ADVANCED PHYSICS CLUB

JANUARY 12, 2025

Useful resources

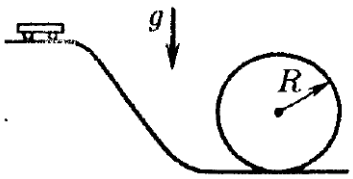
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2024`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

We solved most of the assigned problems on energy conservation law, two remaining problems are reassigned. The next topic is simple harmonic motion.

Reassigned homework

1. A cart goes down the smooth rails which are curved in a vertical loop of radius R. The cart starts moving from rest at height h above the lowest point and stays on the rails for the whole way. What is the minimal h such that it is possible?



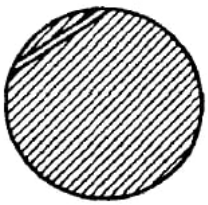
***2.** Two balls with masses m_1 and m_2 are going towards one another with speeds v_1 and v_2 respectively. What maximal possible amount of heat can be released during their collision?

Homework

1. Solve the following problems from the previous F = ma exams:
   (a) 16, 18 (2009: `https://www.aapt.org/physicsteam/2010/upload/2009_F-ma.pdf`)
   (b) 15, 19, 20 (2011: `https://www.aapt.org/physicsteam/2012/upload/WebAssign-exam1-2011-1-4.pdf`)
   (c) 16, 18 (2011: `https://www.aapt.org/physicsteam/2013/upload/exam1-2012-unlocked.pdf`)

2. A block hanging still on a vertical spring extends it by length l. Find the period of small vertical oscillations of the suspended block.

***3.** A straight tunnel is dug through the Earth, not passing through its center. How long would it take a train with engine off to travel from one end to the other end in such a tunnel? Neglect friction and air resistance.



For the next meeting

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **January 19**.