ANSWER KEY

DO NOT HAND OUT

A PREDICTIONS THAT EARN FULL MARKS

Liquid and drop count	Accept a reasoned prediction that plain water may hold more drops because soap can reduce surface tension. Judge using the class's own repeated results.

B VARIABLES

Independent	Liquid: plain water or water with 1 drop of dish soap.
Dependent	Whole-number drops at first spill, with three trials and the mean for each liquid.
Controlled	Same clean penny, dropper, drop height and angle, level surface, counting endpoint and complete drying between trials.

C SAMPLE DATA

Illustrative counts, not guaranteed results. Plain water's 23–27 drops fall within the lab's ordinary expectation of roughly 20–30; soapy water's 6–8 counts are a handful. The means are 25 and 7 drops, calculated from the three trials. Penny condition and drop size can shift both values.

LIQUID	TRIAL 1	TRIAL 2	TRIAL 3	AVERAGE
Plain water	25	23	**27**	**25**
Water + dish soap	8	6	**7**	**7**

Recalculate means as 25 and 7. Confirm the count uses the same first-spill rule and coin-drying method; do not grade against the illustrative values as a fixed target.

D MODEL CLAIM, EVIDENCE, REASONING

Claim: In these illustrative trials, the penny held more plain-water drops than soapy-water drops.
Evidence: Plain water counts were 25, 23 and 27 (mean 25); soapy-water counts were 8, 6 and 7 (mean 7).
Reasoning: Cohesion and surface tension help water form a dome on the penny. Soap can weaken surface tension, so the dome often spills with fewer drops; drop size and coin condition affect the exact count.

E THINK FURTHER

Repeat with a second measured soap amount, keeping the coin, dropper, drop height and endpoint constant.

F QUICK GRADING GUIDE

Require three trials per liquid, correct means and a conclusion based on the student's own counts. Credit a surface-tension explanation that notes drop size and coin condition; do not require sample counts as the only correct results.