

## 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](https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2020)

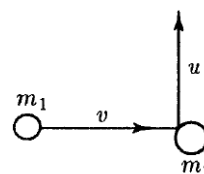
The practical information about the club and contacts can be found on the same web page.

## TODAY'S MEETING

Today we discussed the  $F = ma$  exam, 2014 and began to discuss the momentum conservation law.

## HOMEWORK

- Solve the following problems from the previous  $F = ma$  exams:
  - 4, 5 (2012: <https://www.aapt.org/physicsteam/2013/upload/exam1-2012-unlocked.pdf>)
  - 6 (2011: <https://www.aapt.org/physicsteam/2012/upload/WebAssign-exam1-2011-1-4.pdf>)
  - 15, 16 (2010: [https://www.aapt.org/physicsteam/2010/upload/2010\\_Fma.pdf](https://www.aapt.org/physicsteam/2010/upload/2010_Fma.pdf))
  - 2, 3, 14, 20 (2009: [https://www.aapt.org/physicsteam/2010/upload/2009\\_F-ma.pdf](https://www.aapt.org/physicsteam/2010/upload/2009_F-ma.pdf))
- A cosmic ship had speed  $v$  before the last rocket stage was detached. After detachment ship's speed became  $1.01v$  and the rocket stage moves away with speed  $0.04v$  relatively to the ship. What is the mass of the rocket stage if ship's mass is  $m_0$ ?
- A proton with initial speed  $v$  flies right onto a helium nucleus which was initially at rest. What are the speeds of the particles at the moment when they are at the smallest distance from each other? Mass of helium nucleus is about four times larger than the proton's mass.
- A missile is torn into two identical pieces at the highest point of its' trajectory which is at distance  $L$  in the horizontal direction from the launch point. One of the pieces returns exactly to the launch point. Where does the other piece land?
- A particle of mass  $m_1$  moving with velocity  $v$  hit another particle of mass  $m_2$  and bounced from it with velocity  $u$  at the direction perpendicular to its' initial motion. What is velocity of  $m_2$  particle after the collision?



- \*6. A tank with water with density  $\rho_0$  rests on a frictionless table. Volume of water is  $V_0$ . There is a bug with volume  $V$  and density  $\rho$  at the bottom of the tank. The bug starts to move with horizontal velocity  $v$  with respect to the tank. With what velocity will the tank move on the table? Neglect mass of the tank. Water level stays horizontal at all times.



## FOR THE NEXT MEETING

**IMPORTANT:** The next club's meeting is at 3:00pm, via Zoom, on Sunday, **January 17**.