ANSWER KEY

DO NOT HAND OUT

A PREDICTIONS THAT EARN FULL MARKS

First to appear	Accept any reasoned prediction. Judge it against the measured seconds and darkness; lemon juice or baking soda solution often show first, but results vary.

B VARIABLES

Independent	Liquid used as ink: lemon juice, milk, baking soda solution or plain water (control).
Dependent	Seconds until the writing is visible (up to 120 s) and its darkness: light, medium or dark.
Controlled	Same paper type and size, swab type, amount of liquid, drying time, hair dryer setting and distance, and the 120 s limit.

C SAMPLE DATA

Illustrative values only, not guaranteed results. They show lemon juice and baking soda solution appearing within about a minute under gentle warm air, milk appearing later and fainter, and the plain-water control showing no mark within 120 s. Real times vary with paper, amount applied, drying and heat.

LIQUID USED	TIME TO APPEAR (S)	DARKNESS (LIGHT / MEDIUM / DARK)
Lemon juice	45	Medium
Milk	70	Light
Baking soda solution	50	Medium
Plain water (control)	Not by 120 s	None

No arithmetic: confirm all times are in seconds under the same 120 s limit, a liquid that never appears is recorded as “not by 120 s” with darkness “none”, and the graph shows it as an open bar rather than a number.

D MODEL CLAIM, EVIDENCE, REASONING

Claim: In the illustrative data, lemon juice made the writing appear first, and the plain-water control never showed a mark.
Evidence: Lemon juice appeared at 45 s (medium), baking soda solution at 50 s (medium), milk at 70 s (light), and plain water not by 120 s (none).
Reasoning: The dried liquids left residues that darkened under warm air, while water left almost none. Because the paper itself can also brown and each liquid leaves a different residue, one trial supports a pattern but not a single cause such as acid alone.

E THINK FURTHER

Heat every sheet from exactly the same marked distance, repeat each liquid on a fresh sheet and compare the range of times rather than a single reading.

F QUICK GRADING GUIDE

Credit conclusions that use the student's own seconds and darkness ratings with the water and untreated checks. Require that the adult ran the heat, no flame or iron was used, and that “none visible” is recorded rather than guessed. Treat the sample values as illustrative, not required results.