

Chapter 04 Homework

Part A multiple choice (select the one that is best in each case. 1point/question)

- B** 1. Which of the following statements is true ?
~~A~~ Electrolyte solutions conduct electricity because ions are moving through the solution.
~~B~~ If you add a nonelectrolyte to an aqueous solution that already contains an electrolyte, the electrical conductivity will not change.
~~C~~ When acetone, CH_3COCH_3 , is dissolved in water, a conducting solution results.
~~D~~ When ammonium nitrate, NH_4NO_3 , dissolves in water, the solution is weakly conducting and basic in nature.
 $\text{NH}_4^+ + \text{H}_2\text{O}$ $\text{NH}_3 \cdot \text{H}_2\text{O} + \text{H}^+$
- D** 2. If you have an aqueous solution that contains 1.5 moles of MgCl_2 , how many moles of ions are in the solution?
 A) 1.0 B) 1.5 C) 2.0 D) 4.5 E) 3.0
- C** 3. If you were to draw diagrams representing aqueous solutions of (a) NiSO_4 , (b) $\text{Ca}(\text{NO}_3)_2$, (c) Na_3PO_4 , (d) $\text{Al}_2(\text{SO}_4)_3$, how many anions would you show if each diagram contained six cations?
6:6 6:12
 A) 6,12,3,9 B) 6,3,18,9 C) 6,12,2,9 D) 6,12,3,18 E) 6,12,3,9
- A** 4. What happens when you mix an aqueous solution of magnesium nitrate with an aqueous solution of sodium hydroxide? NaOH $\text{Mg}(\text{NO}_3)_2$
 A) There is no reaction; all possible products are soluble.
 B) Only magnesium nitrate precipitates.
 C) Only magnesium hydroxide precipitates.
 D) Both magnesium hydroxide and sodium nitrate precipitate.
 E) Nothing; magnesium nitrate is not soluble and it stays as a precipitate.
- A** 5. Given a set of species below, which can be classified as strong bases?
~~Mg(OH)₂~~, ~~Ca(OH)₂~~, ~~Al(OH)₃~~, ~~Sr(OH)₂~~, ~~Ba(OH)₂~~
 A) $\text{Ca}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$ B) $\text{Mg}(\text{OH})_2$, $\text{Ca}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$
 C) $\text{Mg}(\text{OH})_2$, $\text{Ca}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$ D) $\text{Ca}(\text{OH})_2$, $\text{Al}(\text{OH})_3$, $\text{Ba}(\text{OH})_2$
 E) $\text{Ca}(\text{OH})_2$, $\text{Al}(\text{OH})_3$, $\text{Sr}(\text{OH})_2$
- D** 6. Which of these substances, when dissolved in water, is a strong electrolyte?
~~A~~ ammonia ~~B~~ hydrofluoric acid ~~C~~ folic acid
~~D~~ calcium chloride ~~E~~ sucrose
- D** 7. Which is the correct net ionic equation for the reaction of phosphorous acid (H_3PO_3) and potassium hydroxide (KOH)? Note that phosphorous acid is a diprotic acid. CaCl_2 HPO_3^{2-}
~~A~~ $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
~~B~~ $\text{H}_3\text{PO}_3(\text{aq}) + \text{KOH}(\text{aq}) \rightarrow \text{KH}_2\text{PO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 C) $\text{H}_3\text{PO}_3(\text{aq}) + 2\text{KOH}(\text{aq}) \rightarrow \text{K}_2\text{HPO}_3(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
 D) $\text{H}_3\text{PO}_3(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{HPO}_3^{2-}(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
~~E~~ $\text{H}_3\text{PO}_3(\text{aq}) + 3\text{OH}^-(\text{aq}) \rightarrow \text{PO}_3^{3-}(\text{aq}) + 3\text{H}_2\text{O}(\text{l})$
- C** 8. In which compound the oxidation state of sulphur is +2?
~~A~~ H_2S B) S_8 C) SCl_2 ~~D) Na_2SO_3~~ ~~E) CuSO_4~~
- E** 9. An experiment showed that aqueous solution of iron(II) chloride oxidize magnesium metal. The net ionic equation is shown below
 $\text{Mg}(\text{s}) + \text{Fe}^{2+}(\text{aq}) \rightarrow \text{Mg}^{2+}(\text{aq}) + \text{Fe}(\text{s})$.
 What's the reaction patten?
~~A~~ oxidation-reduction reaction
~~B~~ displacement reaction
 C) exchange reaction
 D) metathesis reaction
 E) both A) and B)

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- B** 10. Which of the following metal will not be oxidized by $\text{Pb}(\text{NO}_3)_2$? ⁺²
A) Zn B) Cu C) Fe D) Co E) Ba
- B** 11. Which of the following solutions is the most basic?
~~A) 0.600 M NaCl~~ B) 0.150 M CsOH
~~C) 0.100 M $\text{Sr}(\text{OH})_2$~~ ↓ ~~D) 0.200 M glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)~~
- D** 12. Which of the following statements is true?
~~A) Sulfuric acid is a monoprotic acid.~~
~~B) HCl is a weak acid.~~
~~C) Methanol is a base.~~
☒ D) NH_3 contains no OH^- ions, and yet its aqueous solutions are basic.
~~E) HF is a strong acid.~~
- D** 13. Which of the following statements is true?
~~A) If a substance is oxidized, there must be more oxygen in the substance.~~
~~B) If a substance is oxidized, it must lose at least one electron and form an anion.~~
~~C) Reduction occurs if the oxidation number of an element increases.~~
☒ D) Oxidation and reduction must occur together in a reaction.

Part B: Short Answer --Write legibly and show all work for all steps in the problem. (10 points)

14. Will precipitation occur when the following solutions are mixed? If so, write a balanced chemical equation for the reaction and indicate state for each substance. (a) Na_2CO_3 and AgNO_3 , (b) K_2CO_3 and NH_4NO_3 , (c) Na_2S and FeCl_3 , (d) FeSO_4 and $\text{Pb}(\text{NO}_3)_2$.

15. What is the oxidation number of the boldfaced element in ((a) SO_3 , (b) $\text{Ag}\textbf{P}\text{F}_6$, (c) HNO_3 , (d) $\text{O}\textbf{F}_2$.

16. A sample of 70.5 mg of potassium phosphate is added to 15.0 mL of 0.0500 M silver nitrate, resulting in the formation of a precipitate. ^{K_3PO_4} (a) What's the reaction type? (b) Write the molecular equation for the reaction. ^{AgNO_3} (c) What is the limiting reactant in the reaction? (d) Calculate the percent yield, if you obtain 84.2 mg of Ag_3PO_4 .

Chapter 04 Homework Answer Sheet

Name: P. Q. Y. Student ID: 12311410 Instructor: _____ Score: _____

Part A multiple choice (13 points)

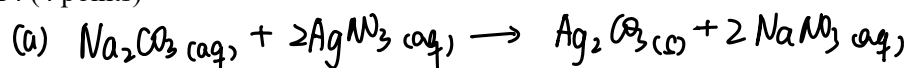
1-5: BDCAA

6-10: DDCEB

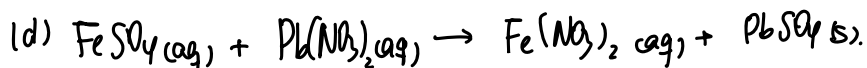
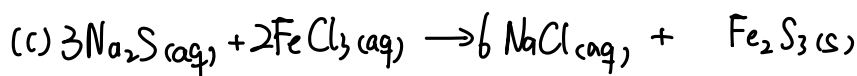
11-13: BDD

Part B short question (12 points)

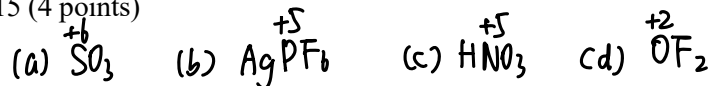
14 (4 points)



(b) No precipitation.

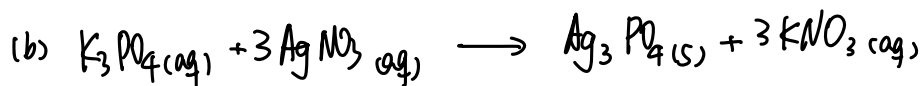


15 (4 points)



16 (4 points)

(a) exchange reaction (复分解).



(c) $\text{K}_3\text{PO}_4 \text{ moles} = \frac{70.5 \times 10^{-3} \text{ g}}{212.27 \text{ g/mol}} = 3.32 \times 10^{-4} \text{ mol.}$

$\text{AgNO}_3 \text{ moles} = 0.05 \text{ mol/L} \times 15 \times 10^{-3} \text{ L} = 7.5 \times 10^{-4} \text{ mol.}$

$3.32 : 7.5 > 1 : 3 \Rightarrow \text{AgNO}_3 \text{ is limited.}$

(d) $\text{Ag}_3\text{PO}_4 \text{ moles} = 7.5 \times 10^{-4} \text{ mol} \div 3 = 2.5 \times 10^{-4} \text{ mol.}$

percent yield = $\frac{80.2 \times 10^{-3} \text{ g}}{2.5 \times 10^{-4} \text{ mol} \times 418.57916 \text{ g/mol}} \times 100\% = 80.76\%$