***Chemistry***

**4: Stoichiometry of Chemical Reactions**

**4.3: Reaction Stoichiometry**

43. Determine the number of moles and the mass requested for each reaction in exercise 1.

Solution

(a) The first step is to calculate the moles of sodium in 10.0 g.



From the balanced equation, 2 mol Na reacts with 1 mol Cl2: therefore,



g Cl2 = mol  molar mass = 0.217 mol  2  35.4527 g mol–1 = 15.4 g Cl2,0.217 mol Cl2, 15.4 g Cl2;(b)

; (c) From the balanced equation, 2 mol of NaNO3 is required to produce 1 mol O2.

mol NaNO3 required = 2 mol O2 = 2(4.00 mol)= 8.00 mol NaNO3

g NaNO3 = 8.00 mol NaNO3  84.9947 g mol–1 NaNO3 = 6.80  102 g NaNO3; (d) ;(e) Molar masses: CuO = 79.545 g mol–1; CuCO3 = 123.555 g mol–1



1 molCuO = 1 mol CuO3

; (f) 

45. Determine the number of moles and the mass requested for each reaction in exercise 3.

Solution

(a) ,;

(b), ;(c) , ;

(d) , 

(e) 



(f) 



47. Gallium chloride is formed by the reaction of 2.6 L of a 1.44 *M* solution of HCl according to the following equation: .

(a) Outline the steps necessary to determine the number of moles and mass of gallium chloride.

(b) Perform the calculations outlined.

Solution

(a) ; (b) 

49. Silver is often extracted from ores as K[Ag(CN)2] and then recovered by the reaction



(a) How many molecules of Zn(CN)2 are produced by the reaction of 35.27 g of K[Ag(CN)2]?

(b) What mass of Zn(CN)2 is produced?

Solution

The development requires the following:;

(a) (b) 

51. Carborundum is silicon carbide, SiC, a very hard material used as an abrasive on sandpaper and in other applications. It is prepared by the reaction of pure sand, SiO2, with carbon at high temperature. Carbon monoxide, CO, is the other product of this reaction. Write the balanced equation for the reaction, and calculate how much SiO2 is required to produce 3.00 kg of SiC.

Solution

. From the balanced equation, 1 mol of SiO2 produces 1 mol of SiC. The unknown is the mass of SiO2 required to produce 3.00 kg (3000 g) of SiC. To calculate the mass of SiO2 required, determine the molar masses of SiO2 and SiC. Then calculate the number of moles of SiC required, and through the mole relation of SiO2 to SiC, find the mass of SiO2 required. The conversions required are:



Molar masses: SiO2 = 60.0843 g mol–1; SiC = 40.0955 g mol–1



53. Urea, CO(NH2)2, is manufactured on a large scale for use in producing urea-formaldehyde plastics and as a fertilizer. What is the maximum mass of urea that can be manufactured from the CO2 produced by combustion of 1.00  103 kg of carbon followed by the reaction?



Solution

Molar mass urea = 12.011 + 15.9994 + 2(14.0067) + 4(1.0079) = 60.054 g mol–1





55. A compact car gets 37.5 miles per gallon on the highway. If gasoline contains 84.2% carbonby mass and has a density of 0.8205 g/mL, determine the mass of carbon dioxide produced during a 500-mile trip (3.785 liters per gallon).

Solution

The balanced chemical equation is 



57. What volume of a 0.2089 M KI solution contains enough KI to react exactly with the Cu(NO3)2 in 43.88 mL of a 0.3842 M solution of Cu(NO3)2?



Solution

Use molarity to convert. This solution involves the following steps:

1. Converting the volume of KI to moles of KI

2. Converting the moles of KI to moles of Cu(NO3)2

3. Converting the moles of to a volume of KI.Cu(NO3)2 solution

All of these steps can be shown together, as follows:



59. The toxic pigment called white lead, Pb3(OH)2(CO3)2, has been replaced in white paints by rutile, TiO2. How much rutile (g) can be prepared from 379 g of an ore that contains 88.3% ilmenite (FeTiO3) by mass?



Solution

Find from worked example, check your learning problem





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