solustoich Name

1. A 20.0–milliliter sample of 0.200–molar K_2CO_3 solution is added to 30.0 milliliters of 0.400–molar $Ba(NO_3)_2$ solution. Barium carbonate precipitates. The concentration of barium ion, Ba^{2+}, in solution after reaction is

(A) 0.150 M

(B) 0.160 M

(C) 0.200 M

(D) 0.240 M

(E) 0.267 M

---

2. $5\ Fe^{2+} + MnO_4^- + 8\ H^+ \rightleftarrows 5\ Fe^{3+} + Mn^{2+} + 4\ H_2O$

In a titration experiment based on the equation above, 25.0 milliliters of an acidified Fe^{2+} solution requires 14.0 milliliters of standard 0.050–molar MnO_4^- solution to reach the equivalence point. The concentration of Fe^{2+} in the original solution is

(A) 0.0010 *M*

(B) 0.0056 *M*

(C) 0.0028 *M*

(D) 0.0090 *M*

(E) 0.14 *M*

---

solustoich

3. $3\ Ag(s) + 4\ HNO_3 \rightarrow 3\ AgNO_3 + NO(g) + 2\ H_2O$

The reaction of silver metal and dilute nitric acid proceeds according to the equation above. If 0.10 mole of powdered silver is added to 10. milliliters of 6.0–molar nitric acid, the number of moles of NO gas that can be formed is

(A) 0.015 mole

(B) 0.020 mole

(C) 0.030 mole

(D) 0.045

(E) 0.090

4.

$$2\ MnO_4^-(aq) + 5\ C_2O_4^{2-}(aq) + 16\ H^+(aq) \rightarrow 2\ Mn^{2+}(aq) + 10\ CO_2(g) + 8\ H_2O(l)$$

Permanganate and oxalate ions react in an acidified solution according to the balanced equation above. How many moles of $CO_2(g)$ are produced when 20. mL of acidified 0.20 *M* $KMnO_4$ solution is added to 50. mL of 0.10 *M* $Na_2C_2O_4$ solution?

(A) 0.0040 mol

(B) 0.0050 mol

(C) 0.0090 mol

(D) 0.010 mol

(E) 0.020 mol

---

solustoich

5.

$$2\ H_2O(l) + 4\ MnO_4^-(aq) + 3\ ClO_2^-(aq) \rightarrow 4\ MnO_2(s) + 3\ ClO_4^-(aq) + 4\ OH^-(aq)$$

According to the balanced equation above, how many moles of $ClO_2^-(aq)$ are needed to react completely with 20. mL of 0.20 *M* $KMnO_4$ solution?

(A) 0.0030 mol

(B) 0.0053 mol

(C) 0.0075 mol

(D) 0.013 mol

(E) 0.030 mol

---

6. $\mathbf{MgCl_2(aq) + 2\ NaOH(aq) \rightarrow 2\ NaCl(aq) + Mg(OH)_2(s)}$

A **100 mL** sample of **0.1 *M*** $\mathbf{MgCl_2(aq)}$ and a **100 mL** sample of **0.2 *M*** $\mathbf{NaOH(aq)}$ were combined, and $\mathbf{Mg(OH)_2(s)}$ precipitated, as shown by the equation above. If the experiment is repeated using solutions of the same molarity, which of the following changes in volume will double the amount of $\mathbf{Mg(OH)_2(s)}$ produced?

(A) Using the same volume of $\mathbf{MgCl_2(aq)}$ but twice the volume of $\mathbf{NaOH(aq)}$

(B) Using twice the volume of $\mathbf{MgCl_2(aq)}$ but half the volume of $\mathbf{NaOH(aq)}$

(C) Using twice the volume of $\mathbf{MgCl_2(aq)}$ but the same volume of $\mathbf{NaOH(aq)}$

(D) Using twice the volume of $\mathbf{MgCl_2(aq)}$ and twice the volume of $\mathbf{NaOH(aq)}$

Reaction 1: $CaC_2(s) + 2\ H_2O(l) \rightarrow C_2H_2(g) + Ca(OH)_2(s)$

Reaction 2: $NaOCl(aq) + 2\ HCl(aq) \rightarrow Cl_2(g) + NaCl(aq) + H_2O(l)$

solustoich

Reaction 3: $C_2H_2(g) + Cl_2(g) \rightarrow C_2H_2Cl_2(g)$

7. Reaction 2 occurs when an excess of 6 *M* HCl(*aq*) solution is added to 100. mL of NaOCL(*aq*) of unknown concentration. If the reaction goes to completion and 0.010 mol of $Cl_2(g)$ is produced, then what was the molarity of the NaOCL(*aq*) solution?

(A) 0.0010 *M*

(B) 0.010 *M*

(C) 0.10 *M*

(D) 1.0 *M*