

CHEMISTRY 101 EXAM 1

SECTIONS 540-550

Dr. Joy Heising

FORM 1J

September 26, 2003

Directions:

1. This examination consists of two parts: **17 multiple choice questions** (4 points each) in **Part 1** and **3 free response questions** (32 points total) in **Part 2**. The total point value for the exam is **100 points**.
2. Fill out your scantron sheet.
 - a. Do not forget to include your **SIGNATURE and ID number**.
 - b. Dept = CHEM, Course No. = 101
3. Fill in your **NAME, SIGNATURE and ID number** at the beginning of **Part 2** (stapled separately).
4. Use a #1 or #2 pencil for marking the scantron. Fill in the appropriate circles completely. You may write on the multiple choice questions.
5. DO NOT write on the envelope.
6. Read each multiple choice question **carefully**, then choose the **best answer** for each question. There is no penalty for guessing.
7. Write your answers in Part 2 **clearly** and **neatly**. Show your work for partial credit.
8. The last page of each Part is a sheet of scrap paper. You may tear it off.
9. When finished, put the **SCANTRON SHEET AND PART 2** back in the envelope and turn it in. You may keep Part 1 (this stapled portion).

PART 1 FORM 1

Multiple Choice (4 points each)

1. What is the symbol for the element magnesium?
 - a) Fe
 - b) Mo
 - c) Mn
 - d) Mg
 - e) Hg
2. What scientific (natural) law serves as the basis for balancing chemical equations by requiring that there be no observable change in the quantity of matter during a chemical reaction?
 - a) Law of Conservation of Energy
 - b) Law of Multiple Proportions
 - c) Law of Conservation of Matter
 - d) Law of Definite Proportions
 - e) Law of Constant Composition
3. A metal cube having a mass of 112 grams is dropped into a graduated cylinder containing 30.00 mL of water. This causes the water level to rise to 39.50 mL. What is the density of the cube?
 - a) 2.86 g/mL
 - b) 11.8 g/mL
 - c) 10.8 g/mL
 - d) 3.74 g/mL
 - e) 10.6 g/mL
4. Which of the following is a **PHYSICAL** property of O₂ (g) ?
 - a) It supports combustion
 - b) It condenses to a liquid at 219°C and atmospheric pressure
 - c) It causes iron to rust
 - d) It reacts with calcium to produce calcium oxide, CaO.
 - e) All of these are physical properties.
5. A sample of matter that can be decomposed into three different elements
 - a) must be a solution
 - b) must be a compound
 - c) must be a homogeneous mixture
 - d) must be a heterogeneous mixture
 - e) could be any of the preceding four answers

6. What is the molecular formula for hydrogen peroxide?

- a) H₂O
- b) H₂SO₄
- c) HO
- d) H₂O₂
- e) H₂O₃

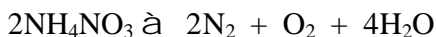
7. Choose the name-formula pair that is **INCORRECT**:

- a) calcium acetate Ca(CH₃COO)₂
- b) aluminum phosphate Al₂PO₄
- c) copper (II) hydroxide Cu(OH)₂
- d) ammonium sulfate (NH₄)₂SO₄
- e) sodium carbonate Na₂CO₃

8. How many atoms of H are contained in 0.341 moles of C₆H₈O₆?

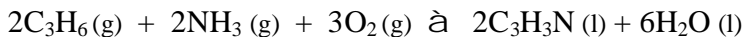
- a) 2.57 x 10⁻²
- b) 6.02 x 10⁻²³
- c) 2.05 x 10²³
- d) 1.23 x 10²⁴
- e) 1.64 x 10²⁴

9. Ammonium nitrate fertilizer is sometimes used as an explosive. How many moles of water can be formed from 13.2 moles of ammonium nitrate?



- a) 6.60
- b) 14.0
- c) 26.4
- d) 13.2
- e) 18.0

10. Acrylonitrile, an important building block for synthetic fibers and plastics, is synthesized in the following reaction:



If 75.0 g of propene are reacted with 75.0 g of ammonia in an excess of oxygen, which compound is **completely consumed** when the reaction is finished?

- a) propene
- b) ammonia
- c) oxygen
- d) acrylonitrile
- e) water

11. What mass of AgNO_3 , is required to prepare 600. g of 3.50 % solution of AgNO_3 ?
- 20.0 g
 - 18.4 g
 - 19.1 g
 - 21.0 g
 - 20.2 g
12. Calculate the molarity of a solution that contains 0.714 moles of H_2SO_4 in 560. mL of solution.
- 1.27 M
 - 3.42 M
 - 4.31 M
 - 4.89 M
 - 5.92 M
13. A laboratory stock solution is 1.50 M NaOH . Calculate the volume of this stock solution that would be needed to prepare 300. mL of 0.200 M NaOH .
- 2.25 mL
 - 10.0 mL
 - 40.0 mL
 - 1.00 mL
 - 0.100 mL
14. Consider the following formula unit equation. What is the **total ionic** equation?
- $$\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$$
- $\text{Ba}^{2+}(\text{aq}) + \text{Cl}^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{S}^{2-}(\text{aq}) + \text{O}^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
 - $\text{Ba}^{2+}(\text{aq}) + \text{Cl}^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) + \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
 - $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
 - $\text{Ba}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) + 2\text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{Na}^+(\text{aq}) + 2\text{Cl}^-(\text{aq})$
 - $\text{Ba}^{2+}(\text{aq}) + \text{Cl}^-(\text{aq}) + \text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
15. Which of the following is a strong and soluble base?
- $\text{Ni}(\text{OH})_2$
 - $\text{Fe}(\text{OH})_3$
 - $\text{Sr}(\text{OH})_2$
 - $\text{Cr}(\text{OH})_3$
 - CH_3COOH

16. Which of the following salts is **insoluble** in water?

- a) K_2SO_4
- b) $\text{Ca}(\text{CH}_3\text{COO})_2$
- c) CaCO_3
- d) NH_4Cl
- e) AgNO_3

17. Which of the following pairs is **INCORRECT**:

- a) neutralization reaction $\text{CsOH (aq)} + \text{HCl (aq)} \rightarrow \text{H}_2\text{O (l)} + \text{CsCl (aq)}$
- b) precipitation reaction $\text{BaCl}_2 \text{ (aq)} + \text{Na}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{BaSO}_4 \text{ (s)} + 2\text{NaCl (aq)}$
- c) metathesis reaction $\text{CaO (s)} + \text{CO}_2 \text{ (g)} \rightarrow \text{CaCO}_3 \text{ (s)}$
- d) decomposition reaction $2\text{NH}_4\text{NO}_3 \text{ (s)} \rightarrow 2\text{N}_2 \text{ (g)} + \text{O}_2 \text{ (g)} + 4\text{H}_2\text{O (l)}$
- e) displacement reaction $\text{Zn (s)} + \text{Cu(NO}_3)_2 \text{ (aq)} \rightarrow \text{Cu (s)} + \text{Zn(NO}_3)_2 \text{ (aq)}$

SCRAP PAPER

PART 2 FORM 1J

Dr. Heising CHEM 101 Sections 540-550 EXAM 1 September 26, 2003

NAME: _____

SECTION #: _____

SIGNATURE: _____

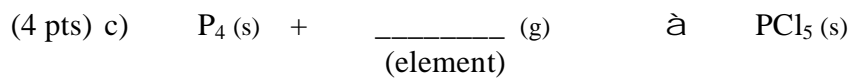
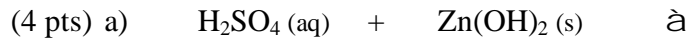
Free response. Worth 32 pts total. Show all work for partial credit.

(10 pts)

1. a) Butyric acid is found in rancid butter. If the percent composition of butyric acid is 54.5% C, 9.09% H, and the balance oxygen, find the empirical formula.

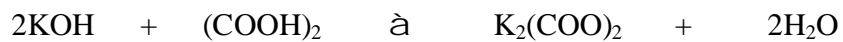
b) If the molar mass of butyric acid is 88 g/mol, what is the molecular formula?

2. Complete and balance the following equations. Indicate the reaction type.



(10 pts)

3. What volume of 0.150 M KOH is required to react completely with 1.259 grams of oxalic acid, $(\text{COOH})_2$?



SCRAP PAPER