ADVANCED PHYSICS CLUB

JANUARY 18, 2026

Useful resources

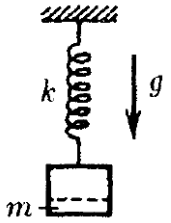
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/classinfo?class_id=2252&sem_id=74`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

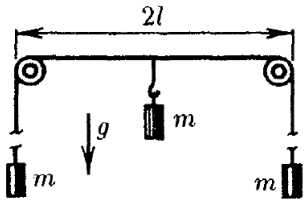
The few remaining problems on energy conservation law are reassigned. The new topic is rotational motion.

Reassigned Homework

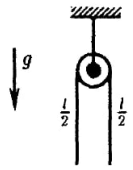
1. A block is in equilibrium on a vertical spring with spring constant k. A part of this block of mass m is detached from it. Up to what height will the rest of the block go?



2. In a system shown on the figure the central block is attached to the center of the rope connecting the other two blocks and initially is held at rest. Find the maximal deviation of the central block from its' initial position during the subsequent motion after it is released.



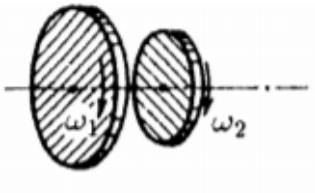
***3.** A uniform smooth rope of mass m and total length l is initially at rest hanging on a small pulley in equilibrium, with exactly $l/2$ on each side, as shown on the figure. Then the rope is displaced just a bit and as a result it starts moving. With what force does the rope act on the pulley when its' length on one side is $l/3$?



New Homework

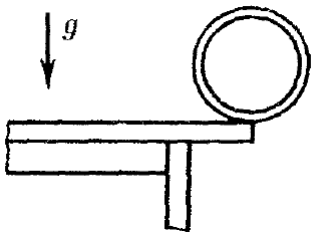
1. Solve the following problems from the previous F = ma exams:
(a) 25 (2009: `https://www.aapt.org/physicsteam/2010/upload/2009_F-ma.pdf`)
(b) 10 (2012: `https://www.aapt.org/physicsteam/2013/upload/exam1-2012-unlocked.pdf`)

2. Two disks with moments of inertia I_1 and I_2 are rotating around the same axis without friction with angular velocities ω_1 and ω_2 respectively. Disks are suddenly brought into contact. Because of the friction between the disks after some time there is no relative slipping between the disks. What is the angular velocity of disks then? How much heat was generated during this process?

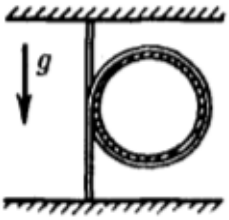


3. A man of mass m stands on the edge of a rotating horizontal disk. The disk has radius R and moment of inertia I, it rotates without friction around vertical axis with angular velocity ω. How will the angular velocity change if the man moves from the edge to the center of the disk? How will the kinetic energy of the system change? Neglect man's size compared to the disk size.

4. A thin ring is placed vertically at the edge of a desk with the ring's center directly above the edge. The ring starts rolling without slipping off the desk. Find the angle it will turn by by the time it loses contact with the desk. Would this angle be larger or smaller if the ring was replaced with a solid ball?



***5.** A uniform, heavy rope is wrapped around a massless ring; both ends of the rope are fixed along the same vertical line. The system is initially held still. What is the acceleration of the ring if it is suddenly released?



For the next meeting

IMPORTANT: The next club's meeting is at 2:40pm, in-person on Sunday, **January 25**.