

Proposals for possible future IYPT problems

ilya.martchenko@unifr.ch

1. Fingerprints

Fill a glass with liquid and take it in your hands. If you look from above at the inner walls of the glass, you will notice a very clear image of patterns on your fingertips. Study and explain this phenomenon.

2. Light bulb in a microwave

Place a light bulb into a glass with water so that all metal contacts are below the water level. When placed into a microwave oven, the lamp in the glass will start to glow. Study and explain this phenomenon.

3. Latex glove

Fill a latex glove with sand, connect it to a vacuum pump via a filter, and carefully evacuate air from the glove. Study the mechanical properties of such a "hand".

4. Giant soap film

Propose a method to make a soap film of maximally possible surface and obtain it in a convenient room. Study the mechanical and optical properties of the film, as well as its stability.

5. Pressure and temperature

Temperatures of air inside and outside of a building may be considerably different, while pressures of the gas are equal or rapidly equalize. Study and explain this phenomenon.

6. Honey coils

A thin downward flow of viscous liquid, such as honey, often turns itself into circular coils. Study and explain this phenomenon.

7. Laser pointer

A laser pointer makes a bright spot on a screen. Study the parameters of the spot in dependence of the distance from the laser pointer. How does the spot look like if the distance reaches several kilometers (in open air)?

8. Oil film

Oil spread on the water surface in stormy weather may calm down the waves. Study and explain this phenomenon.

9. Flow direction

Water flows in a transparent tube. Propose a contactless method to determine the direction of the flow. What would change if you take a non-transparent tube?

10. Tree in snow

In winter, there is often no snow on the ground around a tree trunk, while the snow layer is quite deep farther from the tree. Study and explain this phenomenon.

11. Vacuum in a syringe

What minimum pressure is possible to achieve in a common medical syringe?

12. Domino tiles

Study the propagation of the wave of falling domino tiles.

13. Brush car

Fix an eccentric vibrator on the top of large cleaning brush. When put on a table with bristles down, the brush will start moving ahead. Study and explain this effect.

14. Coast waves

Waves near the coastline of large ponds move to the shore, regardless of the wind direction. In small ponds, however, waves move along the wind. Study and explain this effect. How the wave pattern depends on relevant parameters?