

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 Hour Examination II).
SPECIAL CODES:	Use for course and section number; in positions K-P write in the following:
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 30 questions in this examination. Your score is the sum of the appropriate credit for each response.

Grading and Reporting:

The examination scores will be posted in Blackboard within 96 hours after the examination. If an error has been made in scoring your answers, tell your instructor within 48 hours of the posting of your score.

BE SURE THAT YOUR TEST HAS 30 QUESTIONS, A PERIODIC TABLE, AND ONE SHEET OF SCRATCH PAPER. You may NOT use your own scratch paper during this examination. Cell phones and pagers are to be turned off and out of sight during the exams.

1. Which of the following best describes how to dispose of a 1.0 M HCl solution?

- A. Pour it down the drain.
- B. Pour it down the drain with additional water.
- C. Neutralize it and then pour it down the drain with additional water.
- D. Pour it in the organic waste container.

2. A student in the lab obtains the necessary reagents for the experiment. At the end of the lab session, the student realizes that they have an excess of one of the reagents. What should the student do with the excess reagent?

- A. Dispose of it in the appropriate waste container.
- B. Return it to the stock reagent bottle on the side bench.
- C. Leave it near the reagent bottles so someone in the next class can use it.
- D. Leave it on the lab bench so the next class can use it.

3. What is the electron pair geometry of BrF_3 ?

- A. Trigonal planar
- B. Trigonal bipyramid
- C. Tetrahedral
- D. T-shaped

4. Which of the following pairs a formula with the correct number of valence electrons?

- A. PCl_5 , 35 electrons
- B. I_3^- , 6 electrons
- C. CH_4 , 8 electrons
- D. NH_3 , 6 electrons

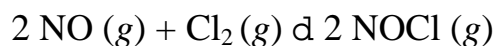
5. What is the boiling point elevation constant for benzene if 10.0 g of naphthalene (C_{10}H_8) is dissolved in 50.0 g of benzene (C_6H_6)? The boiling point of pure benzene and the solution are 80.1°C and 84.1°C , respectively.

- A. $0.0200^\circ\text{C}/\text{m}$
- B. $20.0^\circ\text{C}/\text{m}$
- C. $6.25^\circ\text{C}/\text{m}$
- D. $2.56^\circ\text{C}/\text{m}$

6. What mass of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) should be added to 75.0 g H_2O to raise the boiling point to 100.35°C ? K_b of water $0.52^\circ\text{C}/\text{m}$.

- A. 0.051 g
 - B. 4.9 g
 - C. 4.7 g
 - D. 17 g
-

7. The following data was collected for the reaction



Trial	Initial [NO]	Initial [Cl ₂]	Initial rate of formation of NOCl (M/s)
1	0.13	0.20	1.0×10^{-2}
2	0.26	0.20	4.0×10^{-2}
3	0.13	0.10	2.5×10^{-3}

What is the initial rate of formation of NOCl when the initial concentrations of both reactants are 0.15 M?

- A. 5.1×10^{-4} M/s C. 7.5×10^{-3} M/s
B. 2.2×10^{-2} M/s D. 3.3×10^{-1} M/s
-

8. What is the concentration in mass percent of a 6.0 M HCl solution (density = 1.18 g/cm³)?

- A. 19% B. 22% C. 14% D. 5.3%
-

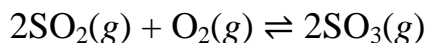
9. Methanol (CH₃OH) is produced according to the following reaction in the presence of ZnO/Cr₂O₃ catalyst.



Which of the following changes will lead to an increase in the amount of methanol formed?

- I. The temperature is increased.
II. The volume is decreased.
III. Helium is added.
IV. CO is added.
V. The catalyst is removed.
- A. II, III, and IV C. III and IV
B. I and V D. II and IV
-

10. A container containing only 0.750 atm of SO₃ proceeds to equilibrium according to the following reaction



If, at equilibrium, the pressure of SO₂ is 0.200 atm, what is the value of the equilibrium constant, K_p ?

- A. 76 C. 28
B. 3.8 D. 4.4
-

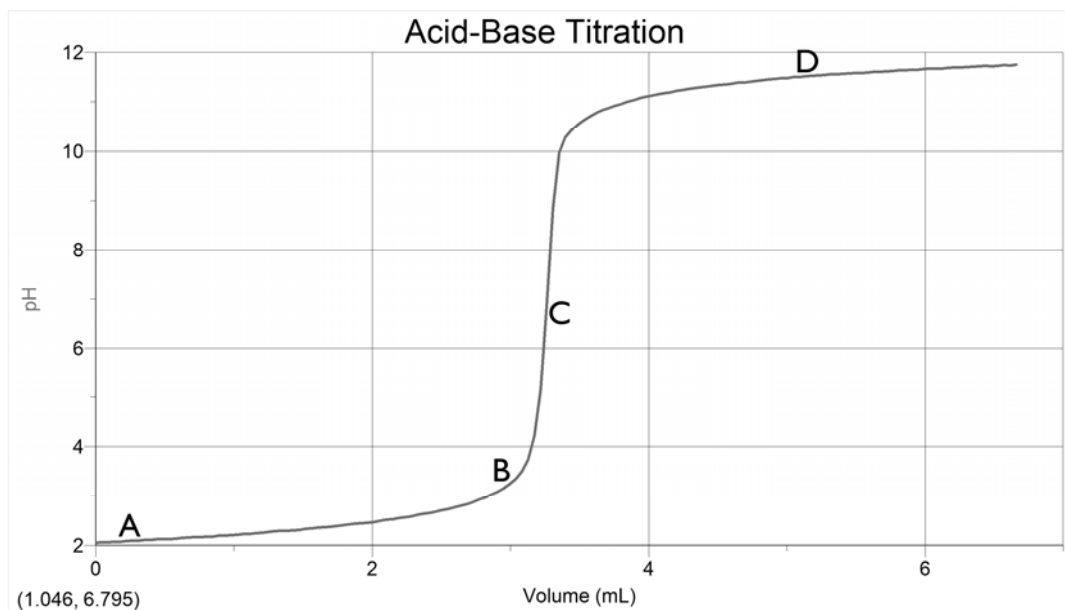
11. Which of the following statements is false regarding the correct use of a buret?

- A. A funnel used for filling the buret should be removed before taking any readings.
- B. A small volume should be drained from the buret before beginning an experiment to remove air bubbles from the tip.
- C. The volume can be estimated if the liquid is drained below the bottom marking on the buret.
- D. The volume can be read to two decimal places if the markings shown on the buret are to the tenth place.

12. 50.0 mL of $\text{Ba}(\text{OH})_2$ is titrated to the final equivalence point with 19.34 mL of 0.250 M H_3PO_4 . What is the concentration of the original $\text{Ba}(\text{OH})_2$ solution?

- A. 145 M
- B. 0.0967 M
- C. 0.0645 M
- D. 0.431 M

13. Which of the following points best indicates the equivalence point on this titration curve?



- A. A
- B. B
- C. C
- D. D

14. Which of the following is false about the properties of a primary standard?

- A. Pure compound that will not decompose at room temperature.
 - B. Compound that can be easily dried.
 - C. Will act as a buffer to resist changes in pH.
 - D. Will not readily absorb water.
-

15. What are the pH and pOH of 0.0841 M NaOH solution?

- A. pH = 1.075, pOH = 12.925 C. pH = 1.376, pOH = 12.624
B. pH = 12.925, pOH = 1.075 D. pH = 12.624, pOH = 1.376
-

16. A student has 25.0 mL of 3.0 M HCl solution but needs 0.620 M HCl solution. What volume of water should be added to the original HCl solution to make the needed concentration?

- A. 121 mL C. 46.5 mL
B. 96.0 mL D. 146 mL
-

17. Which of the following pairs can be used to prepare a buffer?

- A. H_2CO_3 and Na_2CO_3 C. HCl and NaCl
B. HCl and NaOH D. NaHSO_4 and Na_2SO_4
-

18. A buffer is prepared to be 0.250 M acetic acid ($\text{CH}_3\text{CO}_2\text{H}$) with a total volume of 500 mL. What mass of sodium acetate ($\text{CH}_3\text{CO}_2\text{Na}$) is needed to prepare a buffer with a pH of 4.25? K_a of acetic acid = 1.8×10^{-5} .

- A. 0.0809 g C. 31.7 g
B. 6.63 g D. 3.32 g
-

19. What is the pH of a buffer prepared from the combination of 2.436 g of potassium dihydrogen citrate (230.22 g/mol) and 1.021 g of citric acid (192.124 g/mol) in 100. mL of solution? K_a of citric acid = 7.1×10^{-4} .

- A. 3.45 C. 2.85
B. 3.53 D. 2.77
-

20. Which of the following statements is true regarding the correct use of a volumetric flask?

- A. If too much water is added to the volumetric flask, you can remove it without it affecting the concentration of the solution.
B. A volumetric flask can be used to accurately measure a single volume.
C. When filling a volumetric flask, the highest point of the meniscus should be even with the etched line.
D. Multiple volumes (i.e. 25 mL, 50 mL, 100 mL, etc) can be accurately measured using the same volumetric flask.
-

21. Which of the following shows the correct K_{sp} expression for the dissolution of copper(I) sulfide?

A. $\frac{[\text{Cu}^+]^2[\text{S}^{2-}]}{[\text{Cu}_2\text{S}]}$

C. $\frac{[\text{Cu}^+][\text{S}^{2-}]^2}{[\text{Cu}_2\text{S}]}$

B. $[\text{Cu}^+]^2[\text{S}^{2-}]$

D. $[\text{Cu}^+][\text{S}^{2-}]^2$

22. A saturated solution of $\text{Mg}(\text{OH})_2$ is prepared and filtered to remove any excess reagent. Experiments determine that the hydroxide concentration of the resulting solution is $3.00 \times 10^{-4} \text{ M}$. What is the K_{sp} of $\text{Mg}(\text{OH})_2$ under these conditions?

A. 4.50×10^{-8}

C. 1.08×10^{-10}

B. 1.80×10^{-7}

D. 1.35×10^{-11}

23. The K_{sp} of copper (I) bromide is 4.2×10^{-8} . What is the percent error in the K_{sp} value if an experiment finds that the concentrations of the copper and bromide ions in solution are both $1.99 \times 10^{-4} \text{ M}$?

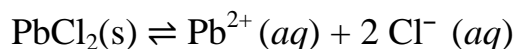
A. 5.7%

C. 47%

B. 1.2%

D. 12%

24. Lead chloride is only slightly soluble in water with a K_{sp} of 2.4×10^{-4} . What are the Pb^{2+} and Cl^- concentrations given the following solubility expression?



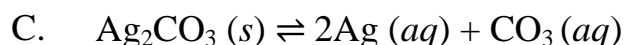
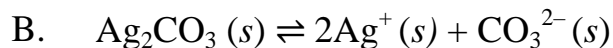
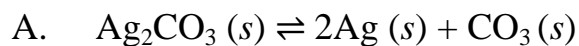
A. $[\text{Pb}^{2+}] = 0.039 \text{ M}$; $[\text{Cl}^-] = 0.078 \text{ M}$

B. $[\text{Pb}^{2+}] = 0.049 \text{ M}$; $[\text{Cl}^-] = 0.099 \text{ M}$

C. $[\text{Pb}^{2+}] = 0.011 \text{ M}$; $[\text{Cl}^-] = 0.022 \text{ M}$

D. $[\text{Pb}^{2+}] = 0.025 \text{ M}$; $[\text{Cl}^-] = 0.049 \text{ M}$

25. Which of the following is the correct K_{sp} expression for Ag_2CO_3 ?



26. Which of the following includes only substances that are considered soluble in water?

- A. KNO_3 , MgCO_3 , and Ba(OH)_2 C. NaOH , AgCl , and K_2S
B. MgSO_4 , NH_4Cl , and BaCl_2 D. Li_3PO_4 , Ca(OH)_2 , and PbBr_2
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27. An unknown solid is tested with vinegar by adding 10-20 drops to the solid sample. Bubbles form immediately in the resulting solution. Which of the following substances could be present?

- A. NaOH C. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
B. CaCO_3 D. MgSO_4
-

28. Which of the following substances will not have an increase in solubility in acid relative to its solubility in pure water?

- A. Ag_2CO_3 C. FeS
B. PbF_2 D. Hg_2Cl_2
-

29. Sodium hydroxide is added to a clear, colorless solution and a precipitate forms. Which of the following substances could form a precipitate when reacting with sodium hydroxide?

- I. AgNO_3 II. NaCl III. MgBr_2 IV. NH_4Cl
- A. I and II C. I and III
B. II and III D. III and IV
-

30. What is the nitrate concentration in a 0.5 M solution of aluminum nitrate?

- A. 0.5 M C. 1.5 M
B. 1.0 M D. Additional information needed.
-

Exam 2 Key

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