

## Vidnyanvahini

### List of experiments performed by or demonstrated to students

**Note:** The experiments performed in schools and science fairs by volunteers of Vidnyanvahini are selected from the wide range of topics appearing in the following list. In addition a number of interesting science toys are also used to illustrate scientific principles.

#### Physics

Sl No	Class	Description of experiment	Apparatus used
1	10	In an electric circuit validate Ohm's Law: $V/I = R$	Power supply, extension boards, insulated copper wires, resistances, ammeter, voltmeter
2	10	In an electric circuit connect resistances in series and validate the formula $R_s = R_1 + R_2 + R_3 + \dots$	As above
3	10	In an electric circuit connect resistances in parallel and validate the formula $1/R_p = (1/R_1) + (1/R_2) + (1/R_3) + \dots$	As above
4	10	<ul style="list-style-type: none"> <li>▪ Determine the focal length <math>f</math> of a convex lens using the image formed by a distant object</li> <li>▪ Study the real and virtual images formed by a convex lens when the object is placed at various distances from the lens</li> <li>▪ Measure the magnification/ reduction of size between object and image</li> <li>▪ Validate Snell's Law: <math>1/f = (1/v) - (1/u)</math></li> </ul>	Power supply, Convex lenses, lens holders, arrow shaped object made of LED lamps, screen for capturing images, measuring tape
5	10	<ul style="list-style-type: none"> <li>▪ Observe the refraction of light passing through a glass slab</li> <li>▪ Determine the refractive index of glass with respect to air</li> <li>▪ Measure the angle of refraction with respect to the angle of incidence.</li> <li>▪ Study total internal reflection of light</li> </ul>	Glass slab, wooden board, pins, paper, compass box, laser torch, plastic bottle, water
6	10	Validate Oersted's law on magnetic effect of electric current	Power supply, insulated copper wire coil wound around an iron rod, electromagnetic iron ring model, electric bell, vehicle horn etc..
7	10	Validate Faraday's Law of electromagnetic induction	Insulated copper wire coil, magnet, galvanometer, model of a generator
8	10	<ul style="list-style-type: none"> <li>▪ Demonstrate the advantages/</li> </ul>	Power supply, custom made

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		<p>disadvantages of series and parallel resistances</p> <ul style="list-style-type: none"> <li>Understand the electric wiring scheme used in homes</li> </ul>	electric board containing bulbs connected in series and parallel, main switch, fuse, circuit breaker
9	9	Validate Newton's Laws of Motion	<ul style="list-style-type: none"> <li>Glass with plastic cover and coin,</li> <li>Plastic pipe and a wire brush,</li> <li>Balloon attached to a circular plastic plate sliding over a glass plate</li> </ul>
10	9	Validate the Law of Conservation of Momentum	<ul style="list-style-type: none"> <li>Newton's cradle</li> <li>One large rubber ball and one small plastic ball</li> <li>A conical plastic apparatus capable of demonstrating conservation of angular momentum using a rolling coin</li> </ul>
11	9	Prove that acceleration due to gravity acts equally on all freely falling bodies independent of their mass	<ul style="list-style-type: none"> <li>A heavy rubber ball and a light plastic ball</li> <li>A notebook and paper</li> </ul>
12	9	Demonstrate transverse and longitudinal wave motion	Wave model apparatus, slinky, straw- model
13	9	<ul style="list-style-type: none"> <li>Demonstrate simple harmonic motion using a pendulum</li> <li>Determine acceleration due to gravity 'g' using the formula for the period of a pendulum</li> </ul>	Pendulum with different weights, stand, stop clock
14	9	Demonstrate properties of sound	<ul style="list-style-type: none"> <li>A set of tuning forks,</li> <li>Copper pipes of different lengths,</li> <li>Plastic bottle and water</li> </ul>
15	9	<ul style="list-style-type: none"> <li>Demonstrate properties of heat and effect of thermal expansion on solids, liquid and gases</li> <li>Measure specific heat</li> </ul>	Ring and ball apparatus, paper wrapped around a brass pipe, thermometer, Bunsen burner, bimetal strip
16	9	Demonstrate effects of surface tension	<ul style="list-style-type: none"> <li>Glass bowl, coins, water</li> <li>Glass bowl, water, wood dust, soap solution</li> <li>Soap bubbles blown thru round as well as rectangular shape openings</li> </ul>
17	9	<ul style="list-style-type: none"> <li>Demonstrate different methods of determining density of regular/ solids and liquids such as kerosene as well as</li> </ul>	Spring balance, measuring cylinder, objects of different materials, beaker, overflow can,

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		change in the density of salt solution ▪ Demonstrate Archimedes' Principle of Flotation	Cartesian diver and various other apparatuses
18	9	Study types of levers, pulleys and their mechanical advantage	Various items demonstrating types of levers, grooved pulleys, weights, string, stand
19	9	Demonstrate the relationship between load and effort	Apparatus with metal scale attached to a stand, weights
20	8	Demonstrate properties of air pressure including Bernoulli's Principle	Glass of water, plastic ball, glass flask with a stopper having two holes, rubber tubes, balloons, funnel, plastic ball, polythene tube, paper strips, model of aircraft, various other apparatuses.
21	8	Demonstrate properties of magnets including electromagnets	Various types of magnets, magnetic needles, iron filings, ring magnets, magnetic compass, power supply, copper coil wound over an iron core, etc.
22	8	Study properties of static electricity	Plastic comb, ebonite rod, paper pieces, gold leaf electroscope
23	8	Demonstrate properties of centre of gravity	Various types of apparatus
24	8	Demonstrate the properties of light including rectilinear propagation of light, reflections from mirrors (plane, concave and convex), dispersion of light through prism etc. and study the causes of defects of eye	Integrated light kit, various types of mirrors, prism, power supply etc.
25	8	Study various optical illusions	Various models/ toys (including 'Mirascope' made from two parabolic mirrors.)

## Biology

Sl No	Class	Description of Experiment	Apparatus used
1	10	Demonstrate the functioning of the nervous system	Model of brain, Powerpoint presentation, laptop, LCD projector
2	10	Demonstrate the functioning of the respiratory system	Powerpoint presentation, laptop, LCD projector
3	10	Demonstrate the functioning of the heart and circulatory system	Model of heart, Powerpoint presentation, laptop, LCD projector

4	10	Demonstrate the functioning of the excretory system	Model of excretory system, Powerpoint presentation, laptop, LCD projector
5	9	Demonstrate cell biology and its functioning	Cell model
6	9	Demonstrate the preparation of glass slides of onion skin and stomata	Glass slides, compound microscope
7	9	Demonstrate the method of detecting carbohydrates, proteins and fats in different food articles	CuSO <sub>4</sub> , NaOH, Iodine, test tubes, filter paper
8	9	Demonstrate the method of detecting common adulterants in <i>dal</i> (lentils), sugar, <i>rava</i> (semolina), tea	Dilute hydrochloric acid, Iodine, magnet
9	9	Describe the classification of animals and plants	Various preserved species, plant specimens, charts
10	8	Describe the evolution and structure of simple and compound microscopes and observe the slides, amoeba, paramecium, spirogyra and mucor	Convex lens, simple and compound microscope, dome microscope
11	8	Demonstrate the functioning of the eye	Model of eye, Powerpoint presentation, laptop, LCD projector
12	8	Demonstrate the functioning of the ear	Model of ear, Powerpoint presentation, laptop, LCD projector

## Chemistry

Sl No	Class	Description of Experiment	Apparatus/ chemicals used
1	10	Study the properties of acetic acid	Litmus paper, Magnesium wire, Sodium bi carbonate, test tubes, pH papers, universal indicator
2	10	Study the reaction of dilute hydrochloric acid and metals such as Copper, Iron, Zinc and Aluminium	Dilute HCl, test tubes, Mg wire.
3	10	Study the reaction of dilute hydrochloric acid and salts of above metals such as Aluminium sulphate, Zinc sulphate, Iron sulphate, Copper sulphate	As above
4	10	Demonstrate the electrolysis of sodium chloride and copper chloride solutions	Power supply, beaker, carbon electrodes, solutions of CuCl <sub>2</sub> and NaCl
5	10	Observe the reaction of sodium with water	Beaker, a small piece of sodium, water, phenolphthalein
6	10	Perform titration for measuring normality of solutions	Pipette, burette, conical flask, dropper, stand, HCl, NaOH

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7	9	<ul style="list-style-type: none"> <li>▪ Study structure of atom</li> <li>▪ Study the periodic table of elements</li> </ul>	Model of atom drawn on paper with thermocole backing, pins, Powerpoint presentation
8	9	Demonstrate various types of chemical reactions	Test tubes, test tube holder, Bunsen burner, beaker, $\text{NH}_4\text{OH}$ , $\text{Pb}(\text{NO}_3)_2$ , $\text{KI}$ , $\text{CuSO}_4$ , Iron nail, Conc. $\text{HCl}$ , liquor ammonia, $\text{NaOH}$ , $\text{NH}_4\text{Cl}$
9	9	Demonstrate the Law of Conservation of Mass	Conical flask with cork stopper, small test tube, $\text{Pb}(\text{NO}_3)_2$ , $\text{KI}$ , spring balance
10	9	Study solubility of salts and saturated solutions	Beaker, stirrer, sugar, $\text{NaCl}$
11		Demonstrate reduction of $\text{KMnO}_4$ using filter paper	Funnel, filter paper, $\text{KMnO}_4$ , $\text{NaOH}$
12	9	Demonstrate apparently puzzling experiments like secret writing (Agnichitra), burning of handkerchief, igniting water etc. ('Anti superstition experiments')	$\text{KNO}_3$ , essence stick, match box, benzene, isopropyl alcohol, water, beaker, piece of cloth etc.
13	8	Prepare the following gases and study their properties: Carbon dioxide, Ammonia, Hydrogen, Chlorine	Flat bottom flask, thistle funnel, delivery tube, gas jar with lid, candles, test tubes, $\text{CaCO}_3$ , dilute $\text{HCl}$ , $\text{Ca}(\text{OH})_2$ solution, $\text{NH}_4\text{OH}$ , Conc. $\text{H}_2\text{SO}_4$ , Mg wire, litmus papers
14	8	Demonstrate the differences in the speed of chemical reactions depending upon shape, heat, water, acid (both concentrated & dilute) and catalyst	Marble pieces, $\text{HCl}$ , Fe, S, Cu, $\text{H}_2\text{SO}_4$ , Acetone, Cu sheet-pieces
15	8	Demonstrate a reversible reaction (blue bottle experiment)	Conical flask, dextrose, $\text{NaOH}$ , methylene blue
16	8	Demonstrate cold flame of phosphorus	Test tube fitted with jet tube, stand, phosphorus
17	8	Demonstrate the fountain of ammonia	Round bottom flask, cork fitted with dropper, $\text{NH}_4\text{OH}$ , indicator