The AP Chemistry exam tests laboratory REASONING: what a measurement means, which error it carries, and whether the data support the claim. Most lost marks come from answers that describe a procedure without connecting it to the quantity being determined. 化学实验题考的是推理: 测量的含义、误差来源, 以及数据能否支持结论。

Measurement and uncertainty

Report a measurement to the precision the instrument allows, including one estimated digit – a burette reads to 0.01 cm^3, not 0.1.

Distinguish random from systematic error. Repeating reduces random error; it does nothing for a systematic error such as an uncalibrated balance.

When asked whether an error raises or lowers the result, work it through the equation rather than guessing the direction.

Do not report more significant figures than the least precise measurement supports, especially after dividing.

Solution and gravimetric work

Rinsing a burette with the titrant, not water, prevents dilution – that is the reason, and the reason is the mark.

Rinsing a conical flask with water is fine: extra water does not change the moles of analyte present.

Heat a crucible to CONSTANT MASS and say why: repeated heating and weighing proves all the water has been driven off.

For a gravimetric determination, the precipitate must be washed and dried; wet or impure precipitate raises the apparent mass and so raises the calculated amount.

Spectroscopy and Beer's law

Beer-Lambert law 比尔-朗伯定律 — absorbance is proportional to concentration and path length, so a calibration line through the origin lets an unknown concentration be read off

Calibration curve 标准曲线 — a plot of absorbance against known concentrations, used to determine an unknown; the unknown must fall INSIDE the range measured

λmax 最大吸收波长 — the wavelength of maximum absorbance, chosen because it gives the greatest sensitivity and the smallest error

Reasoning about data

To justify a claim, cite the data: the number, its units and the comparison you are drawing from it.

A rate law order comes from experimental data, never from the coefficients in the balanced equation.

For a first-order reaction a plot of ln[A] against time is linear; for second order it is 1/[A]. Name which plot is straight – that IS the evidence.

In a titration curve, the equivalence point is the steepest part, and the half-equivalence point gives pKa directly.

When a question asks whether the result supports the identity of an unknown, compare a calculated value with a literature value and state the percentage difference.