

Vintage titrations: sulphur dioxide in wine

Time

1–1.5 h.

Curriculum links

Redox titrations using iodine.

Group size

2.

Materials and equipment

Materials per group

- 120 cm³ of white wine (see below)
- 50 cm³ of 0.01 mol dm⁻³ iodine solution (stabilized with potassium iodide)
- 20 cm³ of 2.5 mol dm⁻³ H₂SO₄ (Corrosive to skin and eyes)
- 25 cm³ of 1 mol dm⁻³ sodium hydroxide (Corrosive to skin and eyes)
- 7 cm³ of 2% starch solution
- deionised water.

Equipment per group

- 50 cm³ burette
- 25 cm³ pipette
- 10 cm³ and 25 cm³ measuring cylinders
- 250 cm³ conical flasks
- white tile
- safety glasses.

Safety

Eye protection (to BS EN166 3) must be worn.

Risk assessment

A risk assessment must be carried out for this activity.

This is an open-ended problem solving activity, so the guidance given here is necessarily incomplete. Teachers need to be particularly vigilant, and a higher degree of supervision is needed than in activities which have more closed outcomes. Students must be encouraged to take a responsible attitude towards safety, both their own and that of others. In planning an activity students should always include safety as a factor to be considered. Plans should be checked by the teacher before implementing them.

You must always comply with your employer's procedures and in some cases may decide that a particular activity is inappropriate in your situation. Further information on Health and Safety should be obtained from reputable sources such as CLEAPSS [<http://science.cleapss.org.uk/>] in England, Wales and Northern Ireland and, in Scotland, SSERC [<https://www.sserc.org.uk/>].

Commentary

This analysis is based on the familiar titration with iodine, using starch as an indicator.¹ In trialling some students needed help to devise an appropriate method; others coped easily.

Procedure

Free SO₂

50 cm³ of wine is pipetted into a 250 cm³ conical flask and ca 5 cm³ of sulphuric acid and 2–3 cm³ of starch solution added.

The solution is titrated with 0.01 mol dm⁻³ I₂ solution. The end-point is taken to be the appearance of a dark blue colour which persists for about 2 minutes.

In the interests of economy one very careful titration should be sufficient.

Total (free and combined) SO₂

25 cm³ of 1 mol dm⁻³ NaOH is placed in a 250 cm³ conical flask, using a measuring cylinder. 50 cm³ of wine is pipetted into this flask. The flask is shaken and left to stand for 15 minutes then 10 cm³ of sulphuric acid and 2–3 cm³ of starch solution are added. The solution is titrated with 0.01 mol dm⁻³ I₂ solution as above.

Calculation

The amounts of free and combined SO₂ can be calculated as mol dm⁻³ and as mg dm⁻³ (parts per million or ppm). The legal limit for total SO₂ varies from one country to another; 250 ppm is a commonly accepted value.

Although there is no legal limit on the amount of free SO₂, levels from 20–40 ppm safeguard the wine without affecting its taste. If the level is below 10 ppm in a white wine it is in danger of going bad.

Extension

The method is not usually recommended for red wines because the colour masks the end-point. However it can normally be seen without too much difficulty if the mixture in the flask is compared with a sample of the original wine.

Reference

1. G. F. W. Fowles, *Educ. Chem.*, 1978, **15**, 89.

Credits

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Health & safety checked May 2018

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