

CHEMISTRY 15
EXAM II-Version A (White)

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June 8, 2001

An optical scoring machine will grade this examination. The machine is not programmed to accept the correct one of two sensed answers and will not sense answers which are lightly marked. Mark your answer sheet carefully with a No. 2 soft lead pencil and erase any undesired marks **COMPLETELY**. Avoid making any extraneous marks on the answer sheet other than the information asked below.

On the answer sheet:

1. Print your name in the space for **NAME (Last name first, CIRCLE your last name)**.
2. In the space marked **SUBJECT** write **Chem 15**.
3. In the space marked **TEST NO.** write **EXAM #2**.
4. In the space marked **HOOR** write **Summer I' 2001**.
5. Check to see that you have 20 examination questions, periodic table, scratch paper and a scantron with **NO** mark in the upper right hand corner.

HAND IN ONLY THE ANSWER SHEET.

CHEM 15
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CHOOSE THE ONE BEST ANSWER

Summer I' 2001

1. What **volume (in mL)** of 0.35 N Ca(OH)_2 is needed to neutralize 30. mL of 0.25 N HCl?
 - A. 29 mL
 - B. 42 mL
 - C. 8.3 mL
 - D. 21 mL
 - E. 11 mL

2. When aqueous solutions of K_2CO_3 and AuCl_3 are mixed, the **products of the reaction** are:
 - A. KCl_2 and $\text{Au(CO}_3)_3$
 - B. KCl and $\text{Au}_2(\text{CO}_3)_3$
 - C. K_3Au and CO_3Cl_2
 - D. K_2Cl_3 and AuCO_3
 - E. KCl and Au_2CO_3

3. Predict products and write the net ionic equation for the aqueous reaction shown below.
The **spectator ions** are:
 $(\text{NH}_4)_2\text{SO}_4 + \text{CaCl}_2 \longrightarrow ?$
 - A. NH_4^+ and Cl^-
 - B. All ions are spectator ions. No net ionic equation can be written.
 - C. Cl^- only
 - D. SO_4^{2-} and Ca^{+2}
 - E. NH_4^+ only

4. Which of the following substances would be classified as a **weak acid** when dissolved in aqueous solution?
 - A. NH_3
 - B. HNO_3
 - C. NaOH
 - D. HNO_2
 - E. NaNO_3

5. Which of the substances in the last question would be classified as **strong electrolytes** when dissolved in water?
- A. HNO_3 , NaOH , and NaNO_3
 - B. NH_3 and NaOH
 - C. HNO_3 and HNO_2
 - D. NaNO_3 only
 - E. NH_3 and HNO_2
6. When aqueous solutions of the following substances are mixed, which **WILL** result in the formation of a **precipitate**? (HINT: Predict products.)
- A. $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ and NaBr
 - B. Na_3PO_4 and $\text{Al}(\text{NO}_3)_3$
 - C. KCl and $\text{Mg}(\text{ClO}_4)_2$
 - D. All of the above.
 - E. A and B.
7. An aqueous solution of a **weak base**
- A. produces protons when dissolved in water.
 - B. has a low concentration of hydroxide ions.
 - C. is classified as a non-electrolyte
 - D. contains only neutral molecules of the weak base.
 - E. conducts a strong electrical current.
8. Which one of the following statements pertaining to **Normality** is **TRUE**? (HINT: Don't guess. Work each one out.)
- A. 1 M H_2SO_4 is equal to 0.5 N H_2SO_4
 - B. 2 L of 3 N H_3PO_4 contains 1.5 eq.
 - C. 3 N $\text{Al}(\text{OH})_3$ is equal to 1 M $\text{Al}(\text{OH})_3$.
 - D. 6 mol H_2SO_3 contains 3 eq.
 - E. None of the above.
9. Derive empirical formulas for the substances shown below. Which has an **empirical formula of CH_2O** ?
- A. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
 - B. $\text{C}_{20}\text{H}_{42}\text{O}_2$
 - C. $\text{C}_{10}\text{H}_{22}\text{O}_4$
 - D. $\text{C}_{10}\text{H}_{20}\text{O}_5$
 - E. $\text{C}_6\text{H}_{12}\text{O}_6$

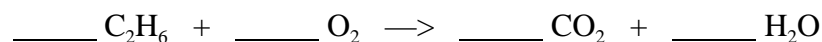
10. A compound is found to contain 82.7% carbon and 17.3% hydrogen. The **empirical formula** of this compound is:

- A. C_5H_{12}
- B. C_2H_5
- C. CH_3
- D. CH_4
- E. C_3H_8

11. A compound with a molar mass of 268.9 is found to contain 2.006 g Si and 7.597 g Cl. The **molecular formula** of this compound is:
(HINT: First find the empirical formula.)

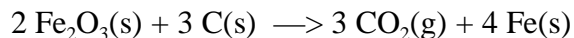
- A. Si_3Cl_5
- B. $SiCl_4$
- C. Si_4Cl_4
- D. Si_2Cl_6
- E. None of the above.

12. Balance the combustion reaction shown below. When balanced, the **coefficients ADD/SUM** to:



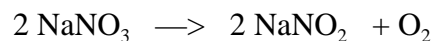
- A. 13
- B. 6
- C. 24
- D. 22
- E. 19

13. Iron is obtained by the reduction of iron ore, Fe_2O_3 , with coke, C. What **mass of coke, C**, is needed to completely react with 50. g Fe_2O_3 ?

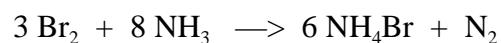


- A. 75 g
- B. 42 g
- C. 5.6 g
- D. 2.3 g
- E. 3.9 g

14. Sodium nitrate decomposes by the reaction shown below. During an experiment, decomposition of 955 g NaNO_3 resulted in the formation of 623 g NaNO_2 . The **percent yield of NaNO_2** for this reaction was:
(Molar masses: $\text{NaNO}_3=85.00$; $\text{NaNO}_2=69.00$)

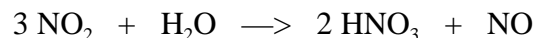


- A. 65.7%
 - B. 33.4%
 - C. 57.1%
 - D. 80.4%
 - E. 12.8%
15. Consider the reaction shown below.



If 0.20 mol Br_2 is reacted with 0.35 mol NH_3 , how many **moles of which reagent are left over** after the reaction?

- A. 0.15 mol NH_3
 - B. 0.18 mol NH_3
 - C. 0.07 mol Br_2
 - D. 0.13 mol Br_2
 - E. 0.02 mol Br_2
16. Consider the reaction shown below.



What **mass of HNO_3** can be produced by the reaction of 100. g NO_2 with 25.0 g of H_2O ?
(Molar masses: $\text{NO}_2=46.01$; $\text{H}_2\text{O}=18.02$; $\text{HNO}_3=63.02$)

- A. 91.3 g
- B. 122 g
- C. 46.7 g
- D. 61.8 g
- E. 177 g

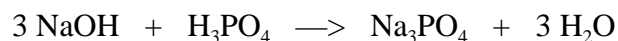
17. What **volume (in mL)** of 6.5 M HCl should be used to make 250. mL of 1.3 M HCl solution?

- A. 1250 mL
- B. 192 mL
- C. 34 mL
- D. 50. mL
- E. 76 mL

18. What **volume (in mL)** of 3.0 M NaCl solution will provide 0.171 mol NaCl?

- A. 57 mL
- B. 16 mL
- C. 30. mL
- D. 69 mL
- E. 0.030 mL

19. During a titration, 13.54 mL of 0.200 M NaOH solution is needed to neutralize 20.00 mL of H_3PO_4 solution. The **concentration of the H_3PO_4 solution** is:



- A. 0.760 M
- B. 0.0451 M
- C. 0.411 M
- D. 0.0989 M
- E. 0.131 M

20. Write the **net ionic equation** for the aqueous reaction that occurs in the previous question. The **spectator ions** are:

- A. Na^+ and PO_4^{-3}
- B. Na^+ only
- C. Na^+ and OH^-
- D. H^+ and OH^-
- E. H^+ and PO_4^{-3}

Exam II Version A (White)
Answer Key

Summer I' 2001

- | | | | |
|-----|---|-----|---|
| 1. | D | 11. | D |
| 2. | B | 12. | E |
| 3. | A | 13. | C |
| 4. | D | 14. | D |
| 5. | A | 15. | C |
| 6. | E | 16. | A |
| 7. | B | 17. | D |
| 8. | C | 18. | A |
| 9. | E | 19. | B |
| 10. | B | 20. | B |