

THE PROBLEMS OF THE IVth INTERNATIONAL YOUNG PHYSICISTS' TOURNAMENT

1. "Invent yourself". Devise several demonstrations and experiments, which would enable you to explain the physical nature of sound and its properties.
2. "Fortune_teller". If melted paraffin is dropped into a saucer of water, one obtains various solid shapes: "lens", "boat" and "spot". Investigate, please, the relationship between the shape and the height from which the paraffin is dropped.
3. "Geizer". A powerful ceramic resistor, having cylindrical form, is plunged into the water so that its axis is vertical and the upper edge of the cylinder is slightly over or below the level of the surface of the water. If current is now allowed to pass through this device the resistor begins periodically to make fountains of hot water like a geizer. Calculate and investigate experimentally, please, how period of pulsation depends on the power of current flowing through the resistor.
4. "Selfexcitation". Sometimes strong buzzing is heard at the concerts of inexperienced rock_groups. It happens when the mic is placed near the dynamic, reproducing the amplified signals of the same mic. In what way do the frequency and amplitude of these sound vibrations depend on the distance between mic and dynamic and on their mutual orientation?
5. "Cosmic monument". Some supercivilization intends to create a cosmic monument: an isolated planet system consisting of 3 planets, where one of them ought to move along an almost triangle trajectory. What ratios of masses and velocities of the planets can you recommend for this supercivilization. Prepare also a project for an almost square trajectory.
6. "Radiation measurement". Produce a device, which measures the level of radioactivity and investigate by this device the main sources of radiation in common life.
7. "Runner". Estimate, please, the maximal velocity of running for the human being. What will the world record for the 100 m sprint be in the year 2000?
8. "TV_screen photo". It is possible to investigate the motion of shutters in your camera and determine the velocity of their motion. In this way measure, please, exact values of exposures for your camera and its shutter speed.
9. "Passive propeller". An apple, falling from the upper storey of multistorey building, will come down to the hands of your friend staying downstairs absolutely gently if it has a passive propeller, made of thick paper with its axis attached to the apple. Explain, please, the principle of action of this kind of parachute and investigate how force of resistance depends on the velocity of falling and on the size of the propeller.
10. "Hunter's gun". It is possible to fire from a hunter's gun by small knitting needle with two pieces of paralon on it. Find, please, optimal sizes of tube for firing projectiles. What maximal velocity could you achieve?

11. "Golden cube". A cubic planet made of pure gold is rotating around the sun. always with the same side facing the Still. Estimate. please. the temperature difference between the various sides of the cube.
12. "Smal ship". A light ship is swimming on the surface of an electrolytic liquid. If an electric current flows through this liquid, the ship begins to move. Estimate, please, velocity of such ship.
13. "Wooden cube". A small cube is cut from a tree. The size af this cube is much smaller than diameter af the tree. Suggest a way to determine the direction af the fibres in this cube, if one considers as a positive direction the one from the roots to the top of this tree.
14. "The Moon". Determine experimentally the ratio of brightnesses (luminescences) of sunlit and nonsunlit parts of the Moon for different phases. Compare your results with theoretical estimates.
15. "Hydroplane". Produce, please, a hydroplane with a engine made from a piece of soap.
Your hydroplane has to win in two competitions: it must travel 50 cm in the shortest possible time and it must be able to cover a maximal distance (for every competition you made produce a different hydroplane). Linear sizes of hydroplane can't be more than 6.28 cm. For the second competition hydroplane can't have more than 0.5 grams of soap.
16. "Sunset". During sunset the Sun become red. What colour have the Moon, Venus or a bright star just above the horizon?
17. "Epigraph". What epigraph for the problems of the tournament can be used as a foundation for serious scientific inverstigation and kust for jokes. Suggest, please, epigraphs o both kinds.

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