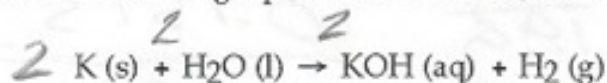


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

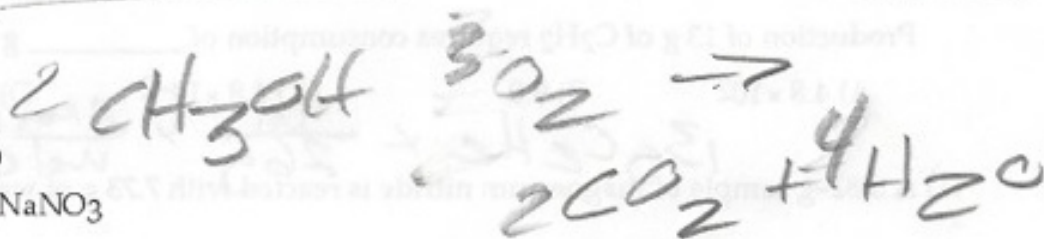
1) When the following equation is balanced, the coefficient of water is _____ 1) _____



- A) 1 B) 5 C) 4 D) 2 E) 3

2) Of the reactions below, which one is a decomposition reaction? 2) _____

- A) $2\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
 B) $\text{NH}_4\text{Cl} \rightarrow \text{NH}_3 + \text{HCl}$
 C) $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
 D) $2\text{CH}_4 + 4\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$
 E) $\text{Cd}(\text{NO}_3)_2 + \text{Na}_2\text{S} \rightarrow \text{CdS} + 2\text{NaNO}_3$



3) Write the balanced equation for the reaction that occurs when methanol, $\text{CH}_3\text{OH}(\text{l})$, is burned in air. What is the coefficient of methanol in the balanced equation? 3) _____

- A) 1 B) 2 C) 3 D) 4 E) 3/2

4) There are _____ mol of carbon atoms in 4 mol $\text{C}_4\text{H}_8\text{O}_2$. 4) _____

- A) 32 B) 8 C) 20 D) 4 E) 16

5) The formula weight of lead (II) carbonate (PbCO_3) is _____ amu. 5) _____

- A) 219.2 B) 267.2 C) 273.2 D) 207.2 E) 235.2

6) How many moles of carbon dioxide are there in 52.06 g of carbon dioxide? 6) _____

- A) 8.648×10^{23}
 B) 0.8452
 C) 3.134×10^{25}
 D) 1.183
 E) 6.022×10^{23}

$$52.06 \text{ g CO}_2 \times \frac{1 \text{ mol}}{44 \text{ g}} = 1.183 \text{ mol}$$

7) Calculate the percentage by mass of lead in $\text{Pb}(\text{NO}_3)_2$. 7) _____

- A) 38.6 B) 44.5 C) 65.3 D) 71.2 E) 62.6

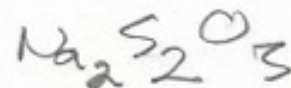
8) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 8) _____

- A) NaSO B) $\text{Na}_2\text{S}_2\text{O}_3$ C) $\text{Na}_2\text{S}_2\text{O}_6$ D) NaSO_2 E) NaSO_3

$$29 \text{ g Na} \times \frac{1 \text{ mol}}{23 \text{ g}} = 1.26 = 1 + 2 \quad 2$$

$$41 \text{ g S} \times \frac{1 \text{ mol}}{32 \text{ g}} = 1.28 = 1 + 2 \quad 2$$

$$30 \text{ g O} \times \frac{1 \text{ mol}}{16 \text{ g}} = 1.875 = 1.5 + 2 \quad 3$$



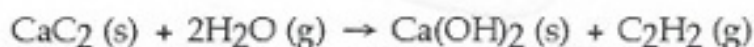
9) Combustion of a 1.031-g sample of a compound containing only carbon, hydrogen, and oxygen produced 2.265 g of CO₂ and 1.236 g of H₂O. What is the empirical formula of the compound? 9) _____

- A) C₃H₉O₃
 B) C₃H₈O
 C) C₃H₆O₃
 D) C₃H₅O
 E) C₆H₁₆O₂

$$2.265 \text{ g CO}_2 \times \frac{12 \text{ g C}}{44 \text{ g}} = \frac{0.6177}{1.031} = 60\% \text{ C}$$

$$1.236 \text{ g H}_2\text{O} \times \frac{2 \text{ g H}}{18 \text{ g}} = \frac{0.1373}{1.031} = 13.3\% \text{ H}$$

10) Calcium carbide (CaC₂) reacts with water to produce acetylene (C₂H₂):



Production of 13 g of C₂H₂ requires consumption of _____ g of H₂O.

- A) 4.8 × 10²

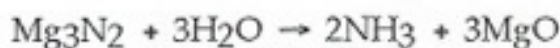
B) 9.0

C) 4.8 × 10⁻²

D) 4.5

E) 18

11) A 3.82-g sample of magnesium nitride is reacted with 7.73 g of water.



The yield of MgO is 3.60 g. What is the percent yield in the reaction?

A) 46.6

B) 99.9

C) 78.4

D) 94.5

E) 49.4

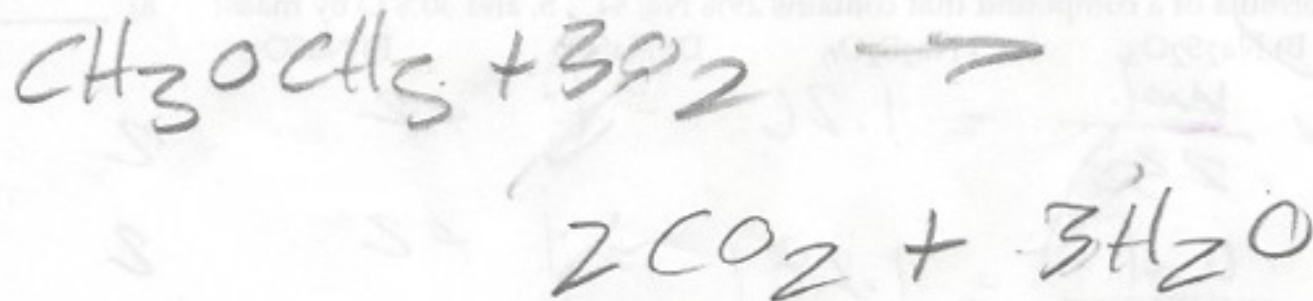
12) Several brands of antacids use Al(OH)₃ to react with stomach acid, which contains primarily HCl:



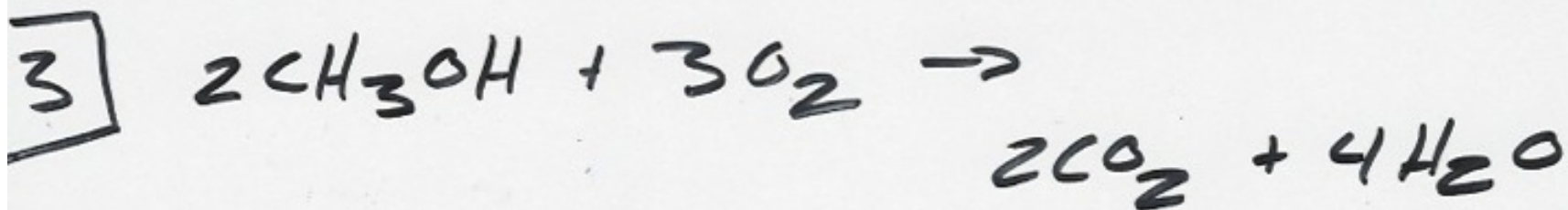
Calculate the number of grams of HCl that can react with 0.500g of Al(OH)₃.

$$.5 \text{ g Al}(\text{OH})_3 \times \frac{1 \text{ mol Al}(\text{OH})_3}{78 \text{ g}} \times \frac{3 \text{ mol HCl}}{1 \text{ mol Al}(\text{OH})_3} \times \frac{36.46 \text{ g}}{1 \text{ mol}} = 0.70$$

13) What is the coefficient for carbon dioxide when dimethylether, CH₃OCH₃ gas combusts to form water carbon dioxide gas.



4cd used



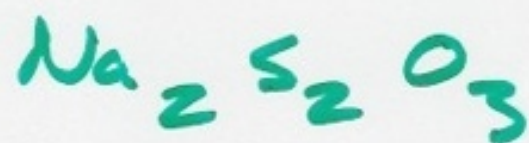
$$\boxed{6} \quad 52.06\text{g CO}_2 \times \frac{1\text{mol}}{44\text{g}} = 1.183\text{mol CO}_2$$

$$\boxed{7} \quad \text{PbCO}_3 \quad \frac{207.2\text{g}}{331.2\text{g}} \times 100 = 62.6\%$$

$$\boxed{8} \quad 29\text{g Na} \times \frac{1\text{mol}}{23\text{g}} = 1.26 = 1 \times 2 = 2$$

$$41\text{g S} \times \frac{1\text{mol}}{32\text{g}} = 1.28 = 1 \times 2 = 2$$

$$30\text{g O} \times \frac{1\text{mol}}{16\text{g}} = \frac{1.875}{1.26} = 1.5 \times 2 = 3$$



$$9 \quad 2.265 \text{ g CO}_2 \times \frac{12 \text{ g C}}{44 \text{ g}} = \frac{0.6177}{1.031} \times 100 = 60\% \text{ C}$$

$$1.236 \text{ g H}_2\text{O} \times \frac{2 \text{ g H}}{18} = \frac{0.1373}{1.031} \times 100 = 13.3\% \text{ H}$$

$$26.7\% \text{ O}$$

$$60 \text{ g C} \times \frac{1 \text{ mol}}{12 \text{ g}} = \frac{5}{1.66} = 3$$

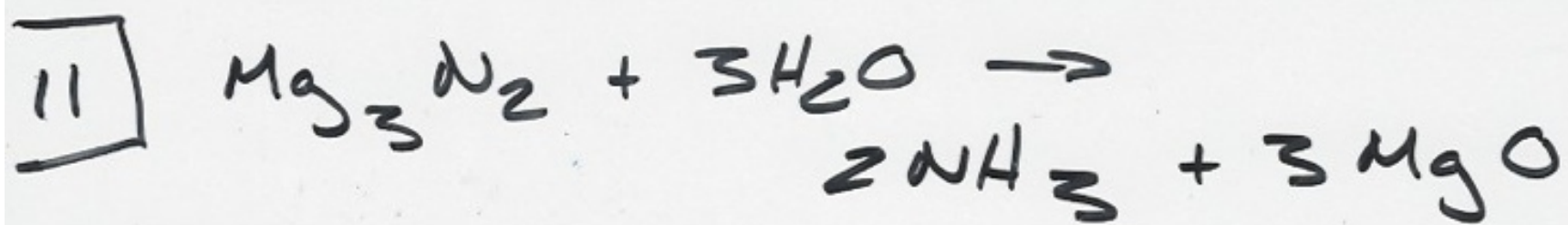
$$13.3 \text{ g H} \times \frac{1 \text{ mol}}{1 \text{ g}} = \frac{13.3}{1.66} = 8 \quad \text{C}_3\text{H}_8\text{O}$$

$$26.7 \text{ g O} \times \frac{1 \text{ mol}}{16 \text{ g}} = 1.66 = 1$$



$$13 \text{ g C}_2\text{H}_2 \times \frac{1 \text{ mol C}_2\text{H}_2}{26 \text{ g}} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol C}_2\text{H}_2} \times \frac{18 \text{ g}}{1 \text{ mol H}_2\text{O}}$$

$$= 18 \text{ g H}_2\text{O}$$



$$3.82 \text{ g Mg}_3\text{N}_2 \times \frac{1 \text{ mol}}{100.9 \text{ g}} = 3.78 \times 10^{-2} \text{ mol L.R.}$$

$$7.73 \text{ g H}_2\text{O} \times \frac{1 \text{ mol}}{18 \text{ g}} = 4.29 \times 10^{-1} \text{ mol H}_2\text{O} \text{ Excess}$$

$$3.78 \times 10^{-2} \text{ mol Mg}_3\text{N}_2 \times \frac{3 \text{ mol H}_2\text{O}}{1 \text{ mol Mg}_3\text{N}_2} = 1.13 \times 10^{-1} \text{ mol H}_2\text{O} \text{ needed}$$

$$3.78 \times 10^{-2} \text{ mol Mg}_3\text{N}_2 \times \frac{3 \text{ mol MgO}}{1 \text{ mol Mg}_3\text{N}_2} \times \frac{40.3 \text{ g}}{1 \text{ mol MgO}} = 4.5 \text{ g Mg theoretical}$$

$$\frac{3.6 \text{ g}}{4.5 \text{ g}} \times 100 = 78.7\% \text{ yield}$$

