

Problems for Science Fight 4

21. Trampoline

Stretch a rubber membrane and investigate how a small ball bounces off the membrane depending on the degree of stretching regarding the fixed height of the falling ball.

22. Airbag

Use plastic bags and a compressor to lift a bag above the floor level. One can also try to sit on it. Determine all relevant properties of your setup.

23. Rotating light

Some molecules have a property called optical activity: they rotate polarized light. This property can be observed using a polarizer and a laptop/phone screen as a source of plane polarized light. Investigate the optical activity in solutions of glucose, fructose, sucrose, and penicillin V to find the beaker containing fructose. Try to specify the other beakers. Note, there are two beakers with one of the compounds.

D-Glucose (+53 [deg dm⁻¹ cm³ g⁻¹] specific rotation clockwise), D-Fructose (-92 [deg dm⁻¹ cm³ g⁻¹] specific rotation counter-clockwise), sucrose (+66 [deg dm⁻¹ cm³ g⁻¹] specific rotation clockwise); Penicillin V (+223 [deg dm⁻¹ cm³ g⁻¹] specific rotation clockwise)

24. Mysterious amylase

An enzyme called amylase catalyses the hydrolysis of starch into sugars. Select a chemical test for starch, find convenient sources of amylase and starch, and investigate how much time of exposure to amylase is needed for the starch test to not be observed.

25. Battery

Use zinc and copper plates, as well as other materials of your choice, to assemble a battery. Investigate its relevant properties.

26. Bouncing ball

Make a small hole in a ping pong ball, fill it with some liquid and seal the hole. Drop the ball from the fixed height and investigate how high it bounces, depending on the amount of liquid inside.

Equipment/substance

- compressor
- rubber balloons
- metal balls
- polarizer
- multimeter
- wires
- needles
- glasses
- thin plates of zinc
- thin plates of copper
- ping pong balls
- corn syrup
- D-Fructose
- table sugar
- Penicillin V solution
- iodine solution
- bread
- starch
- table salt
- water
- test tubes
- beakers
- cups
- plastic garbage bags
- scissors
- adhesive tape
- syringes
- goggles
- gloves