



## AP<sup>®</sup> Physics B 2003 Scoring Commentary

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**Question 1**

Sample A (Score 15)

This response is very explicit in showing the algebraic and numerical steps.

Sample B (Score 13)

This response only earns 1 point in part (a), for correctly showing the weight of student *A*. The normal force on Student *A* is missing and the numerical value of the upward force on Student *B* is incorrect, so the remaining two points are lost.

**Question 2**

Sample F (Score 15)

This student uses the first alternate approach in part (c).

Sample G (Score 12)

This student makes errors in substitution in part (d), and only earns 1 point there.

**Question 3**

Sample K (Score 15)

This student uses a different kinematic approach in part (b) than shown in the scoring guide.

Sample L (Score 13)

This student makes an error in substituting lengths in part (e), and only earns 2 points there.

**Question 4**

Sample P (Score 15)

This student creates a real image, and correctly describes adjusting the experiment setup until the desired image is obtained.

Sample Q (Score 13)

This response only earns 2 points for part (a). The student is creating a virtual image, and does not give any explanation of the process for measuring such an image. Part (e) earns no credit.

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**Question 5**

Sample W (Score 10)

In part (a) this student uses a rarely seen alternate solution. Instead of using the first law of thermodynamics and given energy values, this student recalls the relationship between the changes in temperature and internal energy.

Sample X (Score 8)

This student earned just 1 point for part (e). The explanation references only net work done during the cycle, not the correct change in energy along the path *cda*.

**Question 6**

Sample AA (Score 10)

This student actually calculates the new tension as a justification for part (d).

Sample AB (Score 8)

This student does not correctly calculate the buoyant force in part (c), and only earns 3 points there.

**Question 7**

Sample AF (Score 9)

Part (a) earns only 1 point, because it only addresses momentum conservation.

Sample AH (Score 6)

Part (a) earns only 1 point, because it only addresses energy conservation. In part (c), the solution ends at determining the frequency and does not go on to calculate the wavelength. Part (d) earns 2 point. The error in converting joules to eV results in an incorrect final answer.