



STUDENT PROJECTS

PHYSICS

Title: Magnetic Levitation using Superconductors

Class: I PCME H

Magnetic levitation, maglev, or magnetic suspension is a method by which an object is suspended with no support other than magnetic fields. Magnetic pressure is used to counteract the effects of the gravitational and any other acceleration. Magnetic levitation is used for maglev trains, magnetic bearings and for product display purposes. The principle involved is superconductivity. Superconductivity is a phenomenon observed in several metals and ceramic materials. When these materials are cooled to temperatures ranging from near absolute zero (0 degrees Kelvin, -273 degrees Celsius) to liquid nitrogen temperatures (77 K, -196 C), their electrical resistance drops with a jump down to zero. The cooling of the materials is achieved using liquid nitrogen or liquid helium for even lower temperatures. There is already in this small table a clear separation between the low and high temperature superconductors.

Title: Laser Reflecting Light

Class: I PCME I

Inside a steel cylindrical tube, two lasers are put at the top whereas the two ends of the tube are placed with convex mirrors. Small mirrors are placed inside the tube. As the laser light enters the tube, it gets reflected and comes out through the convex lens placed aside. As the laser light is monochromatic, it can travel for long distances.

Conclusion: This project tells us that laser can travel long distances without losing much energy.

Title: Solar Panel

Class: I PCMB E

Solar cells are devices which convert solar energy directly into electricity, either directly via the photo voltaic effect or indirectly by first convert in the solar energy to heat or chemical energy. The series of solar cells are called as SOLAR PANELS.

Construction: Silicon solar cells are made using single crystal wafers, poly crystalline wafers or thin films.

Working Principle: It works on the principle of solar energy converted into electrical energy.

Applications: Cathode protection systems, Electric fences, Remote lighting systems, Telecommunication and remote monitoring systems, Solar powered water pumping, Rural electrification and Water treatment systems.

CHEMISTRY

Title: Preparation of insect repellent incense sticks using spices and herbs

Class: I PCMB G

The project is about the study of side effects of the commercially available insect repellants and its preparation which act as insect repellants using cheap and easily available herbs and spices.

Formulation of Incense stick: The experimental work starts with first collecting the raw materials, which are purchased from local market. The general procedure followed for the formulation of herbal based incense sticks is as follows: The base material (charcoal powder, jigit powder, fragrance) is mixed, with water.

The following formulations are done in this study:

- Spices (cloves, cinnamon and bayleaf) are used (jigit powder and spice powder are used in equal proportions).
- Herbs (holy basil, neem and eucalyptus-juices) are used instead of water.

The insect repellent activity is tested by its application to the masses and its subsequent effectiveness in repellent activity.

Title: Preparation of a natural anti-bacterial alcohol-gel based hand sanitizer from essential oils

Class: I PCMB A

With the increase in the spread of infectious epidemics, the exhaustive use of hand sanitizers has been of concern and so is their concomitant manufacture. A hand sanitizer or hand antiseptic is a supplement or alternative to rinsing with soap and water. Alcohol based hand sanitizers are more effective at killing germs than soaps and do not dry out hands as much. The active ingredients in hand sanitizers include isopropanol, ethanol or surgical spirit. Inactive ingredients in alcohol rubs typically include humectants such as glycerin for liquid rubs, propylene glycol, and essential oils of plants.

The above project focuses on the preparation of an alcohol based natural hand sanitizer from essential oils. The essential oils like tea-tree and lavender oil have anti-bacterial properties and are hence used for the same. This sanitizer belongs to the class of Water based Thin Liquid Gel Sanitizer. The ingredients of aloe vera gel and iso propyl rubbing alcohol are initially mixed well until blended, to which a few drops of the essential oils are added. Glycerin is added to and acts as a humectant to retain moisture when water is finally added to it in order to set the consistency of the mixture according to the desired proportion. The pH of the sanitizer is found to be fairly neutral and mild around 7-7.8

Types of sanitizers: Alcohol based; Non-alcohol based; Triclosan based gels; Essential Oil base; Water based thin- liquid gel; Thick Gel.

MATHEMATICS

Title: Magic Square

Class: I PCMB A

The magic square contains 625 boxes (25rows & 25columns) in which there are numbers from 1 to 625. When the contents of the square are added vertically, horizontally or in other special patterns the sum or result will be the same, that is, the sum is a constant. In this case, it is 7825.

Title: Rolling of Disc and Angular Momentum

Class: I PCME I

The terms rolling, pure rolling and rolling without slipping are used to convey the same motion. When a circular disc moves along a transverse path without sliding, a particular point moves a distance along the arc that is equal to the distance moved by its center in a particular period of time. The velocity and the kinetic energy of the disc can be found using distinct formulae.

Title: Homemade Theodolite

Class: I PCMB C

A theodolite is a precision instrument for measuring angles in the horizontal and vertical plane. Theodolites are mainly used for surveying applications and have been adapted for specialized purposes in fields like meteorology and rocket launch technology. A homemade theodolite can be made using a cardboard, cylinder, a weight, string and a protractor. This theodolite can be used to measure the angle of elevation and depression of objects taken from a distance.

BIOLOGY

Title: Study of dominant and recessive traits in humans

Class: I PCMB C

The study of various phenotypic traits in human beings and their genetic make-up has always been a fascination to scientists all over the world. This study involves the comparative and statistical analysis of dominance of some traits in human population. We would be comparing the phenotypes of traits like tongue rolling, presence of the Rhesus factor in blood groups, ear lobe attachment, a person's ability to taste the chemical PTC (Phenylthiocarbamide) etc. and identifying the dominant and recessive traits for each character. By undertaking this study, we hope to increase our understanding of genetics in a practical manner. We also hope to highlight the importance of genetics in solving many hereditary defects.

Title: Food Adulteration and its Effects on Health

Class: I PCMB E

Food is any substance consumed to provide nutritional support for the body. It is usually of plant or animal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells in an effort to produce energy, maintain life, and/or stimulate growth. Since food is essential for life. It should be pure, nutritious and free from any type of adulteration for proper maintenance of human health.

Despite of improvement in production, processing and packaging, more poisons seem to be entering our food chain. For example Indian spices or 'masalas' add taste and flavour to food and also help in digestion. Some spices like turmeric have an antiseptic effect on the body. But what is most important is the quality of these ingredients. Every consumer wants to get maximum quantity of a commodity for as low a price as possible. This attitude of the consumer being coupled with the intention of the traders to increase the margin of profit, where the quality of the commodity gets reduced through addition of a baser substance and / or removal of vital elements also commonly known as food adulteration. In this project we study the food adulteration and its effect on human health.

ELECTRONICS

Title: Optic Fiber Communication

This project allows one to send sound through 1mm plastic fiber optic cable. The transmitter circuit board has a microphone which picks up the sound. The processing circuit modulates this sound and emits it in the form of light through LED. The light is transmitted through the fiber optic cable to the receiving circuit which demodulates the received signal and converts it back to sound through a speaker.

Title: Automatic Night Lamp with Morning Alarm

The circuit automatically turns on night lamp as soon as the bedroom lights are switched off. The lamp remains off until the circuit senses day light in the morning and gives alarm. The circuit is based on LDR for sensing light and IC 555 in monostable mode, which is activated by a triggering pulse and IC UM 66 for different melody generation.

Title: Digital Pulse Counter

This circuit is capable of counting digital pulse generated by a timer circuit and displays the decimal using seven segment display. The heart of the circuit is IC 4026, which is a 16-pin CMOS which counts clock pulse and returns the output which can be displayed on a seven segment display.