



**AP[®] Physics B
2004 Scoring Commentary
Form B**

The materials included in these files are intended for noncommercial use by AP teachers for course and exam preparation; permission for any other use must be sought from the Advanced Placement Program[®]. Teachers may reproduce them, in whole or in part, in limited quantities, for face-to-face teaching purposes but may not mass distribute the materials, electronically or otherwise. This permission does not apply to any third-party copyrights contained herein. These materials and any copies made of them may not be resold, and the copyright notices must be retained as they appear here.

The College Board is a not-for-profit membership association whose mission is to connect students to college success and opportunity. Founded in 1900, the association is composed of more than 4,500 schools, colleges, universities, and other educational organizations. Each year, the College Board serves over three million students and their parents, 23,000 high schools, and 3,500 colleges through major programs and services in college admissions, guidance, assessment, financial aid, enrollment, and teaching and learning. Among its best-known programs are the SAT[®], the PSAT/NMSQT[®], and the Advanced Placement Program[®] (AP[®]). The College Board is committed to the principles of excellence and equity, and that commitment is embodied in all of its programs, services, activities, and concerns.

For further information, visit www.collegeboard.com

Copyright © 2004 College Entrance Examination Board. All rights reserved. College Board, Advanced Placement Program, AP, AP Central, AP Vertical Teams, APCD, Pacesetter, Pre-AP, SAT, Student Search Service, and the acorn logo are registered trademarks of the College Entrance Examination Board. PSAT/NMSQT is a registered trademark of the College Entrance Examination Board and National Merit Scholarship Corporation. Educational Testing Service and ETS are registered trademarks of Educational Testing Service. Other products and services may be trademarks of their respective owners.

For the College Board's online home for AP professionals, visit AP Central at apcentral.collegeboard.com.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 1

Sample: A

Score: 14

This paper only lost one point, in part (d). Instead of indicating that the work is negative, the student ascribes a direction to it.

Sample: B

Score: 10

This paper lost one point in part (b) for the extraneous centripetal force. In part (c), the relative signs of the forces are wrong, so only one point was earned. This student also missed the negative sign in part (d). In part (e), the justification does not refer back to the force equation, and so only 2 points were earned there.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 2

Sample: A
Score: 15

In part (b), this student uses the alternate method of calculating the pressure and then multiplying that by the area.

Sample: B
Score: 10

In part (a), the student used the wrong distance for the constant speed portion, and only earned 2 points. In part (c), the student subtracts the internal bell pressure instead of adding atmospheric pressure, and only earned 1 point. The wrong pressure is used in part (d), so one point was lost there.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 3

Sample: A

Score: 15

This is a good example of a concise, completely correct paper.

Sample: B

Score: 12

Only 2 points were earned for part (a) since the difference in resonance lengths was set equal to a whole wavelength instead of a half wavelength. Part (d) also earned only 2 points because a full wavelength was added instead of a half wavelength.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 4

Sample: A

Score: 15

This paper earned full credit on all the parts to the question. One of the alternate solutions was used for part (d). The justification for the correct answer to part (e) is very complete and clearly written.

Sample: B

Score: 9

In part (a), one point was lost for failing to multiply the induced emf per turn by the number of turns to get the total emf. In part (b), credit was given for the numerical answer because it was consistent with the answer to part (a), but one point was lost for the wrong direction. Part (c) received full credit, again for consistency with previous answers. Part (d) received only the point for the correct expression for the force on a straight wire; the wrong value was substituted for the length of the left side of one of the loops, and again the answer did not take into account the 20 turns in the coil. Part (e) also received only one point for recognizing just one of the two effects that doubling the number of turns in the coil would have on the current.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 5

Sample: A
Score: 10

This paper earned full credit on all the parts to the question. Points *B* and *C* were compared in determining the answer to part (b). The justifications in part (d) were very well written, using the first law of thermodynamics to determine whether Q was positive or negative in each of the three processes.

Sample: B
Score: 7

This paper received full credit for part (a) and for a clearly written answer to part (d) that shows a good understanding of the concepts involved. However, in part (b), the subscripts for the temperatures at points *B* and *C* were interchanged resulting in an incorrect answer, thus earning no points. An additional point was lost in part (c) for using the incorrect pressure and for failing to calculate a final answer.

AP[®] PHYSICS B
2004 SCORING COMMENTARY (Form B)

Question 6

Sample: A
Score: 10

This paper earned full credit on all the parts to the question. The answers are clearly presented, although part (d) could have been done with less calculation by deriving a symbolic answer before substituting numerical values.

Sample: B
Score: 8

This paper earned full credit on parts (a), (b), and (c). No points were awarded for part (d) because only the energy of the scattered photon was computed; this energy should have been subtracted from the energy of the incident photon in order to determine the energy imparted to the recoiling nucleus.