The Chemistry of Iron Compounds

You are given a vial with 0.2g of iron (II) sulphate. Add 1.5cm3 of distilled water to the solid, stir/shake to dissolve and place it in the circle.

|  |  |  |  |
| --- | --- | --- | --- |
| 2. Add 2 pieces of magnesium turnings.Move a bar magnet slowly towards the circle | 2. |  |  |
| 3. Add 5 drops of 0.4M sodium hydroxide | 3. |  |  |
| 4. Add 1 drop of 1M hydrochloric acid and 5 drops of 20vol hydrogen peroxide | 4 | 5. Take 1 drop of the solution from **circle 4** and add 5 drops of 0.4M sodium hydroxide solution. | 5. |
| 6. Take 1 drop of the solution from **circle 4** and add 5 drops of 0.5M sodium thiosulphate solution. Stir the solution with your pipette | 6. | 7. Take 1 drop of the solution from **circle 6** and add 5 drops of 0.4M sodium hydroxide solution. | 7. |
| 8. Add 1 drop of 0.1M potassium hexacyanoferrate (II) | 8. | 9. Take 1 drop of the liquid from **circle 4** and add 1 drop of 0.1M potassium hexacyanoferrate (II) | 9. |
| 10. Add 1 drop of 0.1M ammonium (or potassium) thiocyanate | 10. | 11. Take 1 drop of the liquid from **circle 4** and add 1 drop of 0.1M ammonium (or potassium) thiocyanate | 11. |

**Place 2 drops of this solution in each of the circles in boxes 2, 3, 4, 8 & 10**

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1. A displacement reaction producing metallic iron, which is magnetic

 Mg + FeSO4 = MgSO4 + Fe

1. A green precipitate of iron (II) hydroxide is formed

 FeSO4 + 2NaOH = Na2SO4 + Fe(OH)2

1. The solution goes brown as green Iron II is oxidised to brown iron III and bubbles appear as the excess hydrogen peroxide is broken down.

 2 Fe2+ + H2O2 + 2 H+ → 2 Fe3+ + 2 H2O

1. A brown precipitate of iron (III) hydroxide is formed

 Fe2(SO4)3 + 6NaOH = 3Na2SO4 + 2Fe(OH)3

1. A dark purple colour appears and then fades.

 The purple colour is a complex - Fe(S2O3)2

 It then decomposes

 Fe(S2O3)2 + Fe3+ → 2Fe2+ + S4O6 2–

 The iron III has been reduced to iron II

1. A green precipitate of iron (II) hydroxide is formed

 Fe2+ + 2NaOH = 2Na+  + Fe(OH)2

1. There should be a white precipitate but it is oxidised very rapidly to a blue, known as Turnbull’s Blue. This has been shown to be identical to Prussian Blue obtained with iron III but with different particle size (See 9 below)
2. A dark blue complex, Prussian Blue, is formed

 K+ + Fe3+ + [FeII(CN)6]4- → KFeIII[FeII(CN)6]

 With iron II, the same complex is formed as the iron II is oxidised to iron III first.

1. No reaction
2. A dark red complex, of an iron III thiocyanate ion, is formed

Fe3+ + CNS1- = 2Na+  + [Fe(CNS)]2+

This test is specific to iron III, but it is very sensitive so may give a red colour with iron II solutions due to contamination.