

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 <u>VERY IMPORTANT!</u> 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 your course and section number: (e.g. 113-00?)
SIGNATURE:	You <u>MUST</u> 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 40 questions in this examination. Your score is the sum of the appropriate credit for each response.

BE SURE THAT YOUR TEST HAS 40 QUESTIONS, A PERIODIC TABLE AND TWO SHEETS OF SCRATCH PAPER..
You may **NOT** use your own scratch paper during this examination.

1. When can you take your safety goggles off in the laboratory?
 - a. When no one is using chemicals, glassware, or equipment in the lab.
 - b. When you are not working with chemicals, glassware, or equipment.
 - c. While you are working in a fume hood.
 - d. Whenever your goggles are bothering you.

2. What should you do if you are working in the lab and some HCl splashes into your eye?
 - a. Wipe your eye with a wet paper towel for several minutes.
 - b. Nothing, the tears in your eye will eventually wash it out.
 - c. Rinse in the eye wash for at least 15 minutes.
 - d. Splash some water from the faucet into it.

3. When conducting an experiment that requires 0.1 M HNO₃, you notice that the bottle is empty. What you should you do?
 - a. Use half the volume of 0.2 M HNO₃.
 - b. Notify the TA.
 - c. Use 0.1 M HCl
 - d. Stop the experiment and go home.

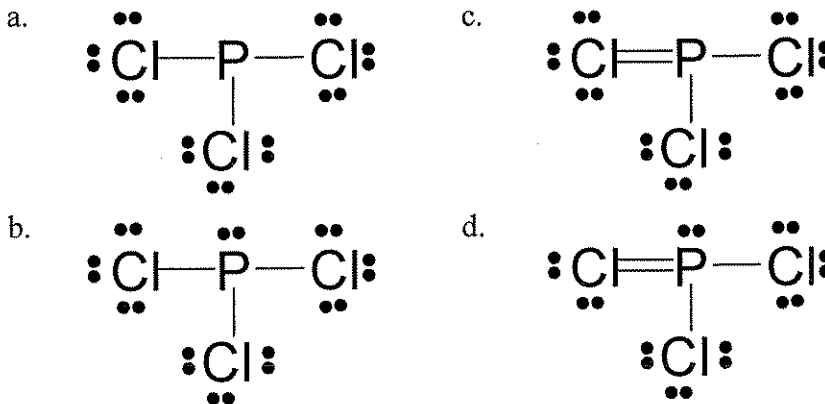
4. What is an MSDS?
 - a. A document listing all possible uses for a particular chemical.
 - b. A procedure for doing an experiment.
 - c. A form that should be completed in case of an accident.
 - d. A document outlining the hazards of a particular chemical.

5. When dispensing a liquid reagent from the bottle, you should
 - a. pour the approximate amount needed into a small beaker or flask and take it to your bench.
 - b. take the bottle to your bench and get the amount needed.
 - c. insert a dropper into the reagent bottle to get the amount needed.
 - d. All of the above are acceptable ways to dispense a liquid reagent.

6. What is the correct electron pair geometry for SF₄?
 - a. trigonal bipyramidal
 - b. tetrahedral
 - c. square planar
 - d. seesaw

7. How many valence electrons are in BrO₃⁻?
 - a. 24
 - b. 25
 - c. 26
 - d. 28

8. Which of the following is the best Lewis structure for PCl₃?



9. What is the molecular geometry (shape) of NH₃?

- a. trigonal planar
 b. trigonal pyramid
 c. T-shaped
 d. seesaw

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

- a. 0.50 m C₁₂H₂₂O₁₁
 b. 0.30 m KCl
 c. 0.30 m Ba(OH)₂
 d. 0.20 m LiBr

11. What is the freezing point of a 1.7 m solution of NaCl in water? K_f of water = 1.86 °C/m.

- a. -6.3°C
 b. 6.3°C
 c. -3.2°C
 d. 3.2°C

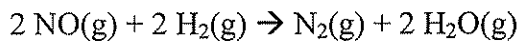
12. The boiling point of an unknown solvent was found to be 72 °C. A 2.0 m solution of a solute (i=1) was prepared and the boiling point of the solution was found to be 75 °C. What is the estimated boiling point of a 4.0 m solution?

- a. 76 °C
 b. 78 °C
 c. 144 °C
 d. 150 °C

13. What is the molality of a solution prepared from 45 g of CaCl₂ in 500. g of water?

- a. 1.2 m
 b. 0.090 m
 c. 0.41 m
 d. 0.81 m

14. What is the general rate law for the reaction shown based on the given data?



Expt #	[NO] (M)	[H ₂] (M)	Initial Rate (M/s)
1	0.10	0.10	1.23 x 10 ⁻³
2	0.10	0.20	2.46 x 10 ⁻³
3	0.20	0.10	4.92 x 10 ⁻³

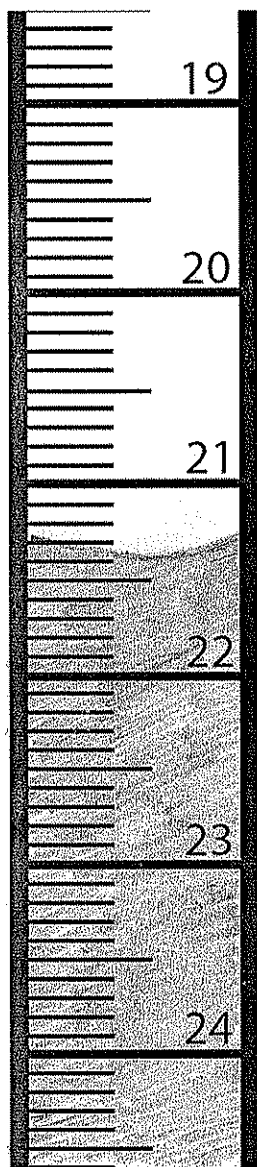
- a. rate = k[NO]²[H₂]²
 b. rate = k[NO]²[H₂]
 c. rate = k[NO]⁴[H₂]²
 d. rate = k[NO][H₂]

15. Which of the following best describes a catalyst?
- A catalyst is a reactant in the gas phase.
 - A catalyst is a product in the gas phase.
 - A catalyst lowers the activation energy of a reaction.
 - A catalyst is consumed in a reaction.
-
16. The activation energy of a reaction is 65.7 kJ/mol. How many times faster will the reaction occur at 50 °C than at 0 °C?
- 4.5
 - 158
 - 88
 - 1
-
17. What are the molarity and mass percent of a solution prepared by the combination of 25.0 g of KCl and 250. mL of water? Assume the volume of solution does not change with the addition of KCl. Density of water = 1.00 g/ml
- 1.22 M, 10.0%
 - 1.22 M, 9.09%
 - 1.34 M, 10.0%
 - 1.34 M, 9.09 %
-
18. Three solutions (listed below) are combined. Assuming the volumes are additive, what is the chloride concentration in the combined solution?
- 25.0 mL of 0.100 M MgCl₂
 - 40.0 mL of 0.250 M LiCl
 - 30.0 mL of 0.400 M KBr
- 0.158 M
 - 0.284 M
 - 0.223 M
 - 0.258 M
-
19. How much water should be added to 25.0 mL of 6.0 M HCl to make a solution that is 0.30 M? Assume volumes are additive.
- 500 mL
 - 1.25 mL
 - 475 mL
 - 139 mL
-
20. Ca(OH)₂ is a slightly soluble salt. Which of the following actions would increase the pH of a Ca(OH)₂ solution?
- Addition of water
 - Addition of HCl(aq)
 - Addition of Na₂CO₃(s)
 - None of the above
-
21. What is the equilibrium constant for the following equation if the initial concentration of N₂O₄ is 0.050 M and the final concentration is 90% of the original value?
- $$\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$$
- 1.6
 - 5.6×10^{-4}
 - 0.11
 - 2.2×10^{-3}
-

22. 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 only c. I, II, and III
b. II and III only d. III only
-
23. 25.00 mL of KOH is titrated to the equivalence point with 31.92 mL of 0.500 M H_2SO_4 . What is the concentration of the KOH solution?
- a. 1.28 M b. 0.638 M c. 0.319 M d. 0.783 M
-
24. The mass of a sample is measured three times and found to be 0.9182 g, 0.9273 g, and 0.9083 g. What is the average mass of the sample?
- a. 0.9182 g b. 0.918 g c. 0.9179 g d. 2.754 g
-
25. Determine the standard deviation in the following values: 1.352, 1.471, and 1.396.
- a. 0.0491 b. 0.0602 c. 0.0425 d. 0.838
-
26. Look at the image of the buret on the last page of the exam (after question 40). What is the best choice for the volume reading on the buret?
- a. 21.36 ml b. 22.64 mL c. 21.4 mL d. 22.6 mL
-
27. The density of a sample of oak wood is tested in the lab and found to be 0.835 g/mL. The accepted density value is 0.794 g/mL. What is the percent error in the experimental value?
- a. 4.91% b. 5.16% c. 95.1% d. 1.03%
-
28. 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 , $K_a = 1.8 \times 10^{-4}$ c. H_2CO_3 , $K_a = 4.3 \times 10^{-7}$
b. NH_3 , $K_b = 1.8 \times 10^{-5}$ d. HCN , $K_a = 4.9 \times 10^{-10}$
-
29. What is the molar mass of $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$?
- a. 164 g/mol b. 174 g/mol c. 236 g/mol d. 276 g/mol
-
30. 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 buffer with a pH = 4.30 in 0.1 M acetic acid (CH_3COOH)? K_a for acetic acid = 1.75×10^{-5} . Molar mass of $\text{CH}_3\text{COONa} \cdot 3\text{H}_2\text{O}$ = 124 g/mol.
- a. 0.0035 g b. 0.035 g c. 4.3 g d. 0.43 g

31. Which of the following best completes the sentence? A buffer solution
- Never changes in pH value no matter what is added.
 - Only resists changes to pH due to the addition of an acid.
 - Resists changes to pH when other reagents are added.
 - Only resists changes to pH due to the addition of a base.
-
32. Which of the following pairs cannot be combined to prepare a buffer solution?
- CH₃COOH and NaOOCCH₃
 - NH₃ and NH₄Cl
 - NaH₂PO₄ and Na₂HPO₄
 - HCl and NaCl
-
33. Which of the following best describes a saturated solution?
- A solution with at least 1 M concentration.
 - A solution in which the maximum amount of solute is dissolved.
 - A solution with multiple solutes dissolved in it.
 - A solution prepared from an insoluble solute.
-
34. Which of the following correctly show the concentration of both ions in a solution of 0.30 M MgBr₂? Assume that all of the solute is dissolved in solution.
- [Mg²⁺]=0.30 M, [Br⁻]=0.60 M
 - [Mg²⁺]=0.30 M, [Br⁻]=0.30 M
 - [Mg²⁺]=0.30 M, [Br⁻]=0.15 M
 - [Mg²⁺]=0.60 M, [Br⁻]=0.60 M
-
35. A sample of the slightly soluble salt, lead (II) chloride is placed in a beaker of water. If the concentration of the Pb²⁺ ion is 0.016M, what is the K_{sp} value for lead (II) chloride under these conditions?
- 0.016
 - 4.0 x 10⁻³
 - 2.8 x 10⁻³
 - 1.6 x 10⁻⁵
-
36. Which of the following statements is true for most solid solutes?
- Solubility increases as temperature increases.
 - Solubility increases as temperature decreases.
 - Solubility decreases as temperature increase.
 - There is no relationship between solubility and temperature for most solutes.
-
37. Which of the following correctly pairs its chemical name and common name?
- sodium carbonate, table salt
 - sodium borate, Borax
 - sodium chloride, baking soda
 - sucrose, table salt
-
38. Which of the following substances will generate CO₂ when combined with acetic acid (vinegar)?
- CaCO₃
 - H₃BO₃
 - MgSO₄
 - NaOH
-
39. Which of the following substances will not readily dissolve in water?
- NaCl
 - NaOH
 - MgSO₄
 - CaCO₃
-

40. Which one of the following tests will distinguish between all three of the following solutions: H_3BO_3 , NaOH , and NaCl ?
- a. Addition of vinegar to produce CO_2
 - b. pH
 - c. Flame test
 - d. Solubility in water



$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$\text{pH} = \text{pK}_a + \log \frac{[\text{conjugate base}]}{[\text{acid}]}$$

$$\ln \frac{k_2}{k_1} = \frac{E_a}{R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

(6)

113 FINAL EXAM Spring 2008

Question #

EXAM KEY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A	C	B	D	A	A	C	B	B	C	A	B	D	B	C	C	D	A	C	C	D	C	A	C	B	A	B	A	C	D	C	D	B	A	D	A	B	A	D	B