# ADVANCED PHYSICS CLUB

SEPTEMBER 26, 2021

## 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

Today we had an organizational meeting and started solving some simple problems. The unfinished problems are assigned as a homework.

The main meetings of the club will happen via Zoom at 4:00-5:30 pm on Sundays. At every meeting, the problems will be assigned to be solved by club participants by the next meeting. At the meetings, we will be solving additional problems and discussing various subtleties and tricks.

**IMPORTANT:** Homework is crucial for the success of the program. Club members will have a dedicated Discord server where they can discuss problems and solve them together.

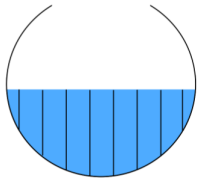
## Classwork

In some problems you might need to use some physical constants or material properties which were not given in order not to hint on the solution. You could use Google search (try to choose a credible source).

**1.** A wooden block of the density $\rho_{wood} = 800$ kg/m$^3$ is floating at the surface of the water. What fraction of the block's height is under water?

## Homework

**2.** A spherical tank of radius $R$ is half-filled with water (see picture). It is known that in a unit time a volume $q$ of water is evaporated per unit area of the water's surface. In what time will all of the water from the tank evaporate?

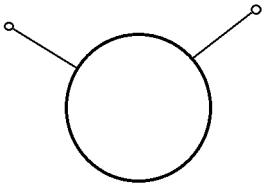


**3.** a) Find the mass of the Earth knowing the free fall acceleration on its' surface $g$ =9.8 m/s$^2$ and its' radius $R = 6370$ km . b) Find the escape velocity for the Earth.

**4.** A pan filled with cold ($t = 10°$C) water is placed on a burner. After 10 minutes the water starts boiling. How long would it take to evaporate the water completely on this burner?

**5.** What would be the charge of a piece of iron with volume 1 cm$^3$ if someone managed to take away 1% of electrons contained in it? What would be the force of interaction between two such pieces of iron placed 1 km apart from each other?

**6.** There is a wire with total resistance 10 Ω. A ring is made out of this wire. Where should one attach two other wires (of negligible resistance) to it so that the resistance between the free ends becomes 1 Ω?



## For the next meeting

**IMPORTANT:** The next club's meeting is at 4:00pm, via Zoom, on Sunday, **October 3**.