

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

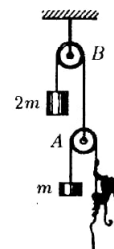
We solved most of the assigned problems on momentum conservation law, two remaining problems are reassigned. The next topic is energy conservation law.

REASSIGNED HOMEWORK

- \*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.



- \*7. A monkey of mass  $m$  is balanced with blocks on two pulleys  $A$  and  $B$  as shown on the figure. The whole system is initially at rest. How the  $2m$  block is going to move if the monkey starts pulling the rope with speed  $v$  with respect to itself?



HOMEWORK

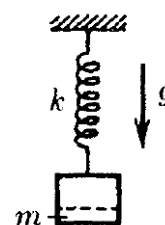
1. Solve the following problems from the previous  $F = ma$  exams:
  - (a) 8, 13 (2012: <https://www.aapt.org/physicsteam/2013/upload/exam1-2012-unlocked.pdf>)
  - (b) 14 (2010: [https://www.aapt.org/physicsteam/2010/upload/2010\\_Fma.pdf](https://www.aapt.org/physicsteam/2010/upload/2010_Fma.pdf))
  - (c) 6, 12 (2009: [https://www.aapt.org/physicsteam/2010/upload/2009\\_F-ma.pdf](https://www.aapt.org/physicsteam/2010/upload/2009_F-ma.pdf))

2. A cart goes down the smooth rails which are curved in a vertical loop of radius  $R$ . The cart starts moving from rest at height  $h$  above the lowest point and stays on the rails for the whole way. What is the minimal  $h$  such that it is possible?

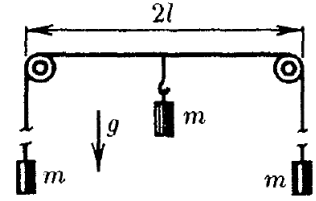


3. Two balls with masses  $m_1$  and  $m_2$  are going towards one another with speeds  $v_1$  and  $v_2$  respectively. What maximal possible amount of heat can be released during their collision?

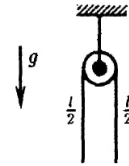
4. A block is in equilibrium on a vertical spring with spring constant  $k$ . A part of this block of mass  $m$  is detached from it. Up to what height will the rest of the block go?



5. 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.



- \*6. 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  $l/3$ ?



FOR THE NEXT MEETING

**IMPORTANT:** The next club's meeting is at 3:30pm, via Zoom, on Sunday, **January 14**.