Neutralization and Stoichiometry

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Use n = MV with volume in liters. Balanced coefficients give the mole ratio. Assume the reactions shown go to completion.

1 Which two ions combine to form water in an acid–base neutralization model?

(1) Na^+ and Cl^-

(2) H_3O^+ and OH^-

(3) Na^+ and H_3O^+

(4) Cl^- and OH^-

2 For $HCl + NaOH \rightarrow NaCl + H_2O$, how many moles of NaOH react completely with 0.0300 mol HCl? Show the ratio. [1]

Answer and work

3 For $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$, how many moles of NaOH react completely with 1 mol H_2SO_4?

(1) 0.5 mol

(2) 1 mol

(3) 2 mol

(4) 4 mol

4 Explain why 10.0 mL of acid and 10.0 mL of base do not always neutralize each other completely. [1]

Answer and work

Comparing Two Acid Samples

Use the information below to answer the questions.

A model uses 0.200 M NaOH to neutralize two acids. Use $HCl + NaOH \rightarrow NaCl + H_2O$ and $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$.

Sample	Acid	Concentration (M)	Volume (mL)
P	HCl	0.100	50.0
Q	H_2SO_4	0.100	50.0

5 How many moles of acid are in sample P?

(1) 0.00250 mol

(2) 0.00500 mol

(3) 0.0100 mol

(4) 0.500 mol

6 Calculate the volume of 0.200 M NaOH needed to react completely with sample Q. Show how the mole ratio is used. [1]

Answer and work

7 Compared with P, how much NaOH does Q require?

(1) Half as many moles

(2) The same number of moles

(3) Twice as many moles

(4) Four times as many moles

8 A student adds 25.0 mL of the NaOH to each acid sample. Which sample has enough NaOH for complete neutralization? Justify using amounts. [1]

Answer and work