	30.97	32.07	35.45	39.95	
Na	Mg	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	Al	Si	P	S	Cl	Ar	
22.99	24.31											26.98	28.09	30.97	32.07	35.45	39.95	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
39.10	40.08	44.96	47.88	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.38	69.72	72.59	74.92	78.96	79.90	83.80	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
132.9	137.3	138.9	178.5	180.9	183.9	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	(209)	(210)	(222)	
87	88	89	104	105	106	107	108	109	110	111	112							
Fr	Ra	Ac**	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub							
(223)	226	(227)																

Integrated rate law forms:

$$[\text{reactant}]_t = -kt + [\text{reactant}]_0$$

$$\ln[\text{reactant}]_t = -kt + \ln[\text{reactant}]_0$$

$$1/[\text{reactant}]_t = kt + 1/[\text{reactant}]_0$$