

AP Chemistry - Unit 1 - Pretest

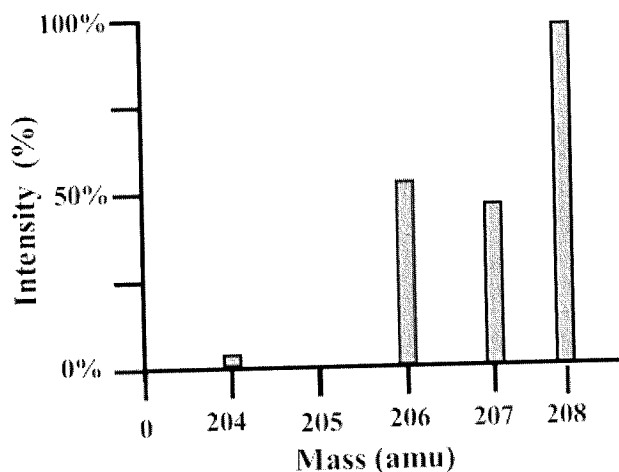
4. The simplest formula for an oxide of element X ($MM = 76.0$) that is 24.0 percent oxygen by weight is

- A) X_2O
- B) XO
- C) XO_2
- D) X_2O_3

5. A 2-L container will hold about 4 g of which of the following gases of $0^\circ C$ and 1 atm?

- A) SO_2
- B) N_2
- C) CO_2
- D) NH_3

6.



The element lead has 4 naturally occurring isotopes as shown in the mass spectrum above. Which of the following best represents the estimated atomic mass of lead based on the data provided?

- A) 206.7 amu
- B) 207.0 amu
- C) 207.5 amu
- D) 208.5 amu

7. The atomic mass of copper is 63.55. Given that there are two naturally occurring isotopes of copper, ^{63}Cu and ^{65}Cu , the natural abundance of the ^{65}Cu isotope must be approximately

- A) 90%
- B) 70%
- C) 50%
- D) 25%

8. What mass of Au is produced when 0.0500 mol of Au_2S_3 is reduced completely with excess H_2 ?

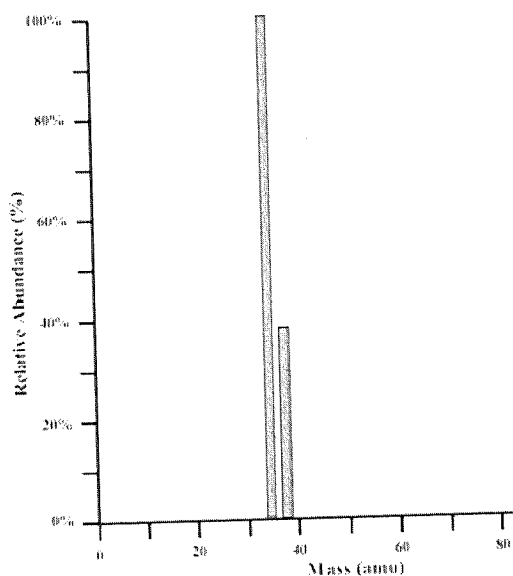
- A) 9.85 g
- B) 19.7 g
- C) 24.5 g
- D) 39.4 g

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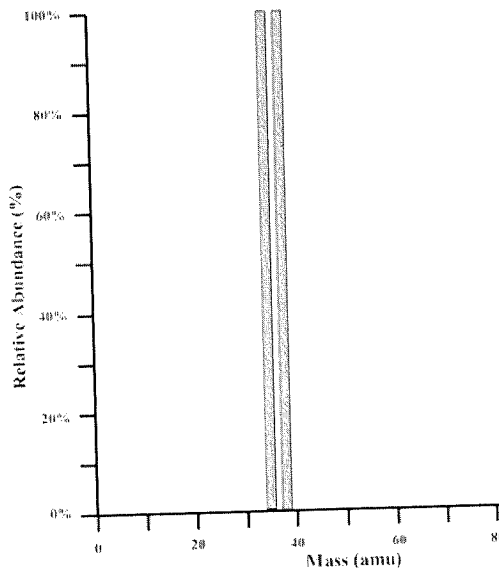
10. A compound contains 1.10 mol of K, 0.55 mol of Te, and 1.65 mol of O. What is the simplest formula of this compound?
- A) KTeO
 - B) KTe_2O
 - C) K_2TeO_3
 - D) K_2TeO_6
15. A 20.0-milliliter sample of 0.200-molar K_2CO_3 solution is added to 30.0 milliliters of 0.400-molar $\text{Ba}(\text{NO}_3)_2$ solution. Barium carbonate precipitates. The concentration of barium ion, Ba^{2+} , in solution **after** reaction is
- A) 0.150 M
 - B) 0.160 M
 - C) 0.200 M
 - D) 0.240 M
- 16.
- $$3 \text{Ag}(s) + 4 \text{HNO}_3 \rightleftharpoons 3 \text{AgNO}_3 + \text{NO}(g) + 2 \text{H}_2\text{O}$$
- The reaction of silver metal and dilute nitric acid proceeds according to the equation above. If 0.10 mole of powdered silver is added to 10. milliliters of 6.0-molar nitric acid, the number of moles of NO gas that can be formed is
- A) 0.015 mole
 - B) 0.020 mole
 - C) 0.030 mole
 - D) 0.045 mole
17. A sample of 9.00 grams of aluminum metal is added to an excess of hydrochloric acid. The volume of hydrogen gas produced at standard temperature and pressure is
- A) 22.4 liters
 - B) 11.2 liters
 - C) 7.46 liters
 - D) 5.60 liters

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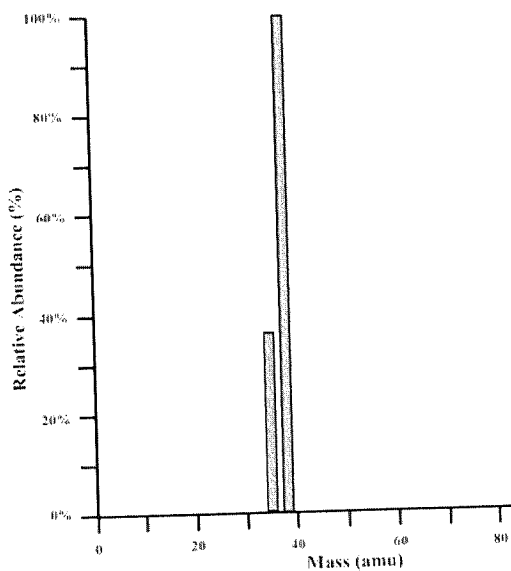
18. Chlorine has two naturally occurring isotopes with masses of 34.969 amu and 36.966 amu and an atomic mass of 35.453 amu. Which mass spectrum is most likely to correspond to a naturally occurring sample of chlorine?



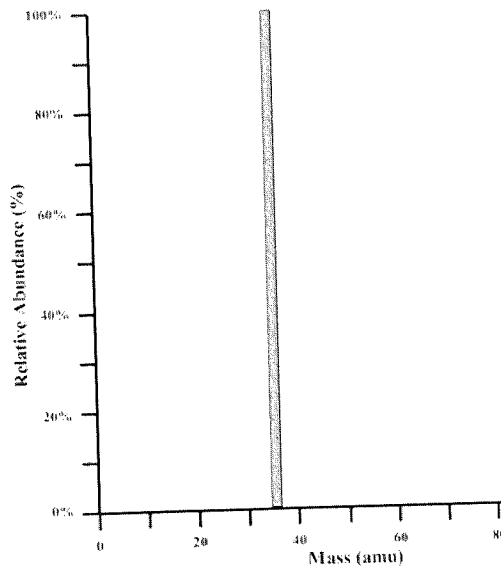
A)



C)



B)



D)

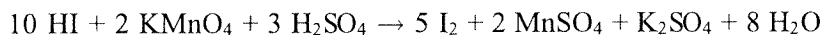
20. The weight of H_2SO_4 (molecular weight 98.1) in 50.0 milliliters of a 6.00-molar solution is
- A) 3.10 grams
 - B) 12.0 grams
 - C) 29.4 grams
 - D) 294 grams
21. A 27.0-gram sample of an unknown hydrocarbon was burned in excess oxygen to form 88.0 grams of carbon dioxide and 27.0 grams of water. What is a possible molecular formula of the hydrocarbon?
- A) CH_4
 - B) C_2H_2
 - C) C_4H_3
 - D) C_4H_6

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23. A hydrocarbon gas with an empirical formula CH_2 has a density of 1.88 grams per liter at 0°C and 1.00 atmosphere. A possible formula for the hydrocarbon is

- A) CH_2
- B) C_2H_4
- C) C_3H_6
- D) C_4H_8

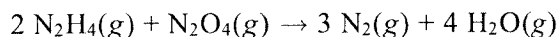
24.



According to the balanced equation above, how many moles of HI would be necessary to produce 2.5 mol of I_2 , starting with 4.0 mol of KMnO_4 and 3.0 mol of H_2SO_4 ?

- A) 20
- B) 10
- C) 8.0
- D) 5.0

25.



When 8.0 g of N_2H_4 (32 g mol^{-1}) and 92 g of N_2O_4 (92 g mol^{-1}) are mixed together and react according to the equation above, what is the maximum mass of H_2O that can be produced?

- A) 9.0 g
- B) 18 g
- C) 36 g
- D) 72 g

26. How many grams of calcium nitrate, $\text{Ca}(\text{NO}_3)_2$, contains 24 grams of oxygen atoms?

- A) 96 grams
- B) 62 grams
- C) 50. grams
- D) 41 grams

YOU MAY USE YOUR CALCULATOR

Directions: Questions 1 and 2 are long constructed-response questions that should require about 15 minutes each to answer. ~~Questions 3 and 4 are short constructed response questions that should require about seven minutes each to answer.~~ Read each question carefully and write your response in the space provided following each question. Your responses to these questions will be scored on the basis of the accuracy and relevance of the information cited. Explanations should be clear and well organized. Specific answers are preferable to broad, diffuse responses. For calculations, clearly show the method used and the steps involved in arriving at your answers. It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Be sure to write all your answers to the questions on the lined pages following the question set.

1. A sample of dolomitic limestone containing only CaCO_3 and MgCO_3 was analyzed.
 - (a) When a 0.2800 gram sample of this limestone was decomposed by heating, 75.0 milliliters of CO_2 at 750 mm Hg, and 20°C were evolved. How many grams of CO_2 were produced?
 - (b) Write equations for the decomposition of both carbonates described above.
 - (c) It was also determined that the initial sample contained 0.0448 gram of calcium. What percent of the limestone by mass was CaCO_3 ?
 - (d) How many grams of the magnesium-containing product were present in the sample in after it had been heated?

2. Answer the following questions that relate to the analysis of chemical compounds.
 - (a) A compound containing the elements C, H, N, and O is analyzed. When a 1.2359 g sample is burned in excess oxygen, 2.241 g of $\text{CO}_2(g)$ is formed. The combustion analysis also showed that the sample contained 0.0648 g of H.
 - (i) Determine the mass, in grams, of C in the 1.2359 g sample of the compound.
 - (ii) When the compound is analyzed for N content only, the mass percent of N is found to be 28.84 percent. Determine the mass, in grams, of N in the original 1.2359 g sample of the compound.
 - (iii) Determine the mass, in grams, of O in the original 1.2359 g sample of the compound.
 - (iv) Determine the empirical formula of the compound.
 - (b) A different compound, which has the empirical formula CH_2Br , has a vapor density of 6.00 g L^{-1} at 375 K and 0.983 atm. Using these data, determine the following.
 - (i) The molar mass of the compound
 - (ii) The molecular formula of the compound