YOUNG PHYSICISTS' TOURNAMENT

Questions for the Collective Competition by Correspondence

1. "Think for yourselves".
   Make a device for demonstrating wave properties and sound propagation in air.

2. "Noon".
   Can we call "noon" the moment exactly at the middle of the time-stretch between sunset and sunrise? With the help of a calendar you can easily make sure that this moment wanders during the year. Explain the causes of this effect.

3. "Tides".
   Estimate the heigth of the tides in the Black Sea on December 12, 1988.

4. "The puddle and the wind".
   Determine the parameters of the waves caused in a puddle by the wind. Study the dependence of the wave length on wind speed.

5. "Khladny figures".
   Study the Khladny figures for the disk and the square.

6. "Soap bubbles".
   What determines the "lifetime" of a soap bubble? Why does it burst and how does that happen?

7. "Leskov".
   Explain how the blacksmith Marov shortened the English bolts? (Leskov N., "Запечатленный Ангел", "Commemorated Angel").

8. "Underground".
   Determine the speed of the underground train between two stations.

9. "Astronauts".
   What is the maximum distance of space travel during 50 years of flight?

10. "The Lunar atmosphere".
    Imagine that you can make the atmosphere in the Moon similar to that of the Earth. Describe its parameters and properties. How quickly will it disappear and how can one conserve it?

11. "Mushrooms".

It's surprising, but sometimes mushrooms and even grass grow through asphalt. Explain this phenomenon.

12. "The weather forecast".

Barometer falling means bad weather. Why is this usually valid?

13. "Photoflash".

Illuminate your teeth with a photoflash and observe their luminescence in the darkness. For this purpose you must remove the cover from the photoflash, close your eyes and open them just after the flash. Explain the phenomenon of afterluminescence.

14. "Triboluminescence".

How much sugar do you need to read a letter (several words) from your predecessor in an underground vault? You have no matches and you have thrown out the lantern.

15. "The electron".

An electron, having velocity $V =$ mps, moves near a metal ball with impact parameter D . The radius of the ball is a few centimeters. The charge of the ball varies as
$q(t) = q \cos \omega t$, where $q =$ Coulombs, $\omega =$ s. Draw the dependence of the scattering angle   of the electron on D.

16. "Information".

How many bits of information have you obtained from reading this paper? How many bits of information will you obtain looking at one page-sized geografical map?

17. "Karlson".

How much jam must Karlson eat in order not to lose weight during his flight?
Usually the solution to problem number 17 has a humorous angle.

Questions are prepared by research associates of the
department of physics, Moscow State University.

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