

Practical activity that forms part of the Gr 10 Physical Sciences 3-in-1 Class text and Study Guide. See p. 141 MODULE 3 TOPIC 3 Unit 4 for the theory.



PRACTICAL INVESTIGATION

Oxidation-reduction reactions in aqueous solution

Materials

○ 2 test tubes with the following solutions:

○ 1 – CuSO_4

○ 2 – H_2O

○ Zn plate or powder

○ small piece of Na

○ phenolphthalein indicator

PART 4

Method

- 1 Add a Zn plate to the CuSO_4 in test tube 1. Leave it for a while and note any changes observed.
- 2 Add a few drops of phenolphthalein and the small piece of Na to the H_2O in test tube 2. Observe what happens.
- 3 Compile a table to record your results and note any chemical reactions that occur.

Observations and discussion

○ A chemical reaction occurs in both instances.

Test tube	Content	Addition	Reaction (Yes/No)
1	CuSO_4	Zn	Yes
2	H_2O	Na	Yes

- In test tube 1, the blue colour of the CuSO_4 solution becomes lighter and clearer over time. A reddish-brown substance forms at the bottom of the test tube.
- In test tube 2, the Na moves around on the surface of the water releasing a gas as the piece of Na becomes smaller and eventually disintegrates. The colour of the solution turns light pink.

Conclusion

○ In both reactions an e^- transfer, i.e. a redox reaction, takes place.

○ In the first reaction Zn displaces Cu in the CuSO_4 solution and goes into solution – colourless $\text{Zn}^{2+}(\text{aq})$ and reddish-brown $\text{Cu}(\text{s})$ forms.

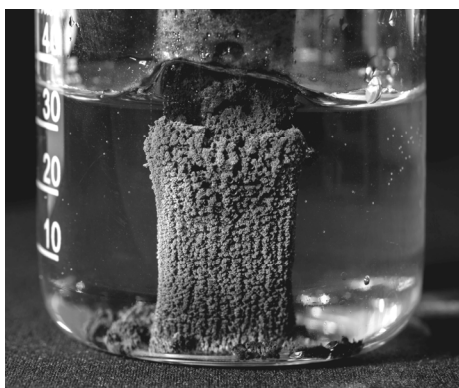
NOTE

SO_4^{2-} is a spectator ion.



ionic equation: $\text{Cu}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq})$

net ionic equation: $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$



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Reaction of zinc metal and copper(II) sulphate



NOTE

OH^- is a spectator ion.

○ In the second reaction Na displaces $\text{H}_2(\text{g})$ in the H_2O and goes into solution. The phenolphthalein turns light pink which indicates the alkaline nature of the NaOH that forms.

ionic equation: $2\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) + \text{Na}(\text{s}) \rightarrow \text{H}_2(\text{g}) + \text{Na}^+(\text{aq}) + \text{OH}^-(\text{aq})$

net ionic equation: $2\text{H}^+(\text{aq}) + \text{Na}(\text{s}) \rightarrow \text{H}_2(\text{g}) + \text{Na}^+(\text{aq})$