**Titrations**: The concentration of an acid is determined from its reaction with a base of known concentration and vice versa.

The concentration of a sample of oxalic acid (HOOCCOOH) is determined by a titration against 0.150 M NaOH.

1. Explain what a primary standard is.

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1. Describe how you would prepare a 250 mL standard solution of 0.05 M Na2CO3.

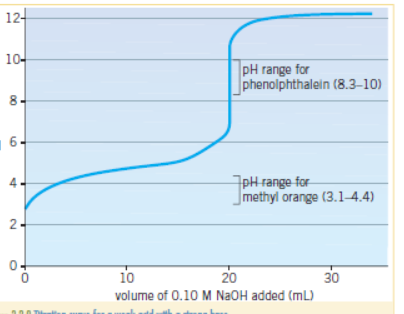
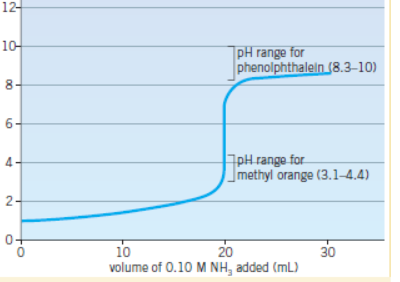
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1. Use an equation to explain why NaOH is not suitable as a primary standard.

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If oxalic acid is a weak acid, explain how you would choose a suitable indicator for this reaction. Refer to the diagrams below.



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1. Oxalic acid is a diprotic acid. Write a balanced equation for its reaction with NaOH.

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**Titration data**: 20 mL of oxalic acid added to a 250 mL volumetric flask and made up to the mark with

de-ionised water. The diluted solution is added to the burette.

20 mL aliquots of 0.15 M NaOH used.

Titres 21.95 21.10 20.90 21.05 mL

Calculate the concentration of the undiluted oxalic acid.

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1. What will each of the following be rinsed with?

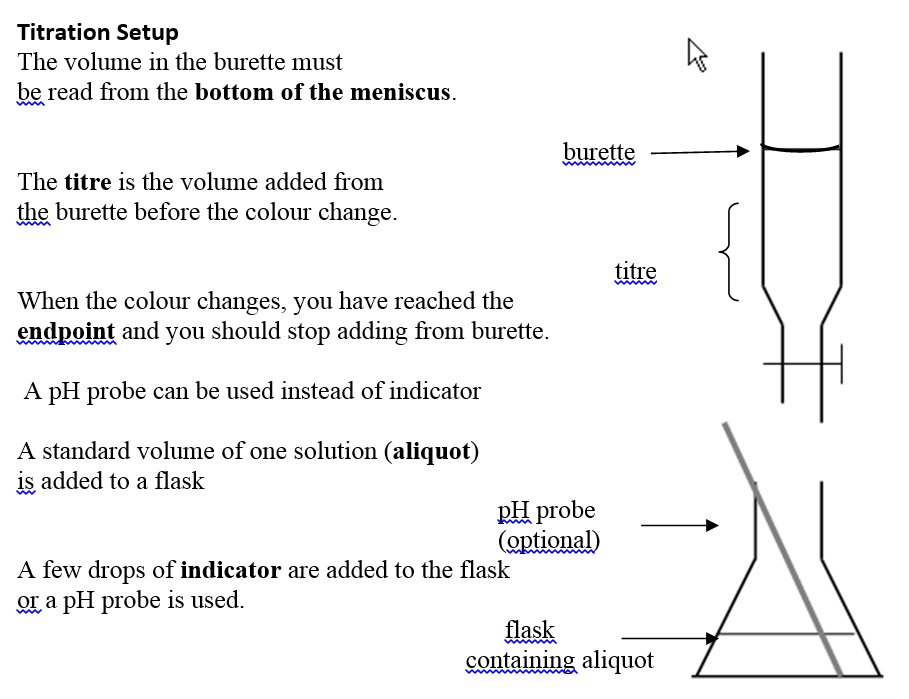
volumetric flask \_\_\_\_\_\_\_\_\_\_\_\_\_\_ pipette \_\_\_\_\_\_\_\_\_\_\_\_\_

burette \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ conical flasks \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Give an example in a titration of a

Random error \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Systematic error \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



**Other**

**Solutions**

1. Solution you have prepared yourself (or purchased) that you are confident of an accurate

concentration – made from stable compound of known formula and purity.

2. Calculate and weigh required mass of Na2CO3. Add to volumetric flask and half-fill with de-ionised

water. Shake to dissolve, make up to the mark with de-ionised water.

3. NaOH reacts with both CO2 and H2O from the air eg. 2NaOH + CO2(g) 🡪 Na2CO3(aq) + H2O(l)

4. C2O4H2(aq) + 2NaOH 🡪 Na2C2O4(aq) + 2H2O(l)

5. volumetric – water: pipette – solution: burette – solution: conical - water

6. random – judging the colour change systematic – volumetric flask not accurate

Concentration: Concordant titres 21.10 20.90 21.05 gives mean titre of 21.02 mL

*n(NaOH) = c x* V = 0.15 x 0.02 = 0.00300 mol

*n*(oxalic) = ½ n(NaOH) = 0.0015 mol

*c*(oxalic diluted) = 0.0015/0.02102 = 0.0714 M *c*(undiluted) = 0.0714 x 250/20 = 0.892 M