

**Marks**  
**6**

- You have completed a number of acid/base titrations during your laboratory work. What is the difference between the 'end point' and the 'equivalence point' in an acid/base titration?

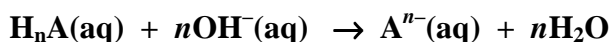
**The endpoint is where the indicator changes colour and the reaction is observed to be completed. The equivalence point is where equal amounts of acid and base have been added. Ideally, the endpoint and equivalence point should be as close to one another as possible.**

How do you determine the concentration of a weak acid through titration with a strong base? Include all necessary steps in your explanation.

**Place a known volume (eg 25.00 mL) of the weak acid solution in a conical flask and add 2 drops of a suitable indicator (such as phenolphthalein).**

**Titrate with a known concentration of the strong base from a burette until the end point (the first *permanent* pink colour) is reached. Record the volume used.**

**The equation of the reaction must be known**



**This can then be used to calculate the moles of OH<sup>-</sup> used.**

**Hence calculate the moles of weak acid present in 25.00 mL.**

**Hence calculate the moles of weak acid present in 1000.00 mL (i.e. its concentration).**

How do you determine the pK<sub>a</sub> of a weak acid through titration with a strong base? Include all necessary steps in your explanation.

**The titration described above is used and the titration of the weak acid is continued past its equivalence point with a strong base, recording the pH as you go.**

**Construct a graph of mL base added vs pH. This is a titration curve.**

**Determine the volume of base required to reach equivalence point (where slope of line is vertical).**

**Divide this value by 2 to give the half equivalence point (where [HA] = [A<sup>-</sup>]).**

**Read the value of the pH at the half equivalence point from the titration curve. From Henderson-Hasselbalch equation, this is the point where pH = pK<sub>a</sub>.**