

Lesson – [errors in titration.](#)

Identify errors in each procedure below and the impact it may have on the eventual average titre.

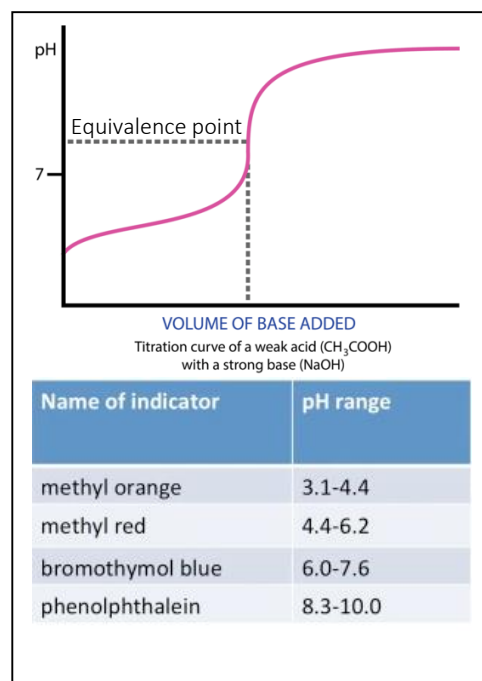
Consider the procedure below.

The acetic acid (ethanoic acid) concentration of a brand of vinegar is to be determined using volumetric analysis. A 20.00 mL pipette is used to take a sample from the original bottle of vinegar which is placed in a 200 mL volumetric flask and made to the mark with distilled water.

A volume of 25.00 mL was transferred from the volumetric flask to a 100mL conical flask, where two drops of indicator is also added and titrated to the end point using a 0.201 M NaOH as the titrant. An average titre of 20.16 mL was obtained.

The titration curve, or pH curve, for this procedure is shown on the right as is the pH range of four indicators.

The concentration of acetic acid in the original sample was found to be 5.00%*m/v*



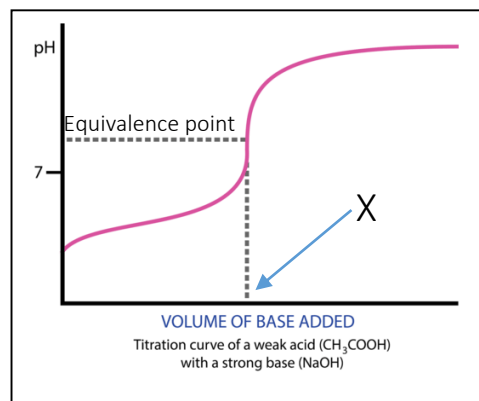
1. Complete the table below.

Event	Impact on the average titre	Impact on the final concentration of 5.00% <i>m/v</i>	Explanation
Burette was rinsed with distilled water			
Methyl red was used as an indicator			
Phenolphthalein was used as an indicator			
The 20mL pipette was rinsed with distilled water			
The 25mL pipette was rinsed with distilled water			
The 100 mL flask was rinsed with water			
The 200mL volumetric flask was rinsed with distilled water			
Burette was rinsed with a 0.201 M NaOH			
Four drops of indicator were placed in the conical flask instead of 2 drops.			
Conical flask was rinsed with 0.201 M NaOH			
Conical flask was rinsed with dilute vinegar solution from the volumetric flask			

2. Consider the pH curve of the titration in question 1. above, shown on the right.

a. what is the value of X?

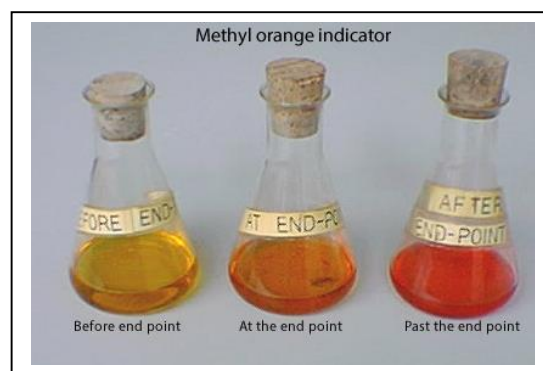
b. Explain the difference between equivalence point and end point.



c. Explain why the Equivalence point is not always at pH 7.

d. The colour changes of methyl orange and phenolphthalein are shown on the right during two separate titrations.

i. Name one advantage of using an indicator such as phenolphthalein as opposed to methyl orange that is obvious from the image on the right.



ii. Which indicator is suitable for the titration of acetic acid with NaOH? Justify your answer.

