ANSWER KEY

DO NOT HAND OUT

A PREDICTIONS THAT EARN FULL MARKS

Temperature and balloon growth	Accept a testable prediction or uncertainty. Judge it from the actual readings; the result does not establish a universal optimum.

B VARIABLES

Independent	Measured bath starting condition: cool (~12°C), room (~22°C), comfortably warm (~35°C).
Dependent	Each of nine balloon circumferences at 0, 5, 10, 15 and 20 minutes; condition means and ranges.
Controlled	Yeast amount/type, sugar amount, water volume, bottle, balloon, seal, start time and measurement location/method.

C SAMPLE DATA

Illustrative repeated values only, not measured or guaranteed outcomes. They deliberately include bottle-to-bottle variation so students can calculate a mean and range; real bottles will vary too. The three bottles in each bath are bottle-level repeats, not independent temperature baths.

CONDITION / BOTTLE	0 MIN (CM)	5 MIN (CM)	10 MIN (CM)	15 MIN (CM)	20 MIN (CM)
Cool · 1	12	12	12.5	**13**	**13.5**
Cool · 2	12	12.5	13	**13.5**	**14**
Cool · 3	12	13	13.5	**14**	**14.5**
Room · 1	12	12.5	13.5	**14.5**	**15.5**
Room · 2	12	13	14	**15**	**16**
Room · 3	12	13.5	14.5	**15.5**	**16.5**
Warm · 1	12	13.5	16.5	**19**	**22**
Warm · 2	12	14	17	**20**	**23**
Warm · 3	12	14.5	17.5	**21**	**24**

Confirm all nine bottle traces have five time points and cm units; report mean and range for each condition, record bath temperatures, and flag leaks rather than treating them as biological readings.

D MODEL CLAIM, EVIDENCE, REASONING

Claim: In this illustrative set, the comfortably warm group had the largest mean circumference increase over 20 minutes.
Evidence: The warm mean rose from 12 to 23 cm; the room mean from 12 to 16 cm; and the cool mean from 12 to 14 cm.
Reasoning: Yeast can use sugar and release CO_2, which can stretch the balloon. These readings describe this recipe and time window, not a universal optimum. Circumference is indirect, and bottle repeats shared each bath.

E THINK FURTHER

At one teacher-approved comfortably warm temperature, compare two sugar amounts with the same yeast and water, matching bottles and balloons, and repeat the five-time-point series.

F QUICK GRADING GUIDE

Require all nine raw traces, condition means and ranges at shared times, a claim based on the student's data, and a note that circumference is indirect evidence.