

.....Each of the following questions is worth 7 points.....

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1. **K-TYPE Answer Format:** Mark *a* if A,B,C are correct; *b* if A, C; *c* if B, D; *d* if D only; *e* otherwise.

- A. If a reaction has a relatively small amount of products and large amounts of reactants at equilibrium, the equilibrium constant for the reaction would probably be less than 1.
- B. A reaction with a large K would proceed very slowly.
- C. A solution of aqueous ammonia would contain relatively few ions.
- D. Solubility of a gas in water decreases as pressure of the gas above the water increases.

2. The top of a funnel is tightly covered with a semi-permeable membrane, the funnel is inverted in a beaker containing a solution of 0.2 m urea and the funnel is then filled with a solution of 0.3 m urea. Choose the correct statements regarding the apparatus.

K-TYPE answer format:

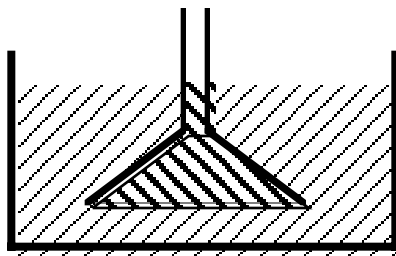
Mark *a* if A,B,C are correct;

b if A, C;

c if B, D;

d if D only;

e otherwise.



- A. If the system above is allowed to proceed to equilibrium, water rises in the stem of the funnel.
- B. The amount of urea in the funnel does not change as the system goes to equilibrium.
- C. Water flows from the beaker into the funnel as the system goes to equilibrium.
- D. The concentration of the solution in the beaker decreases as the system goes to equilibrium.

Chemistry 1020 Sample 5 for Hour Exam #4 (11A, 11B, & 13) Revised by SJB, 4/2002

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3. What is the maximum number of milliliters of 1.2 M potassium bromite which could be prepared from 4.51 grams of potassium bromite and water?
- A. 3.6×10^1 mL B. 2.8×10^1 mL C. 2.5×10^1 mL D. 2.5×10^{-2} mL E. 3.8×10^3 mL
4. At a temperature where all substances are gases, the equilibrium constant for the reaction $2 \text{NH}_3 = 3 \text{H}_2 + 1 \text{N}_2$ is found to be 1.8×10^{-3} . If 0.18 moles of NH_3 , 0.22 moles of H_2 , and 0.53 moles of N_2 are mixed in a 16 liter container, then
- A. $Q = 6.8 \times 10^{-4}$ and the system reaches equilibrium by increasing the amount of H_2 .
B. $Q = 1.7 \times 10^{-1}$ and the system reaches equilibrium by increasing the amount of H_2 .
C. $Q = 6.8 \times 10^{-4}$ and the system reaches equilibrium by decreasing the amount of H_2 .
D. $Q = 1.7 \times 10^{-1}$ and the system reaches equilibrium by decreasing the amount of H_2 .
E. none of the above
5. Given the reaction, $2 \text{SO}_2 + 1 \text{O}_2 = 2 \text{SO}_3$ (all gases), what happens overall if SO_3 is removed from the system in equilibrium?
- A. The amount of SO_3 and SO_2 decreases while that of O_2 increases.
B. The amount of SO_3 increases while the amounts of O_2 and SO_2 increase.
C. The amounts of SO_3 , SO_2 , and O_2 all decrease.
D. The amount of SO_3 and SO_2 decreases while that of O_2 remains constant.
E. The amount of SO_3 decreases while those of O_2 and SO_2 increase.

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6. How many milliliters of 0.24 M sodium hydroxide could be prepared by the dilution of 309 mL of 0.35 M sodium hydroxide?
- A. 3.2×10^3 mL B. 2.1×10^2 mL C. 4.5×10^2 mL D. 1.2×10^3 mL E. 9.2×10^2 mL
-
7. If 7 moles of X, 5 moles of Y and 10 moles of Z are placed in a container and allowed to reach equilibrium according to the equation $3 X + 2 Y = 3 Z$, how many moles of Y are there at equilibrium if there are 10 moles of X at equilibrium?
- A. 0 B. 2 C. 3 D. 10 E. 7
-
8. What is the molecular weight of an unknown if the substance does not dissociate in water and a solution prepared by dissolving 2.0 g of the substance in 75.0 grams of water has a freezing point of -0.500°C ? K_f for water = 1.86°C/m and K_b for water = 0.51°C/m .
- A. 2.48×10^1 g/mole B. 9.92×10^2 g/mole C. 27.2×10^2 g/mole
D. 1.40×10^2 g/mole E. 1.01×10^2 g/mole

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9. **K-TYPE** answer format: *Mark a if A,B,C are correct; b if A,C; c if B,D; d if D only; e otherwise.*
- A. The freezing point of 0.2 m potassium fluoride is the same as the freezing point of 0.2 m urea.
 - B. The vapor pressure of 0.5 m solution of sodium chloride is lower than that of a 0.2 m solution of sodium chloride.
 - C. The boiling point of 0.1 m solution of urea is higher than that of 0.1 m solution of sugar.
 - D. The osmotic pressure of 50 mL of a 0.10 m solution of sugar would be higher than the osmotic pressure of 50mL of 0.01 M of sugar solution.
10. How many grams of lithium peroxide must be mixed with 18.0 grams of water in order to obtain a solution which has a mole fraction of lithium peroxide equal to 0.63?
- A. 78 g B. 29 g C. 46 g D. 1.7 g E. 31 g
11. What is the equilibrium constant for $2 A(g) + 3 B(g) = 2 C(g)$ if an equilibrium mixture in a 5.0 liter container is found to consist of 2.0 moles of A, 6.0 moles of B, and 11 moles of C?
- A. 1.8×10^1 B. 1.4×10^2 C. 5.7×10^{-2} D. 1.4×10^{-1} E. 1.1×10^0

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12. What is the weight % of nitric acid in a solution which is 0.850 M in nitric acid? The specific gravity of the solution is 1.07.
- A. 10.0% B. 5.01% C. 14.4% D. 0.144% E. 13.5%
-
-
13. If the solubility of sodium chloride in water is 30 grams/100grams water at a certain temperature, how much water would be required to dissolve 45 grams of sodium chloride at that temperature?
- A. 30 mL B. 667 mL C. 100 mL D. 150 mL E. 300 mL
-
-
14. What would be the expected boiling point of a solution prepared by adding 8.12 grams of urea (gfw = 60.0) to 100.0 mL of water? K_f for water = $1.86^\circ\text{C}/\text{m}$ and K_b for water = $0.51^\circ\text{C}/\text{m}$.
- A. 101.45°C B. 102.51°C C. 100.69°C D. 97.48°C E. 100.31°C
-
-
15. Choose the substances which are soluble in water using **K-TYPE** answer format:
Mark a if A,B,C are soluble; b if A, C; c if B, D; d if D only; e otherwise.
- A. calcium perchlorate
B. strontium sulfate
C. potassium phosphate
D. mercury (II) bromide

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16. **CHALLENGE:** Given that X reacts to produce Y according to the equation $1 X = 1 Y$, how many moles of X would be present in a 10 liter container at equilibrium if 5 moles of both of the substances were placed in the container initially and the equilibrium constant for the reaction is 100?
- A. 0.99 B. 0.10 C. 5.1 D. 0.50 E. 0.010

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No. in Q-Bank	No. on Test	Correct Answer
5	3	1 B
15	3	2 A
2	3	3 C
11	3	4 A
10	3	5 C
1	3	6 C
8	3	7 E
7	3	8 B
14	3	9 C
3	3	10 A
9	3	11 A
16	3	12 B
4	3	13 D
6	3	14 C
13	3	15 B
12	3	16 B