

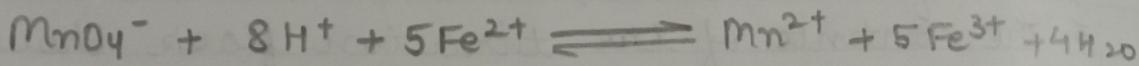
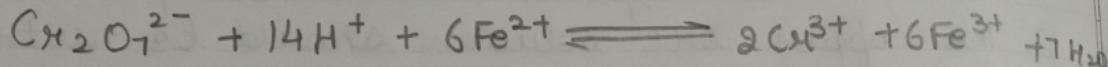
EXPERIMENT - 4

Experiment: To determine hexavalent chromium content of a water sample by back titration method.

Apparatus: Pipette, burette, beaker, conical flask, funnel, burette stand

Chemicals: $K_2Cr_2O_7$ of unknown strength, H_2SO_4 , Mohr's salt, $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$, $KMnO_4$.

Chemical equation:



Observation

a) Standardization of $KMnO_4$ solution
volume of 0.1N $FeSO_4$ (No) solution taken for
Titration = 10 mL (V_0)

S. No.	Initial reading (ml)	Final reading (ml)	Vol. of $KMnO_4$ used
1.			
2.			
3.			

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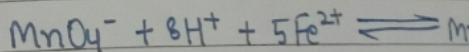
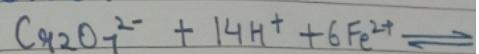
EXPERIMENT - 4

Experiment: To determine hexavalent content of a water sample by titration method.

Apparatus: Pipette, burette, beakers, flask, funnel, burette stand

Chemicals: Potassium dichromate solution of unknown strength, acid (H_2SO_4), Mohr's salt solution, ammonium Sulphate; $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$ and potassium permanganate

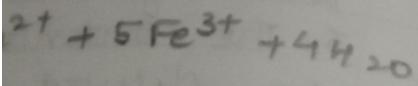
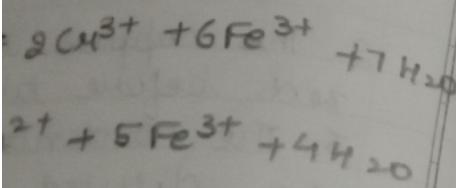
Equations:



Theory:

In an acidic solution Fe^{2+} is oxidized to Fe^{3+} while itself the trivalent chromium volume of the sample Cr^{6+} ions is added of the Mohr salt solution) in presence Cr^{6+} is reduced to Cr^{3+}

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To determine hexavalent chromium content of a water sample by back-titration method.



tion taken for

of KMnO₄ used

and mass of acid

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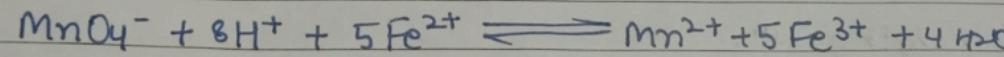
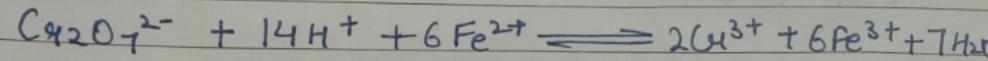
EXPERIMENT-4

Experiment: To determine hexavalent chromium content of a water sample by back-titration method.

Apparatus: Pipette, burette, beakers, conical flask, funnel, burette stand and clamp.

Chemicals: Potassium dichromate solution ($\text{K}_2\text{Cr}_2\text{O}_7$) of unknown strength, sulphuric acid (H_2SO_4), Mohr's salt solution (Ferric ammonium sulphate; $\text{Fe}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$) and potassium permanganate (KMnO_4)

Equations:



Theory:

In an acidic solution of Fe^{2+} , Cr^{6+} oxidizes Fe^{2+} to Fe^{3+} while itself getting reduced to the trivalent chromium. If to a certain volume of the sample solution (containing Cr^{6+} ions) is added a known amount of the Mohr salt solution (known concentration) in presence of sulphuric acid, Cr^{6+} is reduced to Cr^{3+} , while the Fe^{2+}

Teacher's Signature _____

b) Determination of Cu^{2+} solution by back titration method

Volume of $K_2Cr_2O_7$ sample solution taken for titration = 10 ml

Volume of Mohr's salt (0.1M) solution added = 10 ml

Sr. No.	Initial reading (ml)	Final reading (ml)	Vol. of $KMnO_4$ used
1.			
2.			
3.			

Calculations

a) Normality of $KMnO_4$ solution

Applying normality equation

$$N_1 V_0 \text{ (given FA's)} = N_2 V_1 \text{ (KMnO}_4\text{)}$$

Calculate N_1 = normality of $KMnO_4$ being used

i) Determination Cu^{2+} contents

Total Fe^{2+} added to Cu^{2+} solution = 10 ml \times 0.1 M

Volume of $N_1 KMnO_4$ solution used in the titration = V_2 ml = _____

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is oxidised & can then be against the v. From the v. mixed, the mium can solution (Fe is in e. of Cu^{2+} is known a

Procedure

Transfer is a follow Sulphur again Note coll the to T

is oxidised to Fe^{3+} . The un-reacted Fe^{2+} can then be determined by titrating against a standard KMnO_4 solution. From the volume of ferrous ion consumed, the amount of hexavalent chromium can be determined. The Mohr salt solution (Fe^{2+}) added to the dichromate is in excess so that complete reduction of Cr^{6+} ions to Cr^{3+} ions takes place. This method of volumetric analysis is known as back-titration method.

Procedure: a. Standardization of KMnO_4 :

Transfer 10ml of the standard 0.1N FAS solution in a clean conical flask using a pipette following by addition of 5mL of 4N sulphuric acid. Titrate the solution against KMnO_4 solution taken in a burette. Note the volume of solution used when color of the solution in conical flask changes from colourless to pink. Repeat the titration minimum three times and take mean of the closely related readings. Treat this as volume V_1 .

b: Determination

10ml of FAS solution

5ml of 4N NaOH

in a stoppered cylinder

the stopper is removed

the volume is noted

the solution is green in colour

and measured

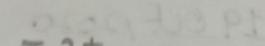
closely

volume

Total

Volume

P

 Fe^{2+} left in solution after conversion of Cr^{6+} to Cr^{3+} $= 15 \text{ V}_2\text{N}_1 \text{ meq. basifying by } 10 \text{ ml of } 0.1 \text{ N FAS}$ Amount of Fe^{2+} reacted with Cr^{6+} =

$$= [10 \times 0.1 \text{ N (FAS)} - \text{V}_2\text{N}_1] \text{ meq.}$$

This is equal to amount of Cr^{6+} present in 10ml of the solutionEquivalent weight of Chromium = $\frac{52}{3}$

$$= \frac{17.33}{3} \text{ gm/L}$$

Thus, amount of Cr^{6+} present in solution

$$= \left[\frac{[10 \times 0.1 \text{ N (FAS)} - \text{V}_2\text{N}_1] \times 17.33}{10} \right] \text{ gm/L}$$

Result: In 10 ml of solution of sampleAmount of Cr^{6+} present in the given sample solution was found to be gm/L

b: Determination of Cr^{6+} content : Transfer 10ml of Cr^{6+} solution and 10 ml of the FAS solution with a pipette. Add 5ml of 5M sulphuric acid with a graduated cylinder. Titrate the solution against the standardization KMnO_4 solution. Note the volume of solution used when color of the solution in conical flask changes from green to pink. Repeat the titration minimum three times and take mean of the closely related readings. Treat this as volume V_2 .

Calculations: a) Normality of KMnO_4 soln. = 0.1N
 Applying normality equation
 $N_1 V_0$ (Given FAS) = $N_2 V_1$ (KMnO_4)
 Total Fe^{2+} added to Cr^{6+} solution = 10ml $\times 0.1\text{N}$
 meq.

Volume of $\text{N}_1 \text{KMnO}_4$ solution used in the titration
 $= V_2 \text{ mL}$

Fe^{2+} left in soln after conversion of Cr^{6+} to Cr^{3+} = $V_2 N_1$
 meq.

Amount of Fe^{2+} reacted with Cr^{6+} = $[10 \times 0.1\text{N} (\text{FAS}) - V_2 N_1]$ meq.

This is equal to amount of Cr^{6+} present in 10ml of the solution

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$$\text{Equivalent weight of chromium} = 52/3 \\ = 17.33 \text{ g/L}$$

Thus, amount of Cr^{6+} present in solution
= $\left[\{10 \times 0.1 \text{N (FAS)} - V_2 \text{N}_1\} \right] / 17.33 \text{ g/L}$

Result: Amount of Cr^{6+} present in the
given sample solution was
found to be - - - g/L