



# IYSDC

INTERNATIONAL YOUNG SCIENTISTS DEBATE COMPETITION

## **- PROBLEMS 2016 -**

### **1. Rusting of Iron**

Rusting of iron is a commonly occurring process. What environmental conditions are needed for iron to rust? How would you prevent rusting of iron?

### **2. Changing the Color of Hydrangeas**

Hydrangea is a widespread garden plant. Some hydrangeas change color - from pale pink, through bright pink to blue. Ann has the pink hydrangeas in her garden but she really would like to have the blue hydrangeas too. What does the color of hydrangeas depend on? Suggest to Ann how to get the blue hydrangeas?

### **3. Lava Lamp**

Liquid motion lamps (which most people know as "lava lamps") are very popular birthday presents. Explain how does a Lava Lamp work? Make your own Lava Lamp using household ingredients.

### **4. Problem of Falling Cats**

Sabrina the cat fell 32 stories from a New York skyscraper and easily survived, as do most cats that fall from skyscrapers, especially those that fall more than several stories. Not so for humans. Why?

### **5. A Case of 25 Eggs per Day**

An 88-year-old man had eaten 25 eggs per day for many years, yet his serum cholesterol was only in the range of 150-200 mg/dL. What can be reasons for this phenomenon?

### **6. A Case of Dead Trees**

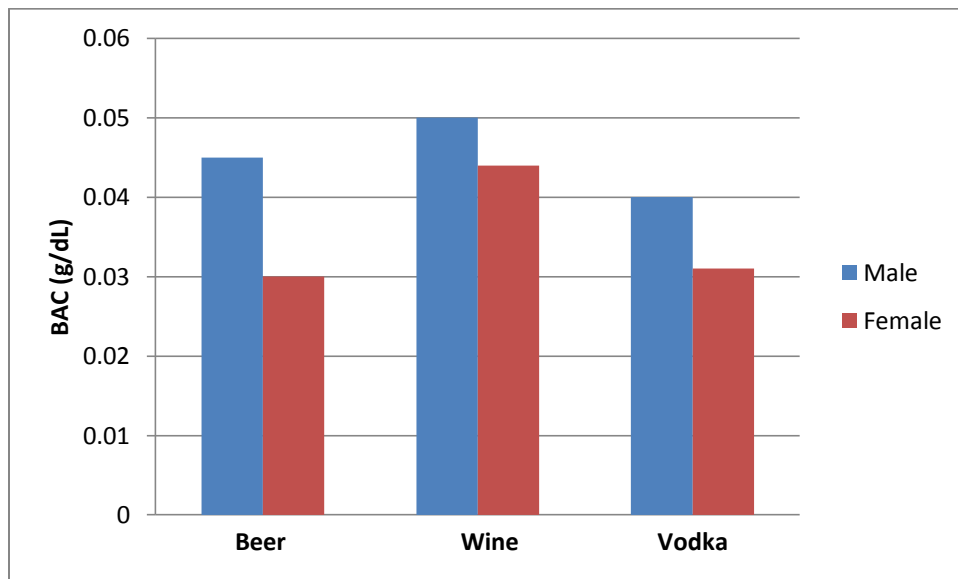
A forest patch was logged, then replanted, but within seven years the newly planted trees began to die. Specify the causes of this phenomenon and discuss opportunities.

## 7. Extraterrestrial Humans and Science

Students have a problem to design biome for a space station that will allow the organisms to exist interdependently and provide a habitat for humans sustaining them indefinitely. Functionality and possibility are the main criteria.

## 8. Beverage type and Blood Alcohol Concentrations

The aim of the problem was to observe the effects of beverage type (beer, wine and vodka) on peak Blood Alcohol Concentrations (BAC). The subjects drank different volumes of alcohol: beer (5% alcohol), wine (11% alcohol) and whisky (40% alcohol) that contained equivalent amounts of ethanol. After imbibing the said drinks with gusto, the subjects were required to have their breath tested with the alcotest. Explain a result from a chart.



## 9. Track with Tracker

Tracker (<http://physlets.org/tracker/>) is a free program available online for the video analysis of different types of motion. Your task is to analyse two types of motion (free fall, horizontal shoot ...) in at least three different media (water, air, sugar solution, ...) and present graphical results and explain the physical laws that are applicable to the specific problems.

## 10. Electricity from nature

A) There is a legend that a small calculator (1.5V) can work if connected to a couple of lime or different types of fruits and vegetables. By going to the nearest supermarket investigate if this is true for any kind of fruits and vegetables or there are some limitations and prepare demonstration for the jury. Explain what the reasons for this phenomenon are.

B) The other type of sources are air-earth batteries, try to make one and explain how they work, by changing at least three parameters investigate the effects on the resulting voltage.

## **11. The spectrometer**

Based on the Bohr's theory, electrons in atoms have well-defined trajectories and energy levels. Absorption and emission of light by atoms are easily explained by this theory. Your task is to make a simple laboratory spectrometer based on the guides available online and to connect it to the web camera so you can take photoshoots of different spectra. Next, obtain the spectra of at least 3 different light sources or gas lamps and explain them based on the Bohr's theory. Use this spectrometer to distinguish between the spectra of sodium and potassium and explain how this principle can be used for the chemical analysis of stars.