TEST 4, VERSION A

CHEM 1110.24492

Spring 2016, Dr. Potts

Put your **NAME, TEST VERSION,** and **ALL YOUR ANSWERS** on the **SCANTRON** and submit the scantron for grading. Do not wait until the end of the test to transfer your answers.

	IA												IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1 H 1.008	IIA																2 He 4.00
2	3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31	IIIB	IVB	VB	VIB	VIIB	VIIIB			IB	IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc [98]	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.40	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.60	53 I 126.90	54 Xe 131.30
6	55 Cs 132.9	56 Ba 137.3	71 Lu 175	72 Hf 178.5	73 Ta 181	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197	80 Hg 200.59	81 Tl 204.4	82 Pb 207.2	83 Bi 209	84 Po [209]	85 At [210]	86 Rn [222]
7	87 Fr [223]	88 Ra [226]	103 Lr [262]	104 Rf [267]	105 Db [268]	106 Sg [271]	107 Bh [272]	108 Hs [270]	109 Mt [276]	110 Ds [281]	111 Rg [280]	112 Uub [285]	113 Uut [284]	114 Uuq [289]	115 Uup [288]	116 Uuh [293]		118 Uuo [294]

	57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm [145]	62 Sm 150.4	63 Eu 152	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.93	68 Er 167.3	69 Tm 168.9	70 Yb 173
	89 Ac [227]	90 Th 232	91 Pa [231]	92 U 238	93 Np [237]	94 Pu [244]	95 Am [243]	96 Cm [247]	97 Bk [247]	98 Cf [251]	99 Es [252]	100 Fm [257]	101 Md [258]	102 No [259]

Part I (60pts). 15 multiple-choice questions worth 4 points each. Choose the ***best*** answer from the options given, and ***record your final answer on your scantron***.

1. What is the process in which molecules undergo a phase change directly from the solid phase to the gas phase?
A. sublimation B. deposition C. freezing D. condensation E. melting

2. Which of the following is a weak acid?
A. HF B. HBr C. HCl D. HNO_3 E. H_2SO_4

3. Which is the net ionic equation for the reaction between aqueous solutions of LiOH and HBr?
A. $Li^+(aq) + OH^-(aq) + H^+(aq) + Br^-(aq) \rightarrow H_2O(l) + LiBr(aq)$
B. $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
C. $LiOH(aq) \rightarrow Li^+(aq) + OH^-(aq)$
D. $HBr(aq) \rightarrow H^+(aq) + Br^-(aq)$
E. $Li^+(aq) + Br^-(aq) \rightarrow LiBr(aq)$

4. If aqueous solutions of ammonium sulfide and copper(II) nitrate are mixed, which insoluble precipitate is formed?
A. Cu_2S B. NH_4NO_3 C. $CuSO_4$ D. CuS E. $NH_4(NO_3)_2$

5. If aqueous solutions of Na_2CO_3 and $BaCl_2$ are mixed, which insoluble precipitate is formed?
A. Ba_2CO_3 B. $BaCO_3$ C. $NaCl_2$ D. BaO E. NaCl

6. Based on the solubility rules, which of these processes will occur if solutions of $CuSO_4(aq)$ and $BaCl_2(aq)$ are mixed?
A. No precipitate will form.
B. $CuCl_2$ will precipitate; Ba^{2+} and SO_4^{2-} are spectator ions.
C. $CuSO_4$ will precipitate; Ba^{2+} and Cl^- are spectator ions.
D. $BaCl_2$ will precipitate; Cu^{2+} and SO_4^{2-} are spectator ions.
E. $BaSO_4$ will precipitate; Cu^{2+} and Cl^- are spectator ions.

7. Based on the solubility rules, which one of these compounds is *soluble* in water?
A. Ag_2S B. Na_2S C. Ag_2CO_3 D. Hg_2Cl_2 E. $BaCO_3$

8. The location that indicates conditions under which two phases can exist in equilibrium is called the
A. transition state. B. phase diagram. C. phase boundary. D. critical point. E. triple point.

9. What is the net ionic equation if sodium sulfate is mixed with barium hydroxide?
A. $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$
B. $2Ba^+(aq) + SO_4^{2-}(aq) \rightarrow Ba_2SO_4(s)$
C. $Na^+(aq) + OH^-(aq) \rightarrow NaOH(s)$
D. $Ba^{2+}(aq) + 2OH^-(aq) \rightarrow Ba(OH)_2(s)$
E. $2Na^+(aq) + SO_4^{2-}(aq) \rightarrow Na2SO_4(s)$

10. Which of the following gases effuses most rapidly?
A. N_2 B. O_2 C. HCl D. NH_3 E. CO

11. What name is given to the phenomenon where a thin film of water contracts and adheres to the wall of a glass cylinder?
A. Cohesion B. Polarity C. Surface tension D. Capillary action E. Adhesion

12. Based on the solubility rules, which one of these compounds is *insoluble* in water?

A (A.) AgBr B. NaCl C. $ZnCl_2$ D. $MgBr_2$ E. $FeCl_2$

13. The distinguishing characteristic of all electrolyte solutions is that they

C A. contain molecules. D. conduct heat.
B. react with other solutions. E. always contain acids.
(C.) conduct electricity.

14. Based on the solubility rules, which one of these compounds is *soluble* in water?

C A. $PbSO_4$ B. $CaSO_4$ (C.) K_2SO_4 D. $BaSO_4$ E. Ag_2SO_4

15. Which chemical equation describes an *acid–base neutralization reaction*?

(A.) $LiOH(aq) + HNO_3(aq) \rightarrow LiNO_3(aq) + H_2O(l)$

A B. $2Al(s) + 3H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3H_2(g)$

C. $2KBr(aq) + Cl_2(g) \rightarrow 2KCl(aq) + Br_2(l)$

D. $2SO_2(g) + 2H_2O(l) + O_2(g) \rightarrow 2H_2SO_4(aq)$

E. $CaBr_2(aq) + H_2SO_4(aq) \rightarrow CaSO_4(s) + 2HBr(g)$

Part 2 (40pts). Calculations: Clearly (**and legibly**) show all work on the blank space on the scantron answer sheet for full credit. Do not wait until the end of the test to transfer your answers.

1. (10 pts) A sample of gas has an initial volume of 5.65 L at a pressure of 735 mmHg. If the volume of the gas is increased of 9.45 L, what is its new pressure in mmHg?

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$ $P_2 = \frac{P_1V_1}{V_2} = \frac{(5.65\,L)(735\,mmHg)}{9.45\,L} = 439\,mmHg$

2. (10 pts) A chemist wants to make 5.50 L of a 0.300 M $CaCl_2$ solution? What mass in grams should the chemist use? (MM of $CaCl_2$ = 110.98 g/mol) 5.50L 0.300 mol/L ?? g

$5.50\,L \times \frac{0.300\,mol\,CaCl_2}{L\,sol'n} \times \frac{110.98\,g\,CaCl_2}{1\,mol\,CaCl_2} = 183\,g\,CaCl_2$

3. (10 pts) Methanol gas can be synthesized by the reaction below. What volume of methanol gas is produced if 2.5L of CO is reacted with 3.5 L of H_2 at constant pressure and temperature?

LR problem 2.5L 3.5L ?? L

$CO(g) + 2\,H_2(g) \rightarrow CH_3OH(g)$

$2.5\,L\,CO \times \frac{1\,L\,CH_3OH}{1\,L\,CO} = 2.5\,L\,CH_3OH$ $3.5\,L\,H_2 \times \frac{1\,L\,CH_3OH}{2\,L\,H_2} = 1.8\,L\,CH_3OH$ (LR)

4. (10 pts) Oxygen gas reacts with powdered aluminum to make aluminum oxide according to the balanced reaction below. What mass of aluminum oxide is produced if 2.75 L of O_2 at 1.00 atm and 298K is reacted with excess aluminum? (MM of Al_2O_3 = 101.96 g/mol)

$PV = nRT$

$n = \frac{PV}{RT} = \frac{(1.00\,atm)(2.75\,L)}{(0.0821\,\frac{L\,atm}{mol\,K})(298\,K)}$

$4\,Al(s) + 3\,O_2(g) \rightarrow 2\,Al_2O_3(s)$

2.75L 1.00atm 298K ??g

$n = 0.112\,mol\,O_2 \times \frac{2\,mol\,Al_2O_3}{3\,mol\,O_2} \times \frac{101.96\,g\,Al_2O_3}{1\,mol\,Al_2O_3} = 7.61\,g\,Al_2O_3$