

# sustainable earth lab

environmental science kit



SCIENCE EDUCATION SET

**WARNING** — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Experiment Manual

## Kit Contents



No.	Description	Qty.	Part No.
1	Parts from die-cut sheet	1	708 340
2	Parts from paper sheet	1	708 341
3	Thermometer	2	702 280
4	Motor	1	016 028
5	Solar cell	1	708 342
6	Compass	1	706 355
7	Magnifying glass	1	311 137
8	Impeller wheel	1	706 540
9	Drive axle	1	702 801
10	Wooden stick	2	020 042
11	Aluminum cup	2	706 377
12	Clothespin	1	708 343
13	Water filter column (3 cups, 3 filter papers)	1	772 874
14	Garden cress seeds	1	532 122

No.	Description	Qty.	Part No.
15	Petri dish	1	700 408
16	Thick copper wire	1	708 344
17	Ice cube tray	1	705 085
18	Measuring cup, 125 ml	2	087 077
19	Balloon	1	231 127
20	Fabric netting	1	708 345
21	Funnel	1	000 410
22	Black paper	3	705 801
23	White paper	1	705 802
24	Battery clip	1	042 106
25	Spool of wire	1	704 275
26	Sand paper	1	000 275
27	Drinking straw	1	707 448
28	Polystyrene foam disk	1	702 235

### Additional Items Needed

Items that are not included in the kit are indicated *in italics* at the beginning of each experiment. Here is a complete list:

Dirt, activated charcoal, sand, cotton wool, paper towels, dishwashing liquid, colored candy-coated chocolate candies, unsweetened cocoa powder, salt, vinegar, soap, laundry detergent, bird feather, cooking oil, saucer, scissors, PETE (plastic) bottle, candle, matches, old newspapers, 4 plastic bags, scale, pencil, paper, plastic bowl, cooking spoon, dishrags, water, watch, dried peas or beans, measuring stick, glasses, baking soda, desk lamp, large glass jar or bucket, plastic wrap, felt-tip pen, deep dish, ink, ladle, pot, tape, yarn, handkerchiefs, flashlight, bucket, aluminum foil, cardboard, all-purpose glue, rock, 9-volt square battery (type 6LR61), hair dryer.

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The topic of sustainability covers a lot of different subject areas. If you have a particular interest in one of the subjects, and you want to start with the experiments in that area, just look for the corresponding symbol:



**Renewable  
Energies**



**Energy  
Conservation**



**Natural Resource  
Usage**



**Climate Change  
Prevention**



**Waste and  
Wastewater  
Management**

4. Holding one of the netting pieces taut with both hands, dunk it into the paper mush and then pull it straight up so it catches some of the paper mush in it.



5. Lay the second piece of netting on top of it and then place both together on a stack of newspaper. Press evenly over the entire piece of netting with the palm of your hand in order to push out as much water as possible and compress the paper mass.

6. Now lay the paper mass with the netting pieces on a dishrag, lay a second dishrag on top, and press it some more between the two dishrags.

7. Then, carefully remove the netting and let the paper dry thoroughly on the heater.

### **i** **Explanation:**

Your homemade paper is, of course, not as nice as commercial paper. Among other things, you would have to add ingredients such as chalk to make it heavier and denser, along with other materials to prevent ink from bleeding on it. If you use printed newspaper as your raw material, the addition of laundry detergent makes your paper brighter, because it dissolves the printer's ink from the

paper fibers. In paper production, the process of removing printer's inks and dyes is called "de-inking."

## **08** **Experiment**



### **Gasoline consumption**

Automobile fuels are made from petroleum. The supplies of this material are gradually declining, while the price is constantly rising. That's why fuel-efficient cars are becoming more and more popular. Also, combustion engines (just like heating systems) produce large quantities of carbon dioxide gas, which accumulates in Earth's atmosphere and contributes to global warming. How much does your car consume?

**You will need:** *pencil, paper.*

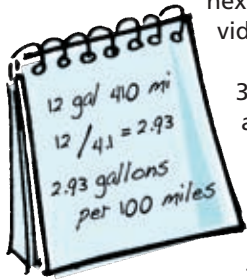
### **→** **Procedure:**

1. When your parents are filling the gas tank, note the number of miles on your car's odometer and the amount of gas put in the tank. For the period during which you are making your experimental observations, ask that the tank always be filled to the same level when filling up (just to the point that the gas nozzle first shuts off, for example).

**Petroleum refinery for the production of gasoline and other crude oil products**



2. Note these figures when a parent or other adult fills the gas tank the next time, or ask to be provided with the data.



3. Calculate the average amount of gas your car uses per mile (gallons divided by the corresponding number of miles), and what the fuel consumption is per 100 miles (consumption per mile multiplied by 100).

### **i** Explanation:

If your car uses around 4 or 5 gallons per 100 miles, that would be about average these days. Still, if you burn a gallon of gas it creates a little under 9 kilograms (20 pounds) of climate-damaging carbon dioxide gas. In the future, cars might be taxed according to the average quantity in weight of carbon dioxide that they emit per kilometer. This should be as far under 200 grams of carbon dioxide per mile as possible.



Filling station gas pump with a variety of fuels

## 09 Experiment



### Expensive dripping faucet

Every American consumes, on average, well over a hundred gallons of water a day. In Europe, the average consumption is a little over one third of that. It's important not to waste

drinking water, especially due to wastefully running or dripping water taps.

**You will need:** measuring cup, watch, pencil, paper.

### ➔ Procedure:

1. Open a faucet just enough for the water to drip slowly.
2. Place the empty measuring cup beneath it and note the time.
3. Check on the experiment from time to time. Once the measuring cup is almost full, note the time again. Look at the scale on the side of the cup to see how much water is in it.
4. Turn off the tap.
5. Calculate how much water per hour dripped out of the faucet, and how much it would be if it dripped like that for a week.



### **i** Explanation:

If even just 1 liter drips out per hour, that's 24 liters a day, or almost 9,000 liters — over 2,300 gallons — a year! Even if we had plenty of water to waste, purification and distribution of water require energy too.

