

READ THESE DIRECTIONS CAREFULLY BEFORE STARTING THE EXAMINATION!

It is *extremely* important that you fill in the answer sheet EXACTLY as indicated, otherwise your test may not be processed; ALL entries are to be made on SIDE 1 of the answer sheet. Use a #2 pencil (or softer); fill in the circles completely and firmly. Erasures must be complete. Use only the following categories:

NAME:	Print your name starting at the first space, LAST NAME first, then a space, followed by your FIRST NAME, then another space, followed by your MIDDLE INITIAL. Fill in the <u>correct</u> circles below your printed name corresponding to the letters of your name; for the spaces, fill in the top blank circle.
STUDENT NUMBER:	This is VERY IMPORTANT! Put in your 8 DIGIT NEW STUDENT ID NUMBER (do not use the 9 at the beginning of your number) beginning in column A and continuing through column H, column I will be blank, (do NOT use column J at this time) under IDENTIFICATION NUMBER; be sure to fill in the correct circles (a common error to be avoided is mistaking "0" for "1").
TEST FORM:	Fill in the "2" blank in the J column under IDENTIFICATION NUMBER (to indicate Final Examination).
SPECIAL CODES:	Use for course and section number; in positions K-P write in one of the following: 113-001, 002, 003, 004, 005 or 006.
SIGNATURE:	You MUST sign the examination answer sheet (bubble sheet) on the line directly above your printed name. Use your legal signature.

Answering Questions:

Starting with answer "1" on SIDE 1, fill in the circle indicating the one best answer for each of the 25 questions in this examination. Your score is the sum of the appropriate credit for each response.

BE SURE THAT YOUR TEST HAS 25 QUESTIONS, A PERIODIC TABLE AND TWO SHEETS OF SCRATCH PAPER.
You may NOT use your own scratch paper during this examination.

Material Covered On Exam 1 - Questions 1-7

1. You accidentally spill a one liter bottle of 6 M sodium hydroxide on yourself. What should you do?

- A. Try to wipe it off with paper towels.
 - B. Splash water on yourself from the sink.
 - C. Start screaming and run out of the lab.
 - D. Go directly to the safety shower, start the shower and remove your clothes.
-

2. Which of the following statements is true?

- A. All aqueous waste can be poured down the drain with excess water.
 - B. All solid waste can be disposed of in the trash can.
 - C. Organic waste should be placed in the appropriate waste container.
 - D. Broken glass can be put in the trash can if it is wrapped in paper towels.
-

3. Which of the following solutions will form a precipitate when an Na_2CO_3 solution is added to it?

- A. NaCl
 - B. MgCl_2
 - C. KNO_3
 - D. A precipitate will not form with any of the solutions given.
-

4. Use the attached flow chart to determine the identity of a solution which exhibited the following properties:

- soluble in water
- basic pH
- forms bubbles upon the addition of vinegar

- A. CaCO_3
 - B. NaCl
 - C. NaHCO_3
 - D. NaOH
-

5. Use the attached flow chart for this question. Which of the following tests would distinguish between $\text{Na}_2\text{B}_4\text{O}_7$ and Na_2CO_3 ?

- A. Solubility in water
 - B. pH
 - C. Vinegar test
 - D. Flame test
-

6. What is the freezing point of a potassium chloride solution prepared from 32.0 g of the solute in 150.0 mL of water? $K_f(\text{water}) = 1.86 \text{ }^\circ\text{C}/\text{m}$?

- A. $-10.6 \text{ }^\circ\text{C}$
 - B. $+10.6 \text{ }^\circ\text{C}$
 - C. $-5.3 \text{ }^\circ\text{C}$
 - D. $+5.3 \text{ }^\circ\text{C}$
-

7. Which of the following solutions will have the highest boiling point?

- A. 0.075 m AlCl_3
 - B. 0.100 m NaCl
 - C. 0.125 m MgCl_2
 - D. 0.150 m KBr
-

Material Covered Since Exam 1 - Questions 8-25

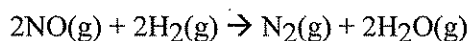
8. What are the units of k for a second order reaction?

- A. $\frac{1}{M^2 \cdot s}$ B. $\frac{M}{s}$ C. $\frac{1}{M \cdot s}$ D. $\frac{1}{s}$
-

9. Biochemists often define Q_{10} for a reaction as the ratio of the rate constant at 37°C to the rate constant at 27°C. What is the activation energy for a reaction that has a Q_{10} of 2.5?

- A. 761 J/mol B. 71 kJ/mol C. -761 J/mol D. -71 kJ/mol
-

10. What is overall order for the reaction shown based on the given data?



Trial	[NO] (M)	[H ₂] (M)	Initial Rate (M/s)
1	0.10	0.10	1.23×10^{-3}
2	0.10	0.20	2.46×10^{-3}
3	0.20	0.10	4.92×10^{-3}

- A. 1 B. 2 C. 3 D. 4
-

11. A solution is prepared by combining 25.0 mL of 0.10 M KNO₃, 35.0 mL of 0.30 M K₂SO₄, and 20.0 mL of 0.25M NaNO₃. What is the concentration of K⁺?

- A. 0.29 M B. 0.16 M C. 0.23 M D. 0.39 M
-

12. A bottle of hydrochloric acid is labeled "20.2% by mass, density = 1.096 g/ml". What is the molarity of the HCl solution?

- A. 0.671 M B. 0.221 M C. 5.06 M D. 6.07 M
-

13. What is the correct equilibrium constant expression for the reaction



- A. $K_c = \frac{[\text{NH}_3][\text{H}_2\text{S}]}{[\text{NH}_4\text{HS}]}$ C. $K_c = \frac{1}{[\text{NH}_3][\text{H}_2\text{S}]}$
- B. $K_c = \frac{[\text{NH}_4\text{HS}]}{[\text{NH}_3][\text{H}_2\text{S}]}$ D. $K_c = [\text{NH}_3][\text{H}_2\text{S}]$
-

14. The absorbance of a 0.25 M FeSCN^{2+} is 0.50. What is the concentration of an FeSCN^{2+} which has an absorbance of 0.35? Assume the solution obeys Beer's Law.

- A. 0.35 M B. 0.60 M C. 0.17 M D. 0.70 M
-

15. Which of the following statements is false?

- A. The equilibrium constant is usually independent of temperature.
B. A system that is disturbed from an equilibrium condition responds in a manner to restore equilibrium.
C. The value of the equilibrium constant for a given reaction mixture, under the same temperature and pressure, is the same regardless of the direction from which equilibrium was attained.
D. Equilibrium is the point at which the rates of the forward and reverse reactions are equal.
-

16. 25.00 mL of H_3PO_4 is titrated to the final equivalence point with 14.3 mL of 0.50 M $\text{Ba}(\text{OH})_2$. What is the concentration of the original H_3PO_4 solution?

- A. 0.29 M B. 0.19 M C. 0.58 M D. 0.43 M
-

17. A 0.1263 g sample of a monoprotic acid is titrated to the equivalence point using 15.83 mL of 0.1000 M NaOH. What is the molar mass of the acid?

- A. 12.53 g/mol B. 79.79 g/mol C. 1.263 g/mol D. 79.18 g/mol
-

18. A primary standard is used to determine the concentration of a solution with an unknown concentration. Which of the following characteristics are required for a substance to be a primary standard?

- I. Will not easily decompose at room temperature.
II. Can be easily dried.
III. Will not readily absorb water.

- A. I, II and III B. I only C. II and III only D. III only
-

19. Excess solid $\text{Mg}(\text{OH})_2$ was added to a solution and allowed to stand for several days. The solution was filtered to remove excess solid $\text{Mg}(\text{OH})_2$ and then titrated with a standardized solution of HCl (concentration = 0.137 M). At the second equivalence point, 19.35 mL of HCl was used to titrate 25.00 mL of the saturated $\text{Mg}(\text{OH})_2$ solution. What is the K_{sp} of the solution?

- A. 1.19×10^{-3} B. 5.62×10^{-3} C. 2.65×10^{-3} D. 5.96×10^{-4}
-

20. Which of the following is true for a saturated solution?

- A. The concentration of the solute cannot be determined.
B. Stirring a solution will allow more solute to dissolve (under constant temperature and pressure).
C. A saturated solution contains the maximum amount of dissolved solute.
D. Saturated solutions can only be prepared for a few, select solutes.
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21. How many grams of PbCl_2 will dissolve in 250. mL of water? $K_{\text{sp}} = 1.6 \times 10^{-5}$

- A. 0.016 g B. 1.1 g C. 1.6×10^{-5} g D. 0.20 g
-

22. Which of the following acids, when paired with its conjugate base, would make the best choice for creating a buffer at a pH of 4?

- A. HCOOH , $K_{\text{a}} = 1.8 \times 10^{-4}$ C. H_2CO_3 , $K_{\text{a}} = 4.3 \times 10^{-7}$
B. NH_3 , $K_{\text{b}} = 1.8 \times 10^{-5}$ D. HCN , $K_{\text{a}} = 4.9 \times 10^{-10}$
-

23. What is the pH of a solution prepared from 100 mL of 0.5 M acetic acid and 4.1 g of solid sodium acetate (CH_3COONa)? Assume that the addition of the sodium acetate does not change the volume and that the system is at equilibrium. $K_{\text{a}}(\text{CH}_3\text{COOH}) = 1.8 \times 10^{-5}$.

- A. 3.7 B. 5.7 C. 4.7 D. 4.4
-

24. What mass of sodium acetate trihydrate ($\text{CH}_3\text{COONa} \cdot 3\text{H}_2\text{O}$) is needed to prepare 100. mL of a buffer with a pH = 4.30 in 0.1 M acetic acid (CH_3COOH)? K_{a} for acetic acid = 1.75×10^{-5}

- A. 0.48 g B. 4.8 g C. 0.035 g D. 0.0035 g
-

25. Consider a solution which is 0.15 M in HF and 0.10 M in KF. Which of the following statements are true?

- I. If NaOH is added, potassium ion reacts with the hydroxide ion.
II. If a small amount of NaOH is added, the pH increases very slightly.
III. If HNO_3 is added, hydrogen ion reacts with fluoride ion.
IV. If more KF is added the pH decreases.

- A. I, III, and IV B. II and III C. II and IV D. III
-

NaCl, NaHCO₃, CaSO₄, Sucrose, CaCO₃, NaOH, Na₂CO₃,
Cornstarch, MgSO₄, H₃BO₃, KHC₄H₄O₆, Na₂B₄O₇

Water

Insoluble

Soluble

Cornstarch, CaCO₃,
CaSO₄, KHC₄H₄O₆

NaCl, H₃BO₃, NaOH, MgSO₄,
NaHCO₃, Na₂B₄O₇, sucrose, Na₂CO₃

I₂

pH

Deep blue

cornstarch

CaCO₃
CaSO₄
KHC₄H₄O₆

vinegar

Bubbles

CaCO₃

CaSO₄
KHC₄H₄O₆

6 M HCl

Dissolves

KHC₄H₄O₆

CaSO₄

6-7

8-10

10-12

NaCl
H₃BO₃
sucrose
MgSO₄

NaHCO₃
Na₂B₄O₇

Na₂CO₃
NaOH

2 M NaOH

vinegar

vinegar

Bubbles

White solid

MgSO₄

NaCl
H₃BO₃
sucrose

flame test

orange

green

NaCl

H₃BO₃

sucrose

Bubbles

NaHCO₃

Na₂B₄O₇

Bubbles

Na₂CO₃

NaOH

CHE 113 Final Exam Key

1. D
2. C
3. B
4. C
5. C
6. A
7. C
8. C
9. B
10. C
11. A
12. D
13. D
14. D
15. A
16. B
17. B
18. A
19. D
20. C
21. B
22. A
23. C
24. A
25. B