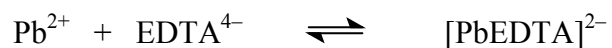


- Ethylenediamine tetraacetate (EDTA^{4-}) is a ligand that forms complexes with many metal ions and consequently may be used to treat heavy metal toxicity in the body. The reaction with lead ions is represented by the following equilibrium:



If a solution had an initial concentration of $1 \times 10^{-4} \text{ M Pb}^{2+}$ and 0.05 M EDTA , what will be the concentration of uncomplexed lead ions once equilibrium is established? K_{stab} for $[\text{PbEDTA}]^{2-}$ is $1 \times 10^{18} \text{ M}^{-1}$.

Answer:

- Briefly outline three kinds of isomerism that can arise in coordination complexes, illustrating each type of isomerism with structural formulas. Give the systematic name for any one of your structures.



- Coordination complexes can display a number of types of isomerism. Draw a simple diagram showing a pair of geometric isomers. Label your diagram with the systematic name of each isomer.

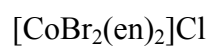
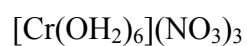


Marks
4

- The presence of iron in inorganic qualitative analysis is detected by the precipitation of the hydroxide using a buffer of pH 8. The solubility product constant of $\text{Fe}(\text{OH})_3$ is $4 \times 10^{-38} \text{ M}^4$ and that of $\text{Fe}(\text{OH})_2$ is $4 \times 10^{-15} \text{ M}^3$. Is it more sensible to try and detect the presence of Fe^{2+} ions or Fe^{3+} ions? Show all working and then give a reason for your answer.

2

- Name the following complexes.



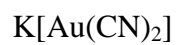
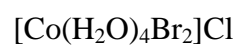
en = ethylenediamine = $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

- Draw all stereoisomers of the complex ion of $[\text{Co}(\text{en})_3]\text{Br}_3$.
(en = ethylenediamine = $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$)

2

- Name the following complexes.

2



- Write the chemical equation for the formation of the complex ion $[\text{Cd}(\text{NH}_3)_4]^{2+}$.

Marks
2

Write the associated stability constant expression (K_{stab}).

- Draw all possible stereoisomers of the complex ion $[\text{CoCl}_2(\text{en})_2]^+$. Label each as *cis* or *trans*.

3

Marks
4

- Zinc sulfate (8.07 g) is dissolved in 1.00 L of a 1.00 M solution of KCN. Write the chemical equation for the formation of the aqueous ion $[\text{Zn}(\text{CN})_4]^{2-}$.

Calculate the concentration of $\text{Zn}^{2+}(\text{aq})$ in solution at equilibrium. Ignore any change in volume upon addition of the salt. K_{stab} of $[\text{Zn}(\text{CN})_4]^{2-} = 4.2 \times 10^{19} \text{ M}^{-4}$.

Answer:

Name the complex ion.

Marks
5

- Cisplatin, $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$, is a particularly effective chemotherapy agent against certain types of cancer. Calculate the concentration of $\text{Pt}^{2+}(\text{aq})$ ions in solution when 0.075 mol of cisplatin is dissolved in 1.00 L of a 1.00 M solution of NH_3 .
 K_{stab} of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2] = 3.4 \times 10^{12}$.

Answer:

What changes would occur to the values of K_{stab} for cisplatin and the concentration of $\text{Pt}^{2+}(\text{aq})$ ions if solid KCl were dissolved in the above solution?

K_{stab}	increase	no change	decrease
$[\text{Pt}^{2+}(\text{aq})]$	increase	no change	decrease

Marks
4

- The general formula for a nickel(II) chloride compound complexed with ammonia is $[\text{Ni}(\text{NH}_3)_x]\text{Cl}_2$. A 0.59 g sample of the salt was dissolved in water and the ammonia from it was titrated with 153 mL of 0.100 M HCl. What is the value of the coefficient x ?

Answer: