

Name: _____

date: _____

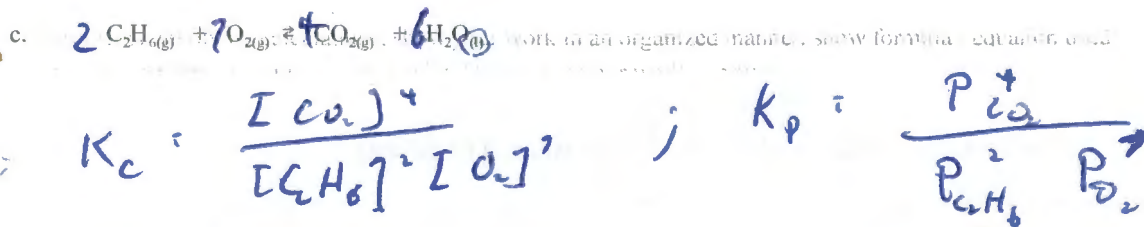
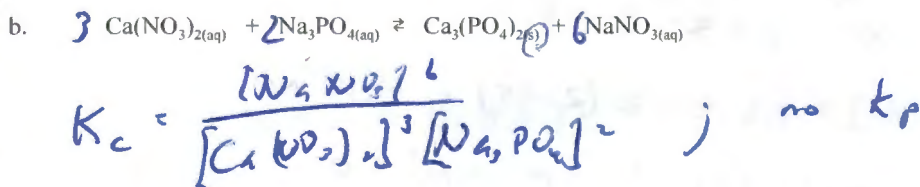
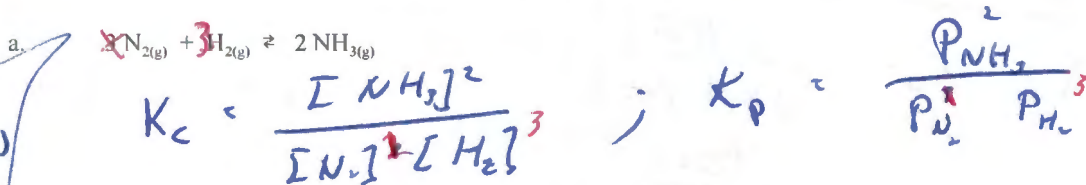
period: _____

Ch. 18 & 19 equilibrium & acid / base / pH test 65 points (2 ec)

honors chemistry

For problems, involving calculations, show your work in an organized manner, show formula / equation used, include the appropriate units and conversion factor(s) in your work / answer.

1. Write the algebraic expression of the equilibrium constant, K_c and K_p , for the following chemical reactions; if it does not exist, then clearly state it. [10 points]



2. Based on the below table, what is the numeric value of the equilibrium constant, K_c , for the reaction: 3



	N_2 (M)	H_2 (M)	NH_3 (M)
[initial]	5.0	3.0	2.0
[change]	-0.5 -4.5	-1.5	+3.0
[equilibrium]	4.5 0.5	1.5	3 3

$K_c = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3} = \frac{3^2}{0.5 \cdot (1.5)^3} = 133$

$\frac{3^2}{(4.5) \cdot (1.5)^3} = 0.59$

1/2 2 (1 pt)

3. In the reaction: $\text{Br}_{2(g)} + \text{H}_{2(g)} \rightleftharpoons 2 \text{HBr}_{(g)}$; $K_c = 10$; what is the equilibrium concentration of HBr by mixing 3.0 M Br_2 and 4.0 M H_2 . [15 points]

i) $\text{Br}_2 + \text{H}_2 \rightleftharpoons 2 \text{HBr}$

	3	4	0
I	3	4	0
Δ	-x	-x	+2x
E	3-x	4-x	2x

ii) $K_c = \frac{[\text{HBr}]^2}{[\text{Br}_2][\text{H}_2]}$

$10 = \frac{(2x)^2}{(3-x)(4-x)}$

$x = 4.58; 2.09$

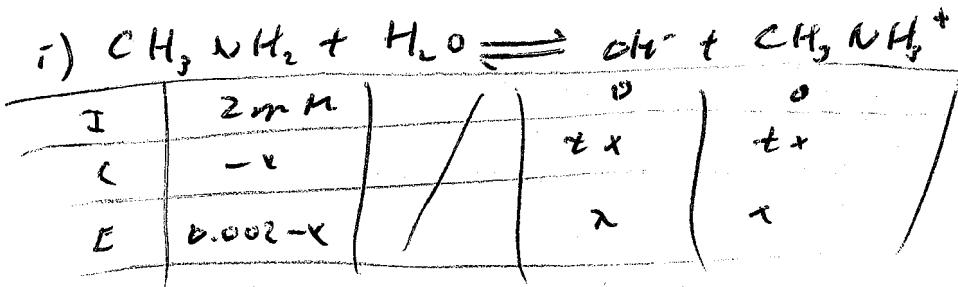
iii) $[\text{HBr}] = 2x = 2(2.09) = 4.18 \text{ M}$
 not 4.58 b/c $[\text{reactants}] < 0$

4. Fill-in the below table; need not show your work. [12 points]

pH	$[\text{H}^+]$ (M)	$[\text{OH}^-]$ (M)
6.5	$10^{-6.5}$ $3.16 \cdot 10^{-7}$	$3.16 \cdot 10^{-8}$
4.70	$2.0 \cdot 10^{-5}$	$5.0 \cdot 10^{-10}$
10.70	$2.0 \cdot 10^{-11}$	$5.0 \cdot 10^{-4}$

2pts @

5. What is the pH of a 2.0 mM aqueous solution of methylamine. [20 points]



ii)
$$K_b = \frac{[\text{OH}^-][\text{CH}_3\text{NH}_3^+]}{[\text{CH}_3\text{NH}_2]}$$

$$4.4 \cdot 10^{-4} = \frac{x^2}{0.002 - x}$$

3

$$x = -0.0012 ; 0.00074$$

iii) $[\text{OH}^-][\text{H}^+] = 10^{-14}$

$$(0.00074)[\text{H}^+] = 10^{-14}$$

$$[\text{H}^+] = 1.34 \cdot 10^{-11}$$

iv) $\text{pH} = -\log[\text{H}^+]$

$$= -\log(1.34 \cdot 10^{-11})$$

$$= 10.87$$

5 pts @