

**November, 2008****Vol.004****In this issue**

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**Patron:** Dr. S. A. Hayat  
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**Head:** Dr. A. Ashfaq  
**Editors:** Dr. Ejaz A Mughal / Dr. A Rashid / Ms. S. Aslam  
**Coeditor:** Ms. I. Sultana

**Student's Question of the Day****What is a solar water heater?****Solar Energy**

The sun has been producing energy for billions of years and will continue to do so for many more billions. Solar energy is free, and its supply is unlimited. It is a pollution free, efficient, and sustainable form of energy. Of all advantages of solar energy, this is, perhaps, the most important.

The advantages of solar energy over conventional energy are:

- The energy from the sun is virtually free after the initial cost has been recovered.
- Depending on the utilization of energy, paybacks can be very short when compared to the cost of common energy sources used.
- Solar and other renewable energy systems can be stand-alone; thereby not requiring connection to a power or natural gas grid.

- The use of solar energy displaces conventional energy; which usually results in a proportional decrease in green house gas emissions.
- The use of solar energy is an untapped market.

There are many ways of using solar energy effectively. Applications of solar energy use can be grouped into three primary categories: heating/cooling, electricity production, and chemical processes. The most widely used applications are for water and room heating. Ventilation solar air heating is also growing in popularity. Uptake of electricity producing solar technologies is increasing for applications such as photo-voltaic and concentrating solar thermal-electric technologies. Due to recent advances in solar detoxification technologies for cleaning water and air, these have become increasingly competitive with conventional technologies.

## Solar water heater / geezer

Here we briefly describe the solar water heater/ geezer. Most solar water heating systems for buildings have two main parts: a solar collector and a storage tank. The most common collector is called a *flat-plate collector*. Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. A copper pipe of small bore is fitted inside the box and the fluid to be heated flows through it water or some other fluid, such as antifreeze. The copper pipe is attached to an absorber plate (aluminum foil), which is painted black to absorb the heat. As heat builds up in the collector, it heats the fluid passing through the copper pipe. The storage tank then holds the hot liquid. It can be just a modified water heater, but it is usually larger and very well-insulated. Systems that use fluids other than water usually heat the water by passing it through a coil of tubing placed in a tank, which is full of hot fluid.

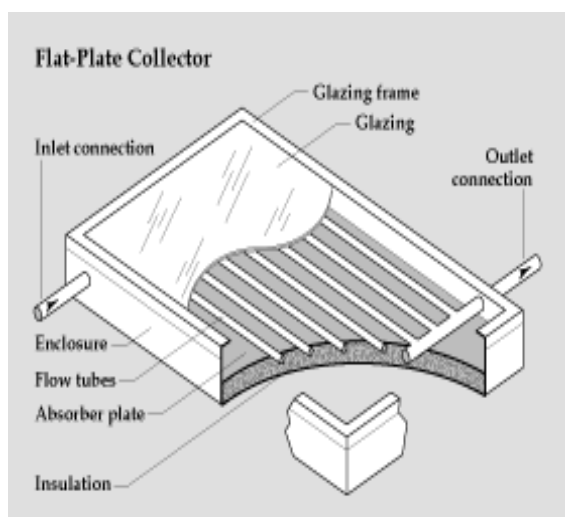


Figure 1: Flat-plate collector (A cross sectional view)

Solar water-heating systems have minimal operating costs, and maintenance costs only about Rs. 120 per month. When all costs for purchase, installation, maintenance and operation are taken into account, average solar water heater usually pulls even with an electric heater after eight and a half years and with a gas heater after about 15 years. From then on, through out the expected 40-year life of the solar heating system, you've got free hot water. Pakistan possesses a large potential for utilizing solar energy for various purposes e.g., dehydration, heating and distillation. The deal only improves when you add in the positive environmental benefits of a solar water heater. A typical residential solar water heater will offset greenhouse gas emissions by about 1,500 pounds of carbon dioxide (CO<sub>2</sub>) per year. That's equal to the amount of CO<sub>2</sub> released by an average vehicle every 1,685 miles. A solar water heater is the easiest initial investment in renewable energy.

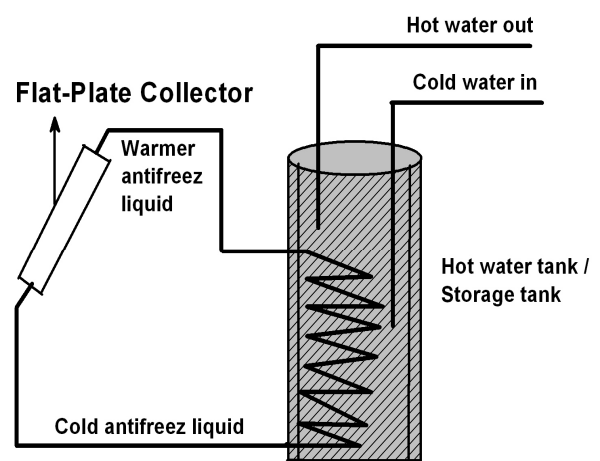


Figure 2: Schematic diagram of solar water heater system



The Physics Department of COMSATS Institute of Information Technology Lahore has proudly installed and demonstrated an indigenously constructed Solar Water Heater/geyser at the campus under the supervision of Dr. Muhammad Ashfaq Ahmad, Assistant Professor. The water heater has been thoroughly completed in the Applied Physics lab of the department by the lab's staff, particularly Mr. Mohammad Shabbir, with the intention of promoting the use of alternate energy sources for heating purposes to counter the growing energy needs of the country with receding resources. In its run on February 28 2008, in front of the revered Director CIIT Lahore, Prof. Dr. Shaukat Ali Hayat, Dean Faculty of Engineering, Prof. Dr. Shahid A. Khan, and various Heads of other departments, water let out by the heater reached temperatures of about 65 degrees Celsius. The effort was greatly appreciated by all those present at the demonstration. Since then, water temperature as high as 96 °C has been recorded during afternoons. The department of physics team is now looking into ways of maximizing the potential of the water heater and of appropriate installation of a number of heating panels at the

campus for actual utility with optimal performance. The Department of Physics CIIT, Lahore is extremely grateful to the Director for his hearty backing, both financial and moral, of this project, in particular, and for his consistent encouragement of all such projects of local and national significance, in general.

**Dr. Muhammad Ashfaq Ahmad**

*(Assistant Professor, Physics, CIIT Lahore)*

## **New Research**

### **Magnetic field could protect spacecraft**

A team of physicists led by Ruth Bamford of the Rutherford lab has shown that it should be possible to shield spacecraft using artificial magnetospheres. Like the real thing, these would separate out the electrons and protons of the solar wind, generating a separation of charge in space that would deflect these particles away from the spacecraft. Astronauts travelling to the International Space Station are protected from much of this radiation by the Earth's atmosphere as well as by its "magnetosphere", the magnetized bubble of plasma surrounding the Earth created by its magnetic field. However, people on longer flights will not have this natural shielding and are therefore at greater risk.

Bamford et al results show that a spacecraft could in fact be protected using a bubble just some 100–200m across, and it would correspond to a magnet of about 1 Tesla, which would be light enough to be transported into space.

R Bamford et al Plasma Phys. Control. Fusion 50, 124025, 2008

## Not wonder, this is Physics

To the nearest ten-thousandth of a mile, light travels at 186,282.3959 miles per second. At that rate, it takes slightly more than eight minutes to get to Earth from the sun. However, it takes light hundreds of years to travel from the sun's centre to its surface. The light must take a very indirect path to the surface due to the large number of collisions with particles within the sun.

## News Bulletin

1. It is a matter of great pleasure to share the news that Prof. Dr. Raheel Qamar (Dean of Sciences) and Prof. Dr. Arshad Saleem Bhatti (Chairman Physics Department) visited CIIT, Lahore to discuss the feasibility of launch of BS Electronics Program at Physics Department.
2. We would like to share news about establishment of COMSATS Physics Forum. The forum will serve the following objectives
  - To help students in better understanding of subject
  - To stimulate creative ability of students
  - Arrangement of Seminars / workshops for students of CIIT Lahore and members of the forum from different institutes / colleges of Punjab
  - Organization of Co-Curricular activities e.g. Quiz competition, paper reading contest etc

The membership of the Forum is open. Any body interested in membership may contact the secretary.

3. A party was organized by the senior students on 05.11.2008 in conference room in the honor of the students of fall 2008. Some of the glimpses of the event are posted below



4. Mrs. Nusrat Rafique has left for UK to pursue her Ph.D at University of Sheffield, UK.
5. Col. (R) Javaid Iqbal Abid is the new DCO of the Physics Department.
6. A research paper by Dr. Abdul Rashid titled, "Lamp-assisted CVD of carbon micro / nano-structures using metal catalysts and  $\text{CH}_2\text{I}_2$  precursors", has been accepted for publication





Journal of Applied Surface Science, Holland  
2008.

7. A research paper by Dr. Salman Naeem Khan titled, "Realization of left handedness through CSRRs and SRRs in microstrip line", has been accepted in Journal of Microwave and Optical technology letters, 2008.
8. In continuation of policy of self reliance, The Department of physics has been preparing low cost "Charles's Law Apparatus" under the kind guidance of Dr. Ashfaq Ahmad (HOD Physics Department). The Boyle's law apparatus has already been prepared and is being used in the undergraduate BS Lab.1. The Boyle's law apparatus is shown in the figure below

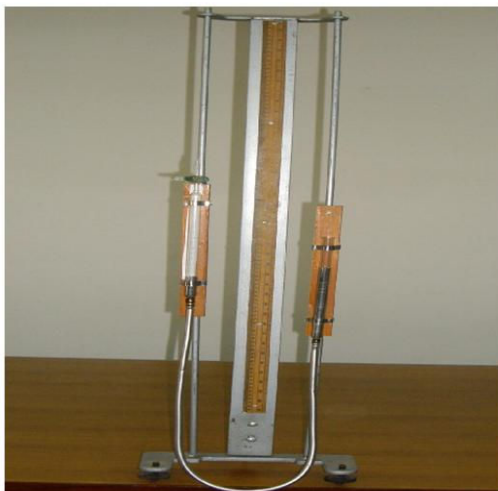


Figure: Boyle's Law apparatus

9. Ms Inum Arshad Mughal, the student of BS Physics Spring 2008 has been appointed the first president of ADEEB – The literary Society of CIIT Lahore. Under the banner of ADEEB, the first all Pakistan bilingual speech competition is going to be held from 26 - 27

November 2008. Congratulation and all the best wishes for new assignment.