

PRACTICE AP CHEMISTRY CUMULATIVE EXAM

Free Response

CLEARLY SHOW THE METHOD YOU USED AND STEPS INVOLVED IN ARRIVING AT YOUR ANSWERS. It is to your advantage to do this, because you may earn partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures. Be sure to write all your answers to the questions on the lined pages following the question set.

1. 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 $\text{CO}_2(\text{g})$ is formed. The combustion analysis also showed that the sample contained 0.0648 g of H.
 - (a) Determine the mass, in grams, of C in the 1.2359 g sample of the compound.
 - (b) 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.
 - (c) Determine the mass, in grams, of O in the original 1.2359 g sample of the compound.
 - (d) Determine the empirical formula of the compound.

2. Account for each of the following observations in terms of atomic theory and/or quantum theory.
 - (a) Atomic size decreases from Na to Cl in the periodic table.
 - (b) Boron commonly forms molecules of the type BX_3 . These molecules have a trigonal planar structure.
 - (c) The first ionization energy of K is less than that of Na.
 - (d) Each element displays a unique gas-phase emission spectrum.

3. A rigid 8.20 L flask contains a mixture of 2.50 moles of H_2 , 0.500 mole of O_2 , and sufficient Ar so that the partial pressure of Ar in the flask is 2.00 atm. The temperature is 127°C .
 - (a) Calculate the total pressure in the flask.
 - (b) Calculate the mole fraction of H_2 in the flask.
 - (c) Calculate the density (in g L^{-1}) of the mixture in the flask.