Measuring pH as a solid base is added

Pearson Edexcel 1CH0 Separate Chemistry · Foundation and Higher

Answer on your own paper. Show your working where needed.

1. A missing entry

A student adds portions of powdered calcium hydroxide to a fixed volume of dilute hydrochloric acid. Their first pH reading is after the first portion. Which starting result is missing, and where would it go in the results table?

2. Compare two readings

Two samples near neutral look the same colour on a universal indicator chart marked in whole pH units. A student says the samples have exactly the same pH. Explain why the evidence is insufficient and suggest a better measurement.

3. Read the results

Total mass of calcium hydroxide added (g): 0.00, 0.20, 0.35, 0.37, 0.39, 0.45

pH: 1.0, 1.3, 2.3, 3.9, 11.7, 12.3

Between which masses does the mixture pass through neutral? Explain why these readings cannot give the exact mass.

4. A changing display

After a student adds one portion of powder, the pH meter reading is still changing. They want to add the next portion at once. Describe what they should do first and explain why.

5. An explanation for the readings

In another test the pH rises from 1.4 to 2.8 as calcium hydroxide is added. After several more additions it reaches 10.9. Explain the first rise and why the final mixture is alkaline.

6. A different powder

A class uses calcium oxide instead of calcium hydroxide. Write the word equation for calcium oxide reacting with dilute hydrochloric acid. Would you expect the reaction to give off a gas? Explain.

7. Compare the two acids

Two beakers contain hydrochloric acid, X and Y. The same powdered base is used. X reaches pH 7 after 0.30 g is added. Y reaches pH 7 after 0.60 g. Decide which beaker initially contained more acid. Explain using the results.

8. A better second run

A class finds that pH 7 is reached between 0.40 g and 0.50 g of powder. They start a fresh run to narrow that interval. Suggest a change to the masses added near pH 7 and one condition to keep the same.

9. Extra challenge · Compare the results from two bottles

A student compares dilute hydrochloric acid from bottles A and B using the same powdered calcium hydroxide. They use 20.0 cm^3 of A and 40.0 cm^3 of B.

For A, the pH goes from below 7 to above 7 between 0.36 and 0.38 g. For B, this happens between 0.72 and 0.76 g.

Assess the claim that B is twice as concentrated because it needs about twice as much powder. Use the readings and describe a test that would give a fairer comparison.

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