

Titration Guide

Ingredients

- 0.1M Sodium Hydroxide solution (NaOH).
- Phenolphthalein indicator in alcohol.
- Distilled / deionised water.

Equipment

- Syringe or calibrated pipette to draw up sample to test (10ml size for cider, 1ml size for vinegar).
- Glass flask or beaker to perform the titration in.
- Pipette or burette to perform the titration.
- Calibrated pH meter (optional - used if titration is performed via pH rather than colour).

Procedure for cider / juice

1. First degas the sample if needed via heating (do not boil) or vigorous swirling.
2. Draw up 6.7ml of cider / juice and add to the flask.
3. Add 20ml or more of distilled water to flask to make reading the colour change easier.
4. Add 2-3 drops of phenolphthalein to the flask if not using pH meter.
5. Draw up 10ml of NaOH in a clean pipette or burette.
6. Slowly dispense the NaOH into the flask one drop at a time swirling after each addition.
7. Titration is complete when the sample turns a permanent light pink for at least ten seconds or when the **pH reads 8.2**.
8. Volume of NaOH used represents acid level in grams per litre malic acid. Divide by ten to give percentage malic acid.

Procedure for vinegar

1. First degas the sample if needed via heating (do not boil) or vigorous swirling.
2. Draw up 0.6ml of vinegar and add to the flask.
3. Add 20ml or more of distilled water to flask to make reading the colour change easier.
4. Add 2-3 drops of phenolphthalein to the flask if not using pH meter.
5. Draw up 10ml of NaOH in a clean pipette or burette.
6. Slowly dispense the NaOH into the flask one drop at a time swirling after each addition.
7. Titration is complete when the sample turns a permanent light pink for at least ten seconds or when the **pH reads 8.2**.
8. Volume of NaOH used represents acid level in % acetic acid. **Must be greater than 5% to be sold as vinegar.**

Formula for cider and juice

$$M = n \times 10 \frac{0.067}{s}$$

M = % malic acid

n = volume of 0.1M NaOH

s = volume of sample in ml