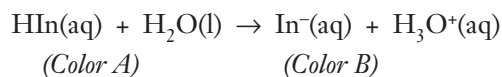


Acidity of Beverages

AP Chemistry Review Questions

Integrating Content, Inquiry and Reasoning

- Why is phenolphthalein an appropriate indicator for titration of a strong acid with a strong base? Explain based on the pH at the equivalence point and the transition range for phenolphthalein.
- A 10.00-mL sample of HCl solution was transferred to an Erlenmeyer flask and diluted by adding about 40 mL of distilled water. Phenolphthalein indicator was added, and the solution was titrated with 0.215 M NaOH until the indicator just turned pink. The exact volume of NaOH required was 22.75 mL. Calculate the concentration of HCl in the original 10.00-mL sample.
- One student accidentally “overshot” the endpoint and added 23.90 mL of 0.215 M NaOH. Is the calculated concentration of HCl likely to be too high or too low as a result of this error?
- Acid–base indicators are large organic molecules that behave as weak acids. The distinguishing characteristic of indicators is that the acid (HIn) and conjugate base (In[−]) forms are different colors.



The color of an indicator solution depends on pH and the relative amount of HIn and In[−] at a given pH. Consider the following indicators and their acidic and basic colors, as well as the pH transition range for each.

Indicator	HIn	In [−]	pH Transition
Alizarin*	Yellow	Red	5.5–6.8
	Red	Purple	11.0–12.4
Bromthymol blue	Yellow	Blue	6.0–7.6
Phenolphthalein	Colorless	Pink	8.2–10.0

*Alizarin has two ionizable hydrogen atoms and three color forms, H₂In, HIn[−], and In^{2−}.

- The intermediate or transition color of bromthymol blue is green. What are the relative proportions of HIn and In[−] when bromthymol blue is green? Explain.
- A colorless solution was tested with phenolphthalein, bromthymol blue and alizarin. The solution was colorless with phenolphthalein, yellow with bromthymol blue and orange with alizarin. What is the pH of the solution? Explain.