

CEM 141 - Chapter 4 Problems

1) Which of the following are strong electrolytes?

HCl $\text{CuC}_2\text{H}_3\text{O}_2$ NH_3 KCl

2) What are the spectator ions in the reaction between KOH (aq) and HNO_3 (aq)?

3) The net ionic equation for the reaction between aqueous solutions of HF and KOH is _____.

4) Combining aqueous solutions of BaI_2 and Na_2SO_4 affords a precipitate of BaSO_4 . Which ion(s) is/are spectator ions in the reaction?

5) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl_2 and AgNO_3 ?

6) The spectator ions in the reaction between aqueous perchloric acid and aqueous barium hydroxide are _____.

7) What is the concentration (M) of KCl in a solution made by mixing 25.0 mL of 0.200 M KCl with 50.0 mL of 0.100 M KCl?

8) What is the concentration (M) of CH_3OH in a solution prepared by dissolving 11.7 g of CH_3OH in sufficient water to give exactly 230 mL of solution?

9) What is the concentration (M) of a NaCl solution prepared by dissolving 9.3 g of NaCl in sufficient water to give 350 mL of solution?

10) The concentration (M) of an aqueous methanol produced when 0.200 L of a 2.00 M solution was diluted to 0.800 L is _____.

11) In a titration of 35.00 mL of 0.737 M H_2SO_4 , _____ mL of a 0.827 M KOH solution is required for neutralization.

12) A 17.5 mL sample of an acetic acid ($\text{CH}_3\text{CO}_2\text{H}$) solution required 29.6 mL of 0.250 M NaOH for neutralization. The concentration of acetic acid was _____ M.

13) Which combinations will produce a precipitate? If one forms, what is the identity?

A) $\text{NaC}_2\text{H}_3\text{O}_2$ (aq) and HCl (aq)

B) AgNO_3 (aq) and $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ (aq)

C) KOH (aq) and $\text{Mg}(\text{NO}_3)_2$ (aq)

D) NaOH (aq) and HCl (aq)

E) NH_4OH (aq) and HCl (aq)

F) NaCl (aq) and $\text{HC}_2\text{H}_3\text{O}_2$ (aq)

G) NaOH (aq) and $\text{Fe}(\text{NO}_3)_3$ (aq)

14) Which one of the following solutions will have the greatest concentration of hydroxide ions?

A) 0.100 M rubidium hydroxide

B) 0.100 M magnesium hydroxide

C) 0.100 M ammonia

D) 0.100 M strontium hydroxide

E) 0.100 M hydrochloric acid

15) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is _____.

16) Oxidation cannot occur without _____.

17) In which reaction does the oxidation number of oxygen increase?

- A) $\text{Ba}(\text{NO}_3)_2 (\text{aq}) + \text{K}_2\text{SO}_4 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{KNO}_3 (\text{aq})$
- B) $\text{HCl} (\text{aq}) + \text{NaOH} (\text{aq}) \rightarrow \text{NaCl} (\text{aq}) + \text{H}_2\text{O} (\text{l})$
- C) $\text{MgO} (\text{s}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{Mg}(\text{OH})_2 (\text{s})$
- D) $2 \text{SO}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow 2 \text{SO}_3 (\text{g})$
- E) $2 \text{H}_2\text{O} (\text{l}) \rightarrow 2 \text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$

18) In which species does sulfur have the highest oxidation number?

- A) S_8 (elemental form of sulfur)
- B) H_2S
- C) SO_2
- D) H_2SO_3
- E) K_2SO_4

19) Which of the following is an oxidation-reduction reaction?

- A) $\text{Cu} (\text{s}) + 2\text{AgNO}_3 (\text{aq}) \rightarrow 2\text{Ag} (\text{s}) + \text{Cu}(\text{NO}_3)_2 (\text{aq})$
- B) $\text{HCl} (\text{aq}) + \text{NaOH} (\text{aq}) \rightarrow \text{H}_2\text{O} (\text{l}) + \text{NaCl} (\text{aq})$
- C) $\text{AgNO}_3 (\text{aq}) + \text{HCl} (\text{aq}) \rightarrow \text{AgCl} (\text{s}) + \text{HNO}_3 (\text{aq})$
- D) $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2 (\text{aq}) + \text{Na}_2\text{SO}_4 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2\text{NaC}_2\text{H}_3\text{O}_2 (\text{aq})$
- E) $\text{H}_2\text{CO}_3 (\text{aq}) + \text{Ca}(\text{NO}_3)_2 (\text{aq}) \rightarrow 2\text{HNO}_3 (\text{aq}) + \text{CaCO}_3 (\text{s})$

20) What mass (g) of AgBr is formed when 35.5 mL of 0.184 M AgNO_3 is treated with an excess of aqueous hydrobromic acid?

21) What volume (L) of 0.250 M HNO_3 is required to neutralize a solution prepared by dissolving 17.5 g of NaOH in 350 mL of water?

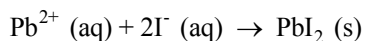
22) A 13.8 mL aliquot of 0.176 M H_3PO_4 (aq) is to be titrated with 0.110 M NaOH (aq). What volume (mL) of base will it take to reach the equivalence point?

23) Calculate the concentration (M) of arsenic acid (H_3AsO_4) in a solution if 25.00 mL of that solution required 35.21 mL of 0.1894 M KOH for neutralization.

24) There are _____ mol of bromide ions in 0.900 L of a 0.500M solution of AlBr_3 .

25) Pure acetic acid ($\text{HC}_2\text{H}_3\text{O}_2$) is a liquid and is known as glacial acetic acid. Calculate the molarity of a solution prepared by dissolving 10.00 mL of glacial acetic acid at 25°C in sufficient water to give 500.0 mL of solution. The density of glacial acetic acid at 25°C is 1.049 g/mL.

26) Lead ions can be precipitated from aqueous solutions by the addition of aqueous iodide:



Lead iodide is virtually insoluble in water so that the reaction appears to go to completion. How many milliliters of 3.550 M HI(aq) must be added to a solution containing 0.700 mol of $\text{Pb}(\text{NO}_3)_2$ (aq) to completely precipitate the lead?