ANSWER KEY

DO NOT HAND OUT

A PREDICTIONS THAT EARN FULL MARKS

Object position	Accept any layer or boundary prediction that students compare with their actual column; no universal object position is required because materials vary.

B VARIABLES

Independent	Test object: grape, bottle cap, eraser or plastic bead.
Dependent	Actual layer or boundary where each object settles and whether that matches prediction.
Controlled	Liquid identities and amounts, cylinder width, settled layer order and gentle object entry.

C SAMPLE DATA

Illustrative placements only; the density of grapes, caps, erasers, beads and household liquids varies. Students should record their own observed layers and boundaries.

OBJECT	PREDICTED LAYER	ACTUAL LAYER	MATCHED?
Grape	Dish soap/water boundary	**Dish soap/water boundary**	**Yes**
Bottle cap	Oil surface	**Oil surface**	**Yes**
Eraser	Bottom layer	**Bottom layer**	**Yes**
Plastic bead	Bottom layer	**Dish soap/syrup boundary**	**No**

Confirm the sketch matches the actual liquid order in the class cylinder and every object's prediction is compared with its recorded resting position.

D MODEL CLAIM, EVIDENCE, REASONING

Claim: In this illustrative column, objects stopped at different levels rather than all sinking to the bottom.
Evidence: The sample record places the cap at the oil surface, the grape at the dish soap/water boundary, the bead at the dish soap/syrup boundary and the eraser in the bottom layer; one prediction (the bead) did not match.
Reasoning: An object sinks through liquids less dense than itself and can be supported by a denser liquid. The column shows a qualitative comparison; product recipes and trapped air can change placements.

E THINK FURTHER

Measure equal volumes of two liquids on a balance and divide each mass by its volume; compare the estimates with their observed layer order.

F QUICK GRADING GUIDE

Award credit for the student's observed order, accurate object positions and reasoning from adjacent liquid layers. Do not require the illustrative sample placements as fixed answers.