Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Inorganic 2

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Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Q1.

This question is about complexes containing the aluminium ion.

(a) Give the electron configuration of the Al^{3+} ion.

_____

(1)

(b) When anhydrous aluminium sulfate, $Al_2(SO_4)_3$, is added to water a solution forms that contains the complex aluminium ion, $[Al(H_2O)_6]^{3+}$

Give the equation for the reaction.

_____

(1)

(c) Explain why the solution containing $[Al(H_2O)_6]^{3+}$ is acidic.

_____

_____

_____

_____

_____

(2)

(d) State why the concentration of aluminium sulfate solution can **not** be determined by colorimetry.

_____

_____

_____

(1)

(e) An excess of aqueous ammonia is added to a solution containing $[Al(H_2O)_6]^{3+}$

Give an ionic equation for the reaction and state one observation.

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Equation

_____

Observation _____

(2)

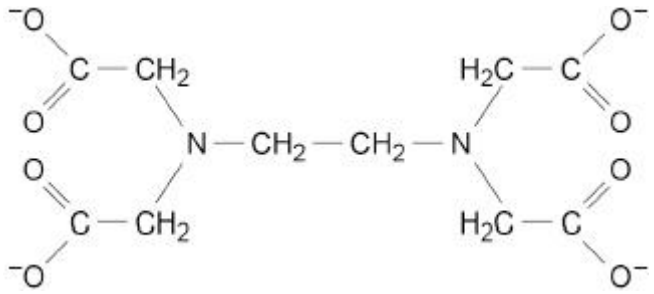
(f) An excess of dilute sulfuric acid is added to the products of the reaction in part (e).

Identify the aluminium species produced.

_____

(1)

(g) The figure below shows the structure of the $EDTA^{4-}$ ion.



Atoms of two different elements in $EDTA^{4-}$ can form co-ordinate bonds with an aluminium ion.

On the figure above, draw circles around the atoms of **two** different elements that would link to an aluminium ion by a co-ordinate bond.

(2)

(h) Hydrated aluminium sulfate, $Al_2(SO_4)_3.xH_2O$, is soluble in water.

The relative formula mass and value of *x* can be found from a titration experiment.

Aqueous $[Al(H_2O)_6]^{3+}$ ions react to form a stable complex when treated with an excess of $EDTA^{4-}$ ions.

The excess of $EDTA^{4-}$ ions is determined by titration with $ZnSO_4$ solution.

Method

- Dissolve 1.036 g of $Al_2(SO_4)_3.xH_2O$ in distilled water and make up to 250 cm^3
- Add 25.0 cm^3 of this solution to 50.0 cm^3 of a solution containing $EDTA^{4-}$ ions of concentration 0.0100 mol dm^{-3}
- Determine the excess of $EDTA^{4-}$ ions by titrating with $ZnSO_4$ solution in the presence of an indicator.

The excess of $EDTA^{4-}$ ions requires 18.00 cm^3 of 0.0105 mol dm^{-3} $ZnSO_4$ solution to react completely.

The equations for the reactions are

$$[Al(H_2O)_6]^{3+} + EDTA^{4-} \rightarrow [AlEDTA]^{-} + 6\ H_2O$$
$$[Zn(H_2O)_6]^{2+} + EDTA^{4-} \rightarrow [ZnEDTA]^{2-} + 6\ H_2O$$

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For $Al_2(SO_4)_3$ M_r = 342.3

Use the information given to calculate the M_r of $Al_2(SO_4)_3.xH_2O$

Calculate x
Give your answer as an integer.

M_r _____

x _____

(7)

(Total 17 marks)

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