ANSWER KEY

DO NOT HAND OUT

A PREDICTIONS THAT EARN FULL MARKS

Circumference pattern	Accept any testable prediction; these small amounts are intended to keep vinegar in excess, but observed balloon readings may vary. The data decide.

B VARIABLES

Independent	Baking soda amount: level ⅛, ¼ or ⅜ tsp.
Dependent	Widest balloon circumference exactly 60 seconds after contact, in centimeters; three trials per amount.
Controlled	30 mL same labeled 5% vinegar, plastic bottle and balloon type, temperature, start method and measuring point.

C SAMPLE DATA

Illustrative readings only, not predictions or measured data. The small tested amounts are designed to keep vinegar in excess, so this example does not demonstrate a limiting-reactant plateau. Balloon fit, stretch and leaks change actual readings.

BAKING SODA	TRIAL 1 (CM)	TRIAL 2 (CM)	TRIAL 3 (CM)	MEAN / RANGE
⅛ tsp	22	24	**23**	**23 / 2 cm**
¼ tsp	29	31	**30**	**30 / 2 cm**
⅜ tsp	36	38	**37**	**37 / 2 cm**

Confirm nine recorded measurements, correct units and a graph axis that starts at zero. Check each mean and range; illustrative values should never be presented as class results.

D MODEL CLAIM, EVIDENCE, REASONING

Claim: In the illustrative readings, circumference rises across the three small baking-soda amounts.
Evidence: The sample means are about 23 cm at ⅛ tsp, 30 cm at ¼ tsp, and 37 cm at ⅜ tsp; ranges are 22–24, 29–31, and 36–38 cm.
Reasoning: The selected baking-soda quantities are intended to stay below the amount that could use up the fixed vinegar. More reacting bicarbonate can form more carbon dioxide, but circumference is an indirect proxy affected by balloon shape, stretch and leaks.

E THINK FURTHER

Plan a separate, teacher-reviewed gas-volume investigation using a suitable apparatus. Keep reactant quantities small, never use a rigidly sealed bottle, and record the collection method.

F QUICK GRADING GUIDE

Full credit requires three readings at each amount, correct units, a comparison that follows the student's evidence and a valid limitation. Do not require a particular balloon size or pattern.