

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Fall 2022

Problem Set #9

Problem Set Due: Thurs., Nov. 3, 2022

Read OpenStax: Chapter 11.1-11.4, 11.7, Lecture Notes #9

There will be a Quiz #3 on Thursday, Nov. 10 (Nov 8—school is closed for elections)

Show explicitly all your work for full credit.

Staple Expert TA solutions to Problems #1-6 together

Staple solutions to #7-10 together

Number your solutions from #1 to #10

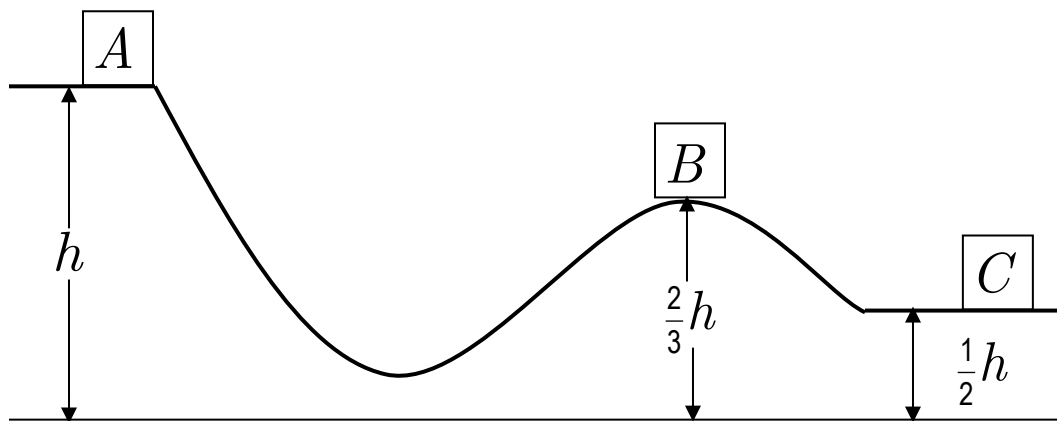
- | | |
|-----------------------|-----------------------------------|
| 1. Expert TA: 15.1.2 | show calculation and figure |
| 2. Expert TA: 15.1.3 | show calculation and figure |
| 3. Expert TA: 15.2.1 | show calculation and figure |
| 4. Expert TA: c15.4.5 | <i>conceptual problem—explain</i> |
| 5. Expert TA: 15.4.3 | show calculation and figure |
| 6. Expert TA: 15.4.19 | show calculation and figure |

Problems #10 is on the next page

Remember: (1st) read the section then (2nd) try to do the problem without looking at the solutions. This will better prepare you for the next Quiz.

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|----------------------------|-----------------------------|
| 7. OpenStax: Example 11.8 | show figure and calculation |
| 8. OpenStax: Example 11.9 | show figure and calculation |
| 9. OpenStax: Example 11.10 | show figure and calculation |

Staple solutions to Problem #7-#10 together



10. You and your friends decide to go on a roller coaster at the county fair. Unfortunately, the roller coaster fails and 3 cars collide with each other. Let each car have mass m and assume the track is frictionless for this problem. After your car A is released *from rest* it makes an inelastic collision with car B stopped on the track due the failure (they both stick together), and the two of them in turn collide with and stick to car C which is also stopped at the end of the track. Fortunately, nobody got hurt.

(a) Find the final velocity of your car A in terms of g and h . (solution: $\frac{1}{3}\sqrt{2gh}$)

(b) Find the total energy converted to heat in this entire process in terms of m , g , and h . (solution: $\frac{1}{3}mgh$)