

Basics for "Inorganic Chemistry"

1. Give a name to the following compounds
 - $\text{CF}_3\text{SO}_3\text{H}$
 - NH_4SCN
 - H_3N
 - N_3H
 - NaNH_2
 - $\text{CCl}_3\text{CO}_2\text{H}$
 - CS_2
 - KI_3
 - CH_3CSNH_2
 - D_2O
 - $\text{C}_5\text{H}_{11}\text{OH}$
 - $(\text{NH}_4)_3\text{PMO}_{12}\text{O}_{40}$
2. Name the following
 - A. $\text{Na}_2[\text{HgI}_4]$
 - B. $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
 - C. TiPO_4
 - D. $\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
 - E. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
 - F. $\text{Eu}_2(\text{SO}_4)_3$
 - G. $\text{KFe}[\text{Fe}(\text{CN})_6]$
3. Draw the structure of the compound and its corresponding acid (if any). Give an approximate value of the pK's.
 - A. acetic acid
 - B. ammonia
 - C. 2-aminoacetic acid (glycine)
 - D. hydroxylamine
 - E. acetamide
 - F. N-hydroxyacetamide (also called acetohydroxamic acid)
 - G. pyridine
 - H. imidazole
 - I. 3-(4-imidazolyl)-2-aminopropanoic acid - also called histidine
 - J. 2-amino-3-mercaptopropanoic acid also called cysteine
 - K. N-(2-aminoacetyl)-2-amino-3-mercaptopropanoic acid - also called glycyl cysteine.
4. Give a name and write a formula for
 - 5 insoluble hydroxides and give their colour
 - 3 insoluble hydroxides, which are soluble in aqueous sodium hydroxide
 - 5 insoluble sulphides and give their colour
 - 3 insoluble sulphides, which are soluble in aqueous sodium sulphide
 - 2 insoluble sulphates and give their colour

5. Give a name and write a formula for
 - 5 insoluble barium salts in basic aqueous solution
 - 2 soluble barium salts in basic aqueous solution
 - 5 insoluble phosphates in basic aqueous solution
 - 2 soluble phosphates in basic aqueous solution
 - 2 insoluble phosphates in aqueous acetic acid
 - 3 soluble silver salts in aqueous nitric acid

6. A calcium salt also contains phosphate. Analysis reveals 18.5% P. Determine a possible formula of the salt.

7. 72.4% iron is found in a chemically pure iron oxide. Calculate a formula of the oxide and give a systematic name.

8. A blue inorganic compound dissolved in dilute hydrochloric acid forms a white precipitate, when barium chloride is added. The precipitate does not dissolve in concentrated hydrochloric acid. To 464 mg of the blue compound is added 2 g of potassium iodide. To the brown slurry formed is added a solution of starch and the mixture is titrated with 17.2 ml 0.108 M of sodium thiosulphate from black to white slurry. Which compound do we have?

9. Suggest methods for the determination of the stoichiometry and structure of a green compound, in which Cr^{3+} , Cl^- and $\text{NH}_4^+/\text{NH}_3$ have been identified.

10. Discuss the statements
 - “The hydrolysis follows first order kinetics”
 - “The hydrolysis is a bimolecular reaction”.

11. Calculate E^0 for $\text{Cu}^{2+} + e^- \rightarrow \text{Cu}^+$ when $E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$ and $E^0_{\text{Cu}^+/\text{Cu}} = 0.52 \text{ V}$

12. 1 litre of an aqueous A solution was prepared by dissolving the following compounds in water: glycinium chloride (0.1 mol), potassium hydrogen phosphate (0.2 mol), sodium dihydrogen phosphate (0.1 mol) and ammonium chloride (0.4 mol). What is the pH of the solution?

13. Write the electron configuration for the oxygen atom. Draw an electron energy diagram for the oxygen atom and for the oxygen molecule

14. Write the electron configuration for the cobalt atom. Draw an electron energy diagram for the cobalt atom and for the cobalt(II) ion