ADVANCED PHYSICS CLUB

FEBRUARY 27, 2022

Useful resources

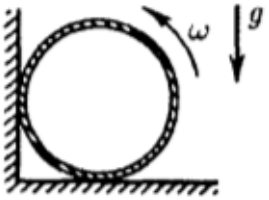
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2021`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

Our new topic is rigid body rotation.

Homework

1. A thin-walled cylinder of radius R rotating with initial angular velocity ω is placed in a corner, as shown on a picture. Friction coefficient between the sides of the corner and the cylinder is μ. Find how many times will the cylinder rotate around its' axis before stopping.

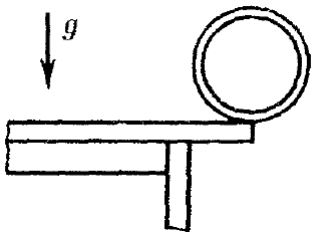


2. A thin ring is rolling without slipping with speed v on a horizontal surface towards a smooth wall. How much time does it take for the ring to stop after an elastic collision with the wall? Friction coefficient between the ring and the horizontal surface is μ. Describe the motion qualitatively in case we take a uniform solid disk instead of a thin ring.

3. A man of mass m stands on the edge of a disk, rotating without friction around a vertical axis with angular velocity ω. The disk has radius R and moment of inertia I. 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 ball with radius R is sliding on a smooth horizontal surface. It hits a "step" of height $H = \frac{R}{5}$. What should be the initial speed of the ball so that it will jump on the step after the first collision? The collision is perfectly elastic, there is no friction.

5. A thin ring stands on the edge of a desk so that its' center is right above the edge. The ring starts rolling without slipping off the desk. By what angle will rotate by the time it loses contact with the desk? Would this angle be larger or smaller if instead of a ring it was a solid ball?



***6.** Consider two people fencing with uniform sticks. Which part of a stick should hit the other stick so that a fencer does not feel recoil? The fencer holds the stick by one of the ends with one hand.

For the next meeting

IMPORTANT: The next club's meeting is at 3:00pm, via Zoom, on Sunday, **March 6**.