

Name (please print)

CHEMISTRY 128
HOUR TEST 2
June 20, 2003

USEFUL INFORMATION:

$$N = 6.022 \times 10^{23} \quad R = 0.08206 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} = 0.0083145 \frac{\text{kJ}}{\text{mol} \cdot \text{K}} \quad K_w = 1 \times 10^{-14}$$

$$\text{pH} = -\log[\text{H}_3\text{O}^+] \quad \text{pK}_a = -\log(K_a) \quad \text{pOH} = -\log[\text{OH}^-] \quad K_w = [\text{H}_3\text{O}^+][\text{OH}^-]$$

$$K_w = (K_a)(K_b) \quad \text{pH} = \text{pK}_a + \log\left(\frac{[\text{A}^-]}{[\text{HA}]}\right) \quad y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1 IA	2 IIA																18 VIIIA
1 H 1.008	2 He 4.00											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	
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
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 -	9 VIIB	10 -	11 IB	12 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
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	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 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.91	36 Kr 83.30
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 98.91	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.34	71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.98	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226.03	103 Lr 262.1	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt									

57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 146.92	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04
89 Ac 227.03	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu 239.05	95 Am 241.06	96 Cm 247.07	97 Bk 249.08	98 Cf 251.08	99 Es 254.09	100 Fm 257.10	101 Md 258.10	102 No 255

There Are 6 Pages On This Test Including This Cover Page.
The Test Contains 100 Points.

I. (45 points) Short Answers

1. (6 points) Circle the stronger acid.



2. (6 points) Complete the following table.

Conjugate Acid

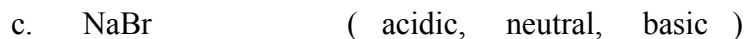
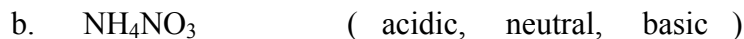
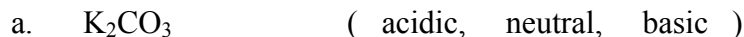
Conjugate Base



3. (4 points) Circle the strong acid(s) and put a box around the strong base(s) of the following list.



4. (9 points) Indicate by circling the correct answer if a 0.10 M solution is acidic, basic, or neutral.

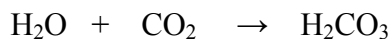


5. (8 points) Answer the following:

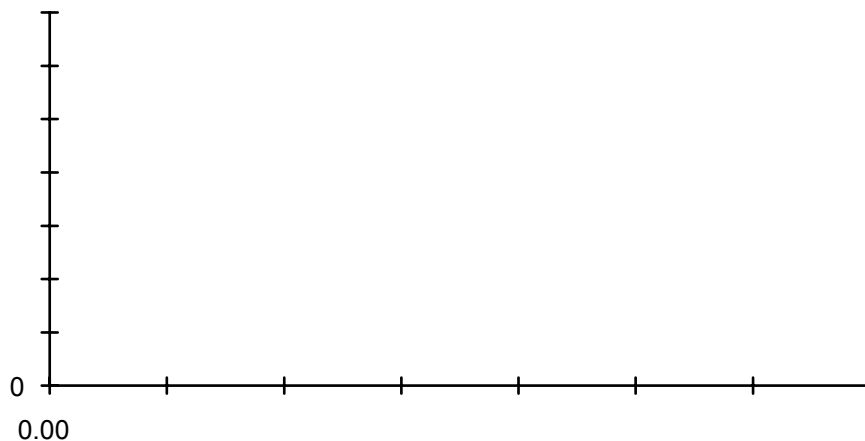
a. What ions immediately form when K_2HPO_4 dissolves in H_2O ?

b. Write out the reaction of each ion from part a, if any, with H_2O (Write NR if no reaction).

6. (4 points) In the following reaction, circle the Lewis acid and put a box around the Lewis base.



7. (8 points) Sketch a curve showing pH as a function of the added volume of NaOH solution for the titration of 25.00 mL of 0.050 M benzoic acid ($C_6H_5O_2H$, $K_a = 6.8 \times 10^{-5}$) with 0.025 M NaOH. Label the axes. Do NOT do hard-core calculations. Simply approximate the pH of the 4 regions of the curve. On the curve, mark the approximate equivalence point with an X.



II. (55 points) Calculations. **Show clear, complete setup for full credit.**

8. (8 points) Calculate the pH of a 0.250 M solution of glycolic acid ($HC_2H_3O_3$, $K_a = 1.48 \times 10^{-4}$)

9. (8 points) Calculate the pH of a 0.00430 M solution of $\text{Ca}(\text{OH})_2$.

10. (10 points) Calculate the pH of a 0.025 M solution of $\text{C}_5\text{H}_5\text{NHCl}$ given that the K_b of $\text{C}_5\text{H}_5\text{N}$ is 1.5×10^{-9} .

11. (15 points) A 0.50 L sample of 0.30 M Concordic acid was found to have a pH of 2.25.

a. Calculate the K_a of Concordic acid.

b. When 61.7 g of the sodium salt of Concordic acid (sodium Concordide) was added to the solution of part a, the pH was found to be 4.14. Calculate the molecular mass (in grams/mole) of sodium Concordide.

12. (14 pts) A 50.00 mL sample of 0.0250 M HCN ($K_a = 6.2 \times 10^{-10}$ M) is titrated with 25.00 mL of 0.0500 M NaOH, calculate the pH of the resulting solution.