AP® Physics B
2002 Scoring Commentary

These materials were produced by Educational Testing Service® (ETS®), which develops and administers the examinations of the Advanced Placement Program for the College Board. The College Board and Educational Testing Service (ETS) are dedicated to the principle of equal opportunity, and their programs, services, and employment policies are guided by that principle.

The College Board is a national nonprofit membership association dedicated to preparing, inspiring, and connecting students to college and opportunity. Founded in 1900, the association is composed of more than 4,200 schools, colleges, universities, and other educational organizations. Each year, the College Board serves over three million students and their parents, 22,000 high schools, and 3,500 colleges, through major programs and services in college admission, 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 equity and excellence, and that commitment is embodied in all of its programs, services, activities, and concerns.

AP® PHYSICS B
2002 SCORING COMMENTARY

Question 1

Sample 1 (Score 15)

This student uses Method 2 for parts (b) and (c), first using the net force in part (b) to calculate the average acceleration while the engine is firing, and then determining the speed attained when the engine stops in part (c). The student also uses energy conservation instead of kinematics to determine the distance traveled after the engine stops firing.

Sample 2 (Score 13)

In part (c), this student does not calculate the distance traveled while the engine is firing, and loses that point and the point for adding the two distances.

Question 2

Sample 1 (Score 15)

This student uses the second explanation noted for part (b), and explicitly indicates in (d) that at $x = 0$ the energy is all kinetic, thus receiving the point for the indication that potential energy is zero at $x = 0$.

Sample 2 (Score 15)

This student writes just about the bare minimum needed to indicate an understanding of the situation and show the appropriate work.

Question 3

Sample 1 (Score 15)

This student has neatly organized solutions, and even draws a circuit diagram for each case. Note in part (d)i that the student recalculates the power for each light bulb and adds them, instead of determining the total resistance or simply adding the two rated powers.

Sample 2 (Score 14)

This student loses 1 point in part(c), where the order of the series bulbs is reversed.

AP® PHYSICS B
2002 SCORING COMMENTARY

Question 4

Sample 1 (Score 15)

The student's image for part (a) is not exactly at 15 cm, but it is accurate enough given the slight errors in ray drawing expected. The student does not explicitly state in (e) that the object is inverted, but does show this in the diagram and describes the image as real.

Sample 2 (Score 15)

This student uses the alternate solution for part (c), and the same equation in part (d). This student also shows an inverted image in (e) and describes it as real.

Question 5

Sample 1 (Score 10)

This student's solution is complete and straightforward.

Sample 2 (Score 9)

This student uses the alternate solution in part (d), but loses 1 point: a factor of v is lost in solving for r, and this makes the solution for acceleration incorrect.

Question 6

Sample 1 (Score 10)

This student uses the method in example 1 for part (a). In part (d), the student does not explicitly define x_1 or x_2, but their meaning is clear in context and all other symbols are defined so full credit was awarded.

Sample 2 (Score 8)

This student earns full credit for the first two parts, but only partial credit for the last two. The measurements needed are complete and clearly described, and the student shows understanding of how to determine the buoyant force, but does not describe how to get from that force to a determination of the fluid density.

AP® PHYSICS B
2002 SCORING COMMENTARY

Question 7

Sample 1 (Score 10)

This student has a well-organized solution, with a clear explanation for part (c).

Sample 2 (Score 8)

This student only earns 1 point in the last part, for the indication of conservation of momentum.