

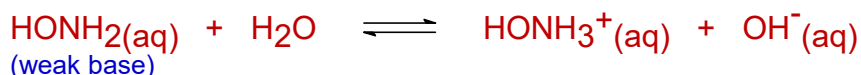
Chem 10113, Quiz 3

October 9, 2019

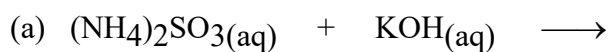
Answer Key

	IA (1)																VIIIA (18)	
1	1 H 1.0080	IIA (2)										III A (13)	IV A (14)	V A (15)	VIA (16)	VII A (17)	2 He 4.0026	
2	3 Li 6.9410	4 Be 9.0122										5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.179	
3	11 Na 22.990	12 Mg 24.305	IIIB (3)	IVB (4)	VB (5)	VIB (6)	VII B (7)	VIII B (8)	VIII B (9)	VIII B (10)	IB (11)	IIB (12)	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
4	19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.880	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.690	29 Cu 63.546	30 Zn 65.380	31 Ga 69.723	32 Ge 72.610	33 As 74.922	34 Se 78.960	35 Br 79.904	36 Kr 83.800
5	37 Rb 85.468	38 Sr 87.620	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.940	43 Tc 98.907	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.20	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po 208.98	85 At 209.99	86 Rn 222.02
7	87 Fr 223.02	88 Ra 226.03	89 Ac 227.03	104 Unq 261.11	105 Unp 262.11	106 Unh 263.12	107 Uns 262.12											

1. (2 points) Write a complete, *balanced chemical equation* to show how hydroxylamine, HONH₂, behaves when dissolved in water. (Remember that chemists are precise in their use of arrows!)



2. (9 points) For each of the following reactions, write *balanced chemical equations* for both the *molecular* and the *net ionic* equations. If no reaction occurs, write No Reaction. Use subscripts [(s), (aq), (g), etc.] to indicate the phase of each compound or ion.



molecular:



net ionic: (gas formation)



molecular:



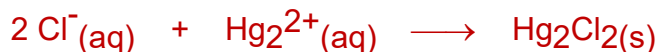
net ionic: (weak electrolyte formation)



molecular:



net ionic: (precipitate formation)



3. (5 points) **SHOW ALL WORK.** A sample of helium passes through a certain membrane in 75 sec. The same amount of an unknown noble gas requires 343 sec to pass through the same membrane. Identify the unknown gas by performing an appropriate calculation. The major concept related to this problem is known as Graham's Law of **Effusion**.

$$\text{Graham's Law of Effusion: } ER_{\text{He}} / ER_x = (FM_x / FM_{\text{He}})^{1/2}$$

but time \sim 1/rate (i.e., larger particles take longer to pass through the membrane)

$$\therefore \text{Time}_x / \text{Time}_{\text{He}} = (FM_x / FM_{\text{He}})^{1/2}$$

$$343 \text{ sec} / 75 \text{ sec} = (FM_x / 4.0 \text{ g/mole})^{1/2}$$

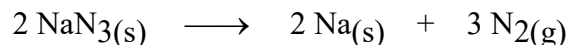
$$FM_x = 83.7 \text{ g/mole} \quad \therefore \text{the unknown noble gas is Kr}$$

4. (2 points) Write the oxidation number of each atom in $(\text{NH}_4)_3\text{SbO}_3$.



5. (2 points) BaO is the anhydride of **Ba(OH)₂**. The anhydride of HBrO₄ is **Br₂O₇**.

6. (5 points) **SHOW ALL WORK.** Automobile air bags inflate when a serious impact triggers the following chemical reaction. If the air bag has a volume of 24.5 L, determine the mass (in grams) of sodium azide that is required to inflate the bag to a pressure of 1250 torr at 23 °C. (molar masses: NaN₃ = 65.0, N₂ = 28.0, Na = 23.0)



$$n = \text{moles N}_2(\text{g}) = PV/RT$$

$$n = (1250 \text{ torr}) (1 \text{ atm} / 760 \text{ torr}) (24.5 \text{ L}) / (0.0821 \text{ L}\cdot\text{atm}/\text{mole}\cdot\text{K}) (296 \text{ K})$$

$$n = 1.66 \text{ mole N}_2$$

$$(1.66 \text{ mole N}_2) (2 \text{ mole NaN}_3 / 3 \text{ mole N}_2) (65.0 \text{ g/mole}) = 71.9 \text{ g NaN}_3$$