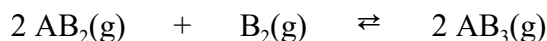


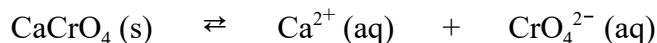
Name _____ Rec. TA/time _____

Show **ALL** your work or **EXPLAIN** to receive full credit.

1. (3 pts) For the following reaction $K_C = 25.8$. The reaction is started with 1.000 mole of AB_3 , 2.000 moles of AB_2 and 1.000 mole of B_2 in a 2.000-L container. Determine if the reaction is at equilibrium or not? If not, which direction will it proceed to reach equilibrium? **Show work and explain!**



2. (9 pts) For the following reaction K_C equals 7.10×10^{-4} , at $25^\circ C$.



- a) (4 pts) What are the **equilibrium** concentrations of Ca^{2+} and CrO_4^{2-} if solid $CaCrO_4$ is placed in water to form a saturated solution at $25^\circ C$? (**Show the ICE table. State any assumptions made and check your percent error.**)

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2. (Cont.)

b) (1 pts) For the system at equilibrium, what happens when $\text{CaCl}_2(\text{s})$, a soluble compound, is added?? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

c) (1 pts) For the system at equilibrium, what happens when **water** is **added** to the system? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

d) (1 pts) For the system at equilibrium, what happens when part of the CaCrO_4 is **removed**? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

e) (2 pts) Assuming the above reaction is endothermic, what happens when the temperature increases? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) Also, what happens to the value of K? **EXPLAIN!**

3. (9 pts) For the following reaction K_c equals 5.35×10^2 at 80°C .



a) (4pts) What are the **equilibrium** concentrations of PH_3 and BCl_3 if 1.000 mole of each is placed in a 0.500-L vessel and allowed to react until equilibrium is reached? (**Show the ICE table. When appropriate, state any assumptions made and check your percent error.**)

NOT on Carmen quiz - just for practice

b) (1 pt) For the system at equilibrium, what happens to the reaction when the **pressure is increased** by adding Ne (an inert gas) at **constant temperature and volume**? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

c) (1 pt) For the system at equilibrium, what happens to the reaction when PH_3 is **added**? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

d) (1 pt) For the system at equilibrium, what happens to the reaction when **all** the PH_3BCl_3 is **removed**? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) **EXPLAIN!**

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3. (Cont.)

e) (2 pts) Assuming the above reaction is exothermic, what happens when the temperature decreases? (i.e. does the equilibrium shift and if so in what direction? If no shift then why not.) Also, what happens to the value of K? **EXPLAIN!**

4. (2 pts) What is(are) the difference(s) between the **Arrhenius** and **Bronsted-Lowry** definitions of a **base**? **Not on quiz - just for practice.**

5. (3 pts) What is the **conjugate acid** of $\text{H}_2\text{P}_2\text{O}_7^{2-}$?

6. (2 pts) Which of the following are **strong** acids or **strong** bases? (Circle all that apply.)



7. (5 pts) A saturated solution of $\text{Ca}(\text{OH})_2$ has a $[\text{Ca}^{2+}]$ of 0.15 M. What is the pH of the solution? (atomic weights: Ca = 40.08, O = 16.00, H = 1.008)

8. (6 pts) A 0.0100 M solution of an acid is 19.0% ionized at 25 °C. **Show all work or explain!**

a) What are the $[\text{H}^+]$ and **pH** of this solution?

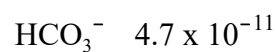
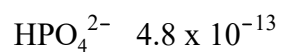
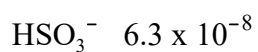
b) What is the K_a for the acid? **Show the ICE table.**

9. (11 pts) You have a solution of 0.0942 M aniline, $C_6H_5NH_2$, with $K_b = 4.3 \times 10^{-10}$, at $25^\circ C$. (**Show the ICE table, state any assumptions made and check your percent error.**) **Show all work or explain!**

a) What are $[H^+]$, $[OH^-]$, pH and pOH in this solution?

b) What is the **percent ionization** for $C_6H_5NH_2$ in this solution?

10. (3 pts) Given the following K_a values, determine which species is the **strongest base**. **Explain!**



USEFUL INFORMATION

$$R = 0.08206 \text{ L-atm/mol-K} = 8.3145 \text{ J/mol-K}$$

$$K_p = K_c (RT)^{\Delta n}$$

$$K_w = [H_3O^+][OH^-] = 1.0 \times 10^{-14} \quad (\text{at } 25^\circ\text{C})$$

$$pH = -\log[H_3O^+]; \quad pOH = -\log[OH^-]; \quad pK_w = -\log[K_w]$$

$$\text{for } ax^2 + bx + c = 0, \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

	IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA		
1	1.008 H 1															4.003 He 2		
2	6.941 Li 3	9.012 Be 4									10.811 B 5	12.011 C 6	14.007 N 7	15.999 O 8	18.998 F 9	20.179 Ne 10		
3	22.990 Na 11	24.305 Mg 12									26.98 Al 13	28.09 Si 14	30.974 P 15	32.06 S 16	35.453 Cl 17	39.948 Ar 18		
4	39.098 K 19	40.08 Ca 20	44.96 Sc 21	47.88 Ti 22	50.94 V 23	52.00 Cr 24	54.94 Mn 25	55.85 Fe 26	58.93 Co 27	58.69 Ni 28	63.546 Cu 29	65.38 Zn 30	69.72 Ga 31	72.59 Ge 32	74.92 As 33	78.96 Se 34	79.904 Br 35	83.80 Kr 36
5	85.47 Rb 37	87.62 Sr 38	88.91 Y 39	91.22 Zr 40	92.91 Nb 41	95.94 Mo 42	98 Tc 43	101.07 Ru 44	102.91 Rh 45	106.42 Pd 46	107.87 Ag 47	112.41 Cd 48	114.82 In 49	118.69 Sn 50	121.75 Sb 51	127.60 Te 52	126.90 I 53	131.39 Xe 54
6	132.91 Cs 55	137.33 Ba 56	138.91 La 57	178.39 Hf 72	180.95 Ta 73	183.85 W 74	186.21 Re 75	190.23 Os 76	192.22 Ir 77	195.08 Pt 78	196.97 Au 79	200.59 Hg 80	204.38 Tl 81	207.2 Pb 82	208.98 Bi 83	209 Po 84	210 At 85	222 Rn 86
7	223 Fr 87	226.03 Ra 88	227.03 Ac 89	261 Rf 104	262 Ha 105	263 Sg 106	262 Ns 107	265 Hs 108	266 Mt 109	269 110	272 111	277 112						

Lanthanide Series	140.12 Ce 58	140.91 Pr 59	144.24 Nd 60	145 Pm 61	150.36 Sm 62	151.96 Eu 63	157.25 Gd 64	158.93 Tb 65	162.50 Dy 66	164.93 Ho 67	167.26 Er 68	168.93 Tm 69	173.04 Yb 70	173.04 Lu 71
Actinide Series	232.04 Th 90	231.04 Pa 91	238.03 U 92	237.05 Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103

A PERIODIC CHART OF THE ELEMENTS
(Based on ¹²C)