

## NATURE LAB

### DAYS OF SCIENCE EXPERIMENTS

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- 1. Hot Box – The chemical Heater:** Without the greenhouse effect, life on Earth would probably not exist as the temperature would be a chilly  $-18^{\circ}\text{C}$ . About 51% of the sun's radiation reaches the earth's surface causing it to become a radiator of energy that is reflected back into space. However only a small portion actually reaches space, the majority is absorbed by greenhouse gases where over 90% is directed back to the earth's surface. A number of gases are involved in the human caused enhancement of the greenhouse effect where  $\text{CO}_2$  accounts for 63% of this change. An increase of more than  $2^{\circ}\text{C}$  would be enough to severely degrade the availability of food and water in developing countries. Modern heating methods are a major contributor of  $\text{CO}_2$ , whereas this experiment provides an eco-friendly method with no  $\text{CO}_2$  emission.
- 2. Chromatography:** Plants are a rich source of untapped potential. They contain a multitude of chemicals that can and are already being used in a variety of purposes, including medicinal and essential oil. The purpose of this experiment is to show the rich reservoir of molecules available to us, and how they can be separated and identified. Inherently this experiment aims to stress the important of plants not just as oxygen providers but also as natural gold mines.
- 3. Air Purifier:** Ethylene-based glycol ethers are common, water-soluble solvents used in a variety of cleaning agents, latex paints and air fresheners. They are classified as hazardous air pollutants under the U.S. Environmental Protection Agency's 1990 Clean Air Act Amendments and as toxic air contaminants by California's Air Resources Board. Terpenes are a class of chemicals found in pine, lemon and orange oils that are used in many consumer products either as solvents or to provide a distinctive scent. Although Terpenes themselves are not considered toxic, some recent studies have shown that they may react with ozone to produce a number of toxic compounds. This experiment provides a 100% green air purifying method.
- 4. Acid Attack:** Acid rain is caused by industrial emissions of ammonium, carbon, nitrogen, and sulfur which react with the water molecules in the atmosphere. Acid rain eats away at the earth's surface and poisons natural water sources. This experiment shows the effect of a home-made acid, almost less than half as acidic as acid rain and its effect on chalk, synonymous to the rocky surface of the earth.
- 5. Sage not Rage:** Chemical deterrents are commonly used to shield off insects. They become a problem when they are washed off into household water supplies and dumped in natural water sources. This experiment provides an ecologically friendly insecticide cream that has been developed purely from organic sources.

- 6. Biodegradable Planting Pot:** The molecular bonds that make plastic so durable make it equally resistant to natural processes of degradation. Since the 1950s, one billion tons of plastic have been discarded and may persist for hundreds or even thousands of years and their burning causes the release toxic fumes and chemical pollutants. This experiment provides an organic plastic substitute that also provides a benefit for the nature of its use.
- 7. Oily Hair:** Fur and feather are oil spill's best friend. When animals unknowingly enter into an oil spill, it sticks to their coats causing them to drown. In addition direct ingestion of oil is fatal. Plankton, the smallest organisms are also affected by oil spills with this effect moving right up the food chain leading to indirect death. This experiment not only shows the adverse effects of this on mammals and birds, but also an effective method of using hair in cleaning up oil spills.
- 8. Light and Enlighten:** Humans are pouring carbon dioxide and other greenhouse gases into the atmosphere much faster than plants and oceans can absorb it, largely due to the use of fossil fuels for providing energy. These gases persist in the atmosphere for years, meaning that even if such emissions were eliminated today, it would not immediately stop global warming. On the other hand, fossil fuels are running out and clearly, humankind has to set a different course in its need for energy, one that involves less intrusive sources such as solar, wind and geothermal energy. They are energy sources that don't harm the planet and will never run out. This experiment provides one such eco-friendly energy source.
- 9. Medicine Box Photo Album:** When considering the numbers projected due to recycling, the need is pretty self explanatory. Every ton of paper that is recycled saves 17 trees. The energy saved when one glass bottle is recycled is enough to light a light bulb for four hours. Recycling creates a net reduction in 10 major categories of air pollutants and 8 major categories of water pollutants. On average, a national recycling rate of 30% reduces greenhouse gas emissions as much as removing nearly 25 million cars from the road. This experiment proves that recycling can be done anywhere and everywhere.
- 10. Composting:** One of the major concerns of chemical fertilizers is Nitrogen emission, where in the past 100 years emissions have increased from around 20m tones to more than 150m tones a year. As an ingredient in fertilizer, nitrogen helps to feed some 2 billion people, but when it is washed from soils into water courses it can make rivers and lakes too rich in nutrients. As a result, algae and other life can grow out of control, eventually stripping oxygen from the water which fish and other aquatic life need creating dead zones. Composting provides an eco-friendly alternative to chemical fertilizers through the recycling of house-hold, and plant organic waste.