

Solutions Stoichiometry Challenge!

You may assume that all solutions are soluble and remain soluble for the titration. (For those of you that are checking solubilities, you would note that barium phosphate would form a precipitate. That's why we will just assume everything is soluble.

Information

An analyte solution of phosphoric acid of unknown concentration is used in a titration with 0.10 mol/L aqueous barium hydroxide solution as the titrant. In the titration, 25.00 mL of phosphoric acid are placed in an empty Erlenmeyer flask. The student notes the initial volume of 0.50 mL of barium hydroxide in the 50 mL burette. (Remember that burettes read zero when they are full and 50 mL when they are empty.) The titration proceeds and the student goes way past the end point. They know this because of the dark pink colour of the phenolphthalein indicator in the flask. The student records the final volume in the burette to be 32.50 mL. (To find volume added, find the difference in volumes). Noticing the error, the student asks the teacher for the correct volume of base that was supposed to be titrated. The teacher says that the correct total volume of base is that should be added is 26.50 mL.

Questions

- (a) Write a properly balanced chemical equation.
- (b) What is the **correct** concentration of the unknown phosphoric acid solution? Base your answer on the teacher's correct volume.
- (c) How many moles is the barium hydroxide in excess according to the **student** volume?
- (d) What is the concentration of the barium hydroxide in the flask at the end of the student's titration. Assume the volumes to be additive?
- (e) What is the concentration of the hydroxide ions in the flask? Work with your information from part (d).
- (f) Suggest a reasonable pH of the final solution in the flask.