

Nine Things the Chief Reader Says Every Year

The advice repeated in 2023, 2024 and 2025 — with the twenty-seven quotations that prove it.

The list is short, and it does not get longer.

For every free-response question, each Chief Reader Report puts the same question to the readers: *what advice would you offer teachers to help them improve student performance on the exam?* Across 2023, 2024 and 2025 that is fourteen blocks and **eighty-eight separate bullets** of advice, written after 499,055 exams were read. Sorted by how many of the three years they appear in, the top of the list runs out fast.

	2023	2024	2025
Precise words, not “gravity”	●	●	●
Task verbs	●	●	●
Reading the prompt	●	●	●
Derivations from the equation sheet	●	●	●
Equations as relationships	●	●	●
Naming what a slope represents	●	●	●
Constructing graphs, not just reading them	●	●	●
Justifying every step	●	●	●
Designing experiments, under-equipped	●	●	●
and then it stops:			
What each question type is for	○	●	●
Fraction and exponent fluency	●	○	●
Copying the sheet correctly	●	○	●

Nine pieces of advice, each quoted below in all three years. The greyed rows appeared in two years of three, and are marked as the weaker evidence they are.

A note on the green boxes. Each restates its item in classroom language, stripped of the report’s wording — a formulation, not a script. What to do with it is yours.

The words

1 Precise words are part of the physics, and “gravity” is not one of them.

2023 “Be specific with the physics vocabulary in class. Example: ‘Force of gravity’ or ‘acceleration due to gravity’ vs. ‘gravity.’” (Q5, p. 16)

2024 “... it is necessary to use precise terminology (g or acceleration due to gravity vs. gravity) ...” (Q4, p. 13)

2025 “... students often use conservation of energy and conservation of momentum interchangeably ...” (Q1, p. 4)

WHAT STUDENTS STILL DO

2024 records responses that “used ‘gravity’ in their justifications instead of using the terms gravitational force, gravitational acceleration, or gravitational field ...” (Q4, p. 12). 2023 has the other half: students

who “confuse conservation with same or equal in general” (Q4, p. 13).

IN CLASSROOM LANGUAGE

“Gravity” is not a quantity. There is a gravitational *force*, in newtons, and a gravitational *acceleration*, in m/s^2 — and two things being equal is not a conservation law.

2 A task verb tells the student how much work to show.

2023 “Derive ... *must start with a fundamental principle* ... Determine ... *does not require work to be shown, only the final answer.*” (Q1, p. 4)

2024 “... *addressing the action verbs (determine, justify, etc.) used in exams* ...” (Q5, p. 15)

2025 “*Be intentional about using task verbs ... These words are bolded in the free-response questions* ...” (Q1, p. 4)

WHAT STUDENTS STILL DO

The 2024 readers describe what arrives instead — “weaker wording like ‘it’ ” and “being vague with wording,” where “answers should be definitive and should address what is being requested in the prompt” (Q5, p. 15). The verb also sets the price: work shown under *determine* costs minutes, work skipped under *derive* costs points.

IN CLASSROOM LANGUAGE

The bold word sets the price. *Derive*: start from the sheet and show the lines. *Determine*: the answer alone is enough. *Calculate*: show the substitution and put the units on.

3 The prompt names the starting point and the space to use.

2023 “Remind students to read the prompt ... *Many students drew a separate graph in the space beneath the prompt.*” (Q1, p. 4)

2024 “*Answers ... should address what is being requested in the prompt.*” (Q5, p. 15)

2025 “... *ensure their response uses the correct information and answers the question that is asked.*” (Q2, p. 7)

WHAT STUDENTS STILL DO

On the 2025 fluids question, “some responses began the derivation with Bernoulli’s equation, despite the prompt ... stating, ‘Starting with Newton’s second law ...’ ” (Q4, p. 12). A prompt that gives you the starting equation is giving you a point.

IN CLASSROOM LANGUAGE

Two things in a prompt are not suggestions: the equation it tells you to start from, and the figure it tells you to draw on. Find both before you write anything.

Deriving

4 A derivation begins on the equation sheet and runs more than one line.

2023 “*Derived equations should always start with a law or equation from the equation sheet. When working on derivations, require that derivations contain at least three separate lines:*” (Q5, p. 16)

2024 “*Practice derivations beginning from fundamental principles and substituting given variables.*” (Q3, p. 10)

2025 “... *beginning with fundamental principles and writing answers in terms of given variables.*” (Q1, p. 4)

WHAT STUDENTS STILL DO

2023’s lowest-scoring question, Q5 at a mean of 1.57 out of 7, states the failure in one line: “When a derivation is asked for, only one line of work is shown” (p. 16). Two years on, “less than 20% of responses correctly combined all steps in the derivation and arrived at a correct final expression ...” (2025, Q2, p. 6).

IN CLASSROOM LANGUAGE

Three lines, every time. The law as it appears on the sheet. The substitution, in the letters this problem gave you. The rearranged answer — each on a line of its own, so a reader can see where you started.

5 An equation is a relationship between variables, not a thing to be solved.

2023 “... *understand which variables remain constant in the scenario and which do not.*” (Q3, p. 11)

2024 "... they need to identify which quantities are changing and which quantities remain the same." (Q4, p. 13)

2025 "Students too often view an arrangement of variables as something to be solved rather than a relationship between variables." (Q3, p. 10)

WHAT STUDENTS STILL DO

On the 2024 equilibrium question, "about 30 percent of responses attempted to show functional dependence in part (c) but did not correctly relate the dependence to their response in part (b)" (Q3, p. 10). The equation was there; the sentence saying what it predicts was not.

IN CLASSROOM LANGUAGE

Before you solve an equation, read it: which letters are fixed in this scenario, and which one is being changed? Read that way, an equation answers a comparison question with no numbers at all.

Graphs

6 A slope means something before it equals anything.

2023 "... 5. Determine what the slope would represent on your linearized graph." (Q2, p. 8)

2024 "Discuss how the slope of a line could indicate a variety of information." (Q5, p. 15)

2025 "... demonstrate explicitly how the slope is related to what they were trying to calculate." (Q3, p. 10)

WHAT STUDENTS STILL DO

On 2025's lab question, mean 4.93 out of 10, responses were "unable to determine what should be graphed on vertical and horizontal axes such that the mass of the meterstick was the slope ..." some plotting "the inverse of the appropriate quantity ... which does not produce a straight line" (Q3, p. 9). In 2024, responses "showed difficulty describing how to use the slope of a linearized graph to determine an unknown quantity" (Q2, p. 6).

IN CLASSROOM LANGUAGE

Finish this sentence before you plot a single point: "the slope of this graph is ____." If you cannot finish it, the axes are wrong — and choosing them is usually the harder half of the question.

7 Students spend the year reading graphs and are asked to produce them.

2023 "Practice with different ways of visualizing the Law of Conservation of Energy" — then six sub-bullets: bar charts, and K or U against t , against x , and against each other. (Q1, p. 4 — narrower in 2023: energy representations)

2024 "Students ... get a lot of practice reading graphs. They should also get practice constructing graphs ..." (Q5, p. 15)

2025 "Practice sketching graphs ... Require students to identify what is independent and what is dependent ..." (Q1, p. 4)

WHAT STUDENTS STILL DO

Asked to sketch angular speed for a beam whose torque was falling, "about 80 percent of responses drew a linear relationship representing a constant angular acceleration ... Very few responses showed a decrease in the angular acceleration with respect to time" (2024, Q3, p. 10).

IN CLASSROOM LANGUAGE

On the exam you make the graph; nobody hands you four to choose from. Practise the ones no textbook prints: the curve that flattens out, the horizontal line that means nothing is changing.

Arguing, and the lab

8 Every step of a justification needs its own reason.

2023 "Responses need to justify each step of reasoning. Many times, the responses are too vague to receive credit ..." (Q5, p. 16)

2024 "... have students review each other's justifications for clarity and logical completeness." (Q4, p. 13)

2025 "... how each step of the process supports their claim by connecting physics principles." (Q4, p. 13)

WHAT STUDENTS STILL DO

2023 names the failure mode exactly, on the paragraph-length question that averaged 2.56 out of 7: "students often use circular logic (for example, because change in angular momentum is the same, then rotational inertia times angular velocity must be the same, so that explains why change in angular

momentum is the same)” (Q4, p.13). In 2025, justifications were incomplete because they “did not address all the variables that were associated in the problem” (Q2, p.7).

IN CLASSROOM LANGUAGE

Every sentence in a justification needs a *because*, and it has to come from outside the claim. If your reason is the thing you are trying to show, you have written a circle.

9 Experimental design is a year-long habit, practised with equipment that isn't enough.

2023 “... allow students an opportunity to be frequently engaged in open inquiry lab experiences.” (Q2, p.8)

2024 “Ask students to design an experimental procedure using limited equipment ...” (Q2, p.6)

2025 “Perform experiments with limited equipment ... explain ... how they reduced experimental uncertainty.” (Q3, p.9)

WHAT STUDENTS STILL DO

The 2025 lab question handed out a spring scale and a metre stick, and “some responses indicated that spring scales could be used to directly measure torque” (Q3, p.9). The same report asks for procedures edited down — cut “extra steps like ‘gather equipment’ and ‘record data in a neat table’” (p.9).

IN CLASSROOM LANGUAGE

The lab question always gives you less equipment than you want; that *is* the question. What can be measured with what is on the table, how is it measured more than once, and what comes out of the procedure to make room for saying so?

AND THREE THAT WERE SAID TWICE, NOT THREE TIMES

What each question type is for. 2024: “the purpose of the Qualitative-Quantitative Translation is for students to connect qualitative claims based on physics principles to a mathematical representation of the same principle” (Q3, p.10) — the same sentence recurs in 2025, with the name restyled as “qualitative/quantitative translation” (Q4, p.13). Nothing in 2023. **Algebra itself.** 2023 asks for practice with “Fractions with addition/subtraction, exponents, square roots” (Q1, p.4); 2025, for “derivations with several algebraic combinations ... for students who struggle with algebraic manipulation” (Q1, p.4). Nothing in 2024. **Copying the sheet correctly.** 2023: “Help students understand the relevance of each equation on the equation sheet” (Q1, p.4). 2025: responses include “an incorrect equation; for example, forgetting to square a variable ...” (Q2, p.7), and “many students confused rho ρ with the letter p ...” (Q4, p.13). Nothing in 2024.

Where this shows up first

None of the nine needs a new unit, and four of them are settled before a student writes a second line: which words are used, which verb is obeyed, which equation is copied down first. **Items 1 to 4 are the ones that cost nothing but the language used at the board** — and between them they account for eight of the fourteen advice blocks.

And one thing worth knowing

Some of this advice does not merely recur — it recurs *verbatim*. Two sentences appear in the 2024 report and again in the 2025 report, word for word. One: “Have students practice working with equations to identify variables and describe how changes in a variable will lead to changes in the derived quantity” (2024, Q4, p.13; 2025, Q4, p.13). The other opens the bullet about question types: “Make sure students understand the specific purpose of the types of free-response questions” (2024, Q3, p.10; 2025, Q4, p.13). The two-column derivation scaffold is asked for in both years as well, in slightly different words (2024, Q1, p.3; 2025, Q4, p.13). Read one way, three Readings kept arriving at the same conclusion. Read another, the report is quoting itself. Either way, the list is closed — and that is the useful part.

Sources. All quotations are from the AP Physics 1: Algebra-Based Chief Reader Reports for 2023, 2024 and 2025, published by the College Board on AP Central, and are cited by question and by page of the report as published. Eighty-eight is the count of top-level bullets in the fourteen “what advice would you offer teachers” blocks of those three reports, several of which carry sub-bullets under them; four of the blocks continue onto the following page. Students scored: 159,582 (2023), 164,481 (2024), 174,992 (2025); global means 2.55, 2.59 and 3.12. Chief Reader, all three years: Brian Utter, University of California, Merced. Question means are as printed in each report. Reproduced for teacher professional use with attribution. Independent publication, not endorsed by or affiliated with the College Board. AP® is a College Board trademark.