Question 1 **[10]**

You are provided with two solutions C–10 and C–11.

(a) C–10 is a solution containing 1.50 g of potassium permanganate, $KMnO_4$ per litre.

(b) C–11 is a solution containing 17.60 g of hydrated ammonium iron (II) sulphate crystals, $(NH_4)_2SO_4.FeSO_4.xH_2O$ per litre.

The equations for the reactions are as follows:

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

$$[2FeSO_4.(NH_4)_2SO_4.xH_2O + H_2SO_4 + [O] \longrightarrow Fe_2(SO_4)_3 + 2(NH_4)_2SO_4 + (2x+1)H_2O]\times 5$$

Relative atomic masses:

K = 39 Fe = 56 S = 32 O = 16 Mn = 55 N = 14 H = 1

(a) Answer the following:

(i) Write the ionic equation for the given redox reaction.

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(ii) Write the procedure and carry out the volumetric titration.

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(iii) Tabulate your readings.

(b) Calculate the following:

(i) molarity of potassium permanganate solution, C-10.

(ii) molarity of hydrated ammonium iron (II) sulphate solution, C-11.

(iii) experimental molecular mass of hydrated ammonium iron (II) sulphate.

(iv) value of *x* of hydrated ammonium iron (II) sulphate.

Question 2 **[5]**

Substance C-13 is a mixture of organic compounds.

(a) Write down the procedure for the preparation of Lassaigne's extract.

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(b) Use the extract to identify two elements present in the given organic compound and record your observations in the table given below.

Sl. No.	Experiment	Observation	Inference

Sl. No.	Experiment	Observation	Inference

Question 3 **[5]**

(a) You are provided with a sample of salt, C-14. Carry out the experiment as given below:

PROCEDURE

(i) Take 40 mL of water with calorimeter constant 13 gm in a calorimeter (100 cc beaker) and place it in the heat insulating compartment.

(ii) Measure and record the temperature of water in the calorimeter.

(iii) Weigh 2.0 gram of C-14 and add it to the water in a calorimeter.

(iv) Stir the content till the salt is dissolved completely.

(v) Record the final temperature of the solution in the table given below. *Show it to the Visiting Examiner.*

Salt	**Weight of salt W_1 (g)**	**Temperature of water T_w (^{0}C)**	**Temperature of salt solution T_m (^{0}C)**	**T_w - T_m (^{0}C)**
C-14				

(b) State the:

(i) volume of water taken (V): ……

(ii) thermometer range used for the measurement: ……..

(c) Total enthalpy change of dissolution (ΔH) = $[W (T_w - T_m) + (V + W_1) (T_w - T_m)] 4.184$ J

(i) Determine the enthalpy change of dissolution of C-14 by using the above expression.

(ii) Suggest a mechanism by which dissolution of C-14 takes place.

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Question 1 **[10]**

You are provided with two solutions C–10 and C–11.

(a) C–10 is a solution containing 1.80 g of potassium permanganate, $KMnO_4$ per litre.

(b) C–11 is a solution containing 17.60 g of hydrated ammonium iron (II) sulphate crystals, $(NH_4)_2SO_4.FeSO_4.60H_2O$ per litre.

The equations for the reactions are as follows:

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

$$10FeSO_4.(NH_4)_2SO_4.6H_2O + 5H_2SO_4 + 5[O] \longrightarrow 5Fe_2(SO_4)_3 + 10(NH_4)_2SO_4 + 65H_2O$$

Relative atomic masses:

K = 39 Fe = 56 S = 32 O = 16 Mn = 55 N = 14 H = 1

(a) Answer the following:

(i) Write the ionic equation for the given redox reaction.

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(ii) Write the procedure and carry out the volumetric titration.

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(iii) Tabulate your readings.

(b) Calculate the following:

(i) molarity of hydrated ammonium iron (II) sulphate solution, C-11.

(ii) molarity of potassium permanganate solution, C-10.

(iii) strength of potassium permanganate solution, C-10.

(iv) percentage purity of an impure sample of potassium permanganate.

Question 2 **[5]**

Substance C-13 is a mixture of organic compounds.

(a) Write down the procedure for the preparation of Lassaigne's extract.

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(b) Use the extract to identify two elements present in the given organic compound and record your observations in the table given below.

Sl. No.	Experiment	Observation	Inference

Sl. No.	Experiment	Observation	Inference

Question 3 **[5]**

(a) You are provided with a sample of salt, C-14. Carry out the experiment as given below:

PROCEDURE

(i) Take 40 mL of water with calorimeter constant 13 gm in a calorimeter (100 cc beaker) and place it in the heat insulating compartment.

(ii) Measure and record the temperature of water in the calorimeter.

(iii) Weigh 2.0 gram of C-14 and add it to the water in a calorimeter.

(iv) Stir the content till the salt is dissolved completely.

(v) Record the final temperature of the solution in the table given below. *Show it to the Visiting Examiner.*

Salt	**Weight of salt W_1 (g)**	**Temperature of water T_w (^{0}C)**	**Temperature of salt solution T_m (^{0}C)**	**$T_w - T_m$ (^{0}C)**
C-14				

(b) State the:

(i) volume of water taken (V): ……

(ii) thermometer range used for the measurement: ……..

(c) Total enthalpy change of dissolution (ΔH) = $[W (T_w - T_m) + (V + W_1) (T_w - T_m)] 4.184$ J

(i) Determine the enthalpy change of dissolution of C-14 by using the above expression.

(ii) Suggest a mechanism by which dissolution of C-14 takes place.

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Question 1 **[10]**

You are provided with two solutions C–10 and C–11.

(a) C–10 is a solution containing 1.0 g of potassium permanganate, $KMnO_4$ per litre.

(b) C–11 is a solution containing 10.20 g of an impure sample of hydrated ammonium iron (II) sulphate crystals, $(NH_4)_2SO_4.FeSO_4.6H_2O$ per litre.

The equations for the reactions are as follows:

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

$$10FeSO_4.(NH_4)_2SO_4.6H_2O + 5H_2SO_4 + 5[O] \longrightarrow 5Fe_2(SO_4)_3 + 10(NH_4)_2SO_4 + 65H_2O$$

Relative atomic masses:

K = 39 Fe = 56 S = 32 O = 16 Mn = 55 N = 14 H = 1

(a) Answer the following:

(i) Write the ionic equation for the given redox reaction.

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(ii) Write the procedure and carry out the volumetric titration.

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(iii) Tabulate your readings.

(b) Calculate the following:

(i) molarity of potassium permanganate solution, C-10.

(ii) molarity of hydrated ammonium iron (II) sulphate solution, C-11.

(iii) strength of hydrated ammonium iron (II) sulphate solution, C-11.

(iv) percentage purity of hydrated ammonium iron (II) sulphate.

Question 2 **[5]**

Substance C-13 is a mixture of organic compounds.

(a) Write down the procedure for the preparation of Lassaigne's extract.

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(b) Use the extract to identify two elements present in the given organic compound and record your observations in the table given below.

Sl. No.	Experiment	Observation	Inference

Sl. No.	Experiment	Observation	Inference

Question 3 **[5]**

(a) You are provided with a sample of salt, C-14. Carry out the experiment by following the procedure given below.

(i) Take 40 mL of water with calorimeter constant 13 gm in a calorimeter (100 cc beaker) and place it in the heat insulating compartment.

(ii) Measure and record the temperature of water in the calorimeter.

(iii) Weigh 2.0 gram of C-14 and add it to the water in a calorimeter

(iv) Stir the content till the salt dissolves completely.

(v) Record the final temperature of the solution in the table given below.

Show it to the Visiting Examiner.

Salt	**Weight of salt W_1 (g)**	**Temperature of water T_w (^{0}C)**	**Temperature of salt solution T_m (^{0}C)**	**$T_w - T_m$ (^{0}C)**
C-14				

(b) State the:

(i) volume of water taken (V): ……

(ii) thermometer range you used for the measurement: ……..

(c) Total enthalpy change of dissolution (ΔH) = $[W (T_w - T_m) + (V + W_1) (T_w - T_m)] 4.184$ J

(i) Determine the enthalpy change of dissolution of C-14 by using the above expression.

(ii) Suggest a mechanism by which dissolution of C-14 takes place.

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