Chemistry 11

Gram A → Gram B

Name: Key
Date:
Block:

1. The balanced equation for hexamine combustion is:

$$4\ C_6H_{15}N + 43\ O_2 \rightarrow 24\ CO_2 + 30\ H_2O + 4\ NO_2$$

a) Calculate the molar mass for each compound.

$C_6H_{15}N = 101.22\ g/mol$

$H_2O = 18.02\ g/mol$

$O_2 = 32.00\ g/mol$

$NO_2 = 46.01\ g/mol$

$CO_2 = 44.01\ g/mol$

b) What mass of oxygen is required to react with 763.2 g of $C_6H_{15}N$?

$$763.2\ g\ C_6H_{15}N \times \frac{1\ mol\ C_6H_{15}N}{101.22\ g\ C_6H_{15}N} \times \frac{43\ mol\ O_2}{4\ mol\ C_6H_{15}N} \times \frac{32.00\ g\ O_2}{1\ mol\ O_2} = \boxed{2594\ g\ O_2}$$

c) Calculate the mass of water produced when 253 g of O_2 are consumed.

$$253\ g\ O_2 \times \frac{1\ mol\ O_2}{32.00\ g\ O_2} \times \frac{30\ mol\ H_2O}{43\ mol\ O_2} \times \frac{18.02\ g\ H_2O}{1\ mol\ H_2O} = \boxed{99.4\ g\ H_2O}$$

2. A reaction between potassium and chlorine produced 250.0 grams of the product. How many grams of potassium and chlorine were needed for the reaction?

$$\underset{?\ g}{2\ K} + \underset{?\ g}{Cl_2} \rightarrow \underset{250.0\ g}{2\ KCl}$$

$$250.0\ g\ KCl \times \frac{1\ mol\ KCl}{74.55\ g\ KCl} \times \frac{2\ mol\ K}{2\ mol\ KCl} \times \frac{39.10\ g\ K}{1\ mol\ K} = \boxed{131.1\ g\ K}$$

$$\times \frac{1\ mol\ Cl_2}{2\ mol\ KCl} \times \frac{70.90\ g\ Cl_2}{1\ mol\ Cl_2} = \boxed{118.9\ g\ Cl_2}$$

3. Given the following equation for the combustion of hexane (C_6H_{14}):

$$C_6H_{14} + O_2 \rightarrow CO_2 + H_2O$$

a) What is the balanced equation? *(Hint: use the algebraic method)*

$$2\,C_6H_{14} + 19\,O_2 \rightarrow 12\,CO_2 + 14\,H_2O$$

b) What mass of CO_2 is produced by burning 268 g of C_6H_{14}?

$$268\,g\,C_6H_{14} \times \frac{1\,mol\,C_6H_{14}}{86.21\,g\,C_6H_{14}} \times \frac{12\,mol\,CO_2}{2\,mol\,C_6H_{14}} \times \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} = \boxed{821\,g\,CO_2}$$

c) What mass of oxygen is consumed when 3.00 kg of hexane reacts?

$$3.00\,kg\,C_6H_{14} \times \frac{1000\,g\,C_6H_{14}}{1\,kg\,C_6H_{14}} \times \frac{1\,mol\,C_6H_{14}}{86.21\,g\,C_6H_{14}} \times \frac{19\,mol\,O_2}{1\,mol\,C_6H_{14}} \times \frac{32.00\,g\,O_2}{1\,mol\,O_2} = \boxed{1.06 \times 10^4\,g\,O_2}$$

d) If burning a quantity of hexane produces 78.0 grams of H_2O, what mass of CO_2 would be produced at the same time?

$$78.0\,g\,H_2O \times \frac{1\,mol\,H_2O}{18.02\,g\,H_2O} \times \frac{12\,mol\,CO_2}{14\,mol\,H_2O} \times \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} = \boxed{163\,g\,CO_2}$$

e) Carbon dioxide is a greenhouse gas. What mass of carbon dioxide is produced by burning 20.0 moles of hexane?

$$20.0\,mol\,C_6H_{14} \times \frac{12\,mol\,CO_2}{2\,mol\,C_6H_{14}} \times \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} = \boxed{5.28 \times 10^3\,g\,CO_2}$$

1. a. $C_6H_{15}N$ = 101.22 g/mol; O_2 = 32.00 g/mol; CO_2 = 44.01 g/mol; H_2O = 18.02 g/mol; NO_2 = 46.01 g/mol
b. 2594 g O_2 c. 99.4 g H_2O 2. 131.1 g K; 118.9 g Cl_2 3. a. 2, 19, 12, 14 b. 821 g CO_2 c. 1.06 x 10^4 g O_2
d. 163 g CO_2 e. 5.28 g CO_2

$\times 10^3$