

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=ay2020

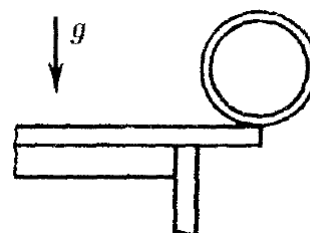
The practical information about the club and contacts can be found on the same web page.

TODAY'S MEETING

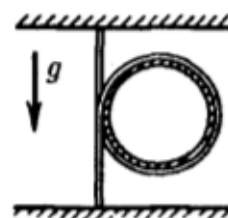
Today we solved most of the assigned problems on rotational dynamics. The remaining problems are reassigned. The next topic is gravity and Kepler's laws.

REASSIGNED HOMEWORK

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 it turn 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. A uniform heavy rope with ends fixed along the same vertical line is grasped around a massless ring that is initially held still. What is the acceleration of the ring if it's suddenly let go from rest?



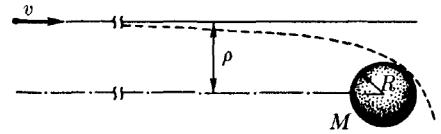
- *7. Consider two people fencing with uniform sticks. Which part of a stick should hit the other stick so that a fencer does not feel recoil? The fencer holds the stick by one of the ends with one hand.

NEW HOMEWORK

1. a) Find the mass of the Earth knowing the free fall acceleration on its' surface $g = 9.8 \text{ m/s}^2$ and its' radius $R = 6370 \text{ km}$. b) Find the escape velocity for the Earth.
2. A satellite is orbiting the Earth with velocity v . What additional velocity should it be supplied with so that it can escape the Earth gravity completely?
3. A rocket at the surface of a planet is provided with the speed exceeding the escape velocity v_e of this planet by 0.5%. When the rocket gets very far away from the planet it has speed v_f . What is the ratio $\frac{v_f}{v_e}$?
4. The largest distance from the Sun to the Halley comet is $35.4R_E$, and the smallest distance is $0.6R_E$ where R_E is the radius of Earth's orbit. Last time it was observed near the Sun in 1986. Which year would it be observed near the Sun next time? What is the ratio of velocities of the comet in these two points (the farthest from and the closest to the Sun).
5. How long would an Earth's year be if mass of the Earth was equal to mass of the Sun and the distance between them stayed the same?

*6. What minimal velocity should be supplied to a cosmic ship near the surface of the Earth so that it can leave the Solar System without firing its engines again? Orbital velocity of the Earth is 30 km/s. Do not account for gravity of other planets in this problem.

*7. A space probe approaches a planet of mass M and radius R from far away with a relative speed v . At what impact parameter ρ (see the figure) the space probe will fly the closest to the planet without crashing?



FOR THE NEXT MEETING

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **February 11**.