A Compendium of Teaching Aids

Compilation of Teaching Aids Prepared by 2-year B.Ed. Students

Dr. P.R. Lalitha
Professor of Physics

REGIONAL INSTITUTION OF EDUCATION
(National Council of Educational Research and Training)
Mysore - 570 006

FOREWORD

Science Teaching becomes interesting and enjoyable if supported by interesting experiments, demonstrations and use of teaching aids. Preparation of Teaching Aids, using them in teaching and conducting exhibitions is an important activity of student teachers of the Four-Year Integrated B.Sc.Ed. and two-year B.Ed. (Secondary) students of our Institute. Our students have prepared a number of teaching aids over the years under the guidance of Dr. P.R.Lalitha, Professor of Physics at the Institute.

A 'Compendium of Teaching Aids' prepared by our two-year B.Ed. Students, is an attempt towards compiling all the teaching aids in one source. the book is specially useful to teachers, teacher educators and student-teachers as it can be used to fabricate teaching aids to teach different topics. The models described in the book cut across secondary and senior-secondary levels as they can be used to demonstrate difficult concepts like centripetal and centrifugal forces, conservation of energy, conservation of angular momentum, resonance, moment of inertia, etc. which are mainly taught at the senior secondary level.

I would like to place on record my appreciation for the efforts put in by Dr. P.R.Lalitha in compiling this volume. I may also mention herein that these models have been exhibited during the Annual Teaching Aids Exhibition of the Institute, the National Children's Science Congress 2002, the International Year of Physics IYP-2005 Exhibition and the National Teachers' Science Conference 2006 held at RIE, Mysore and received accolades for the same.

I am sure that this compendium will be of immense help and will meet the needs of the concerned.

G Ravindra
Principal

PREFACE

One of the consequences of living in the modern world is that there is almost no one to whom Physics is totally unfamiliar. The technologies are so numerous that it would be quicker to try to list any daily activities that have not come to involve some technology based on physics. Physics involves the learning of abstract concepts. Students of physics need to develop skills of observation, collection of data, processing of data, drawing graphs, interpretation of data, computation, writing equations, translation from verbal to symbolic form and vice-versa. However, students of today, seem to lack these skills, more so because we as physics teachers lay a great amount of stress on physics content. They do not seem to see the relevance of the physics they study in classrooms in their daily life.

How then do we address this problem? We need to make the study of physics an enjoyable experience. We ought to allow our students to explore. We need competent teachers who are able to make study of physics interesting in spite of well equipped laboratories not being available. We need good communicators of science. To this end, preparation of teaching aids assumes great significance. Teacher education programs ought to train student teachers to prepare relevant teaching aids and use them to organize activities for students to explore. An experience of this type instills confidence in the teacher and also paves the way for developing new projects involving school children.

The students of the two-year B.Ed. at the Regional Institute of Education, Mysore have over the years developed a number of teaching aids in Physics which can be used even at the tertiary level, some of them as laboratory experiments. Using the teaching aids they developed during science exhibitions and teaching practice, they have not only improved their communication skills but articulated on how to improve them and use them to develop concepts in the classroom.

I would like to mention herein that ideas have been drawn from references like School Science Review, Physics Teacher and Physics Education listed at the end of this volume.

I wish to express my deep sense of gratitude to Prof. G. Ravindra, Principal, RIE, Mysore who was a constant source of encouragement in bringing out this volume. My thanks are also due to Mrs. Imavathi, Stenographer for patiently typing the manuscript and my students of the two-year B.Ed. course who put in their sincere and undeterred efforts in preparing the teaching aids which was the source of inspiration in bringing out this volume. I am sure the users of the book, the students and teachers will find it useful.

P R Lalitha
Professor of Physics

CONTENTS

RAY APPARATUS

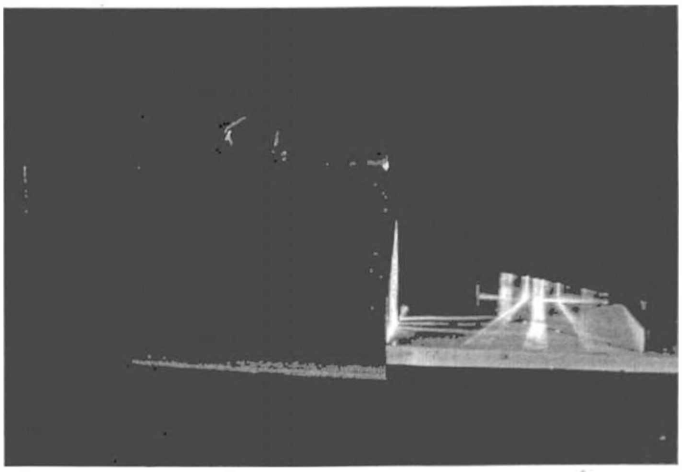
S. Vijayakumar
II Sem B.Ed. 2001

Materials Required:

- Plywood sheet 2 cm thickness 20cm x 15 cm
- Plywood sheet 1mm
- Bulb and Bulb holder
- Wire
- Metal sheets 16cm x 15cm
- Metal rod 4 Nos

Construction:

Construct a box 30cm x 15cm x 16cm using the plywood sheet of 1mm thickness at the end of the plywood sheet of thickness 50 cm x 15cm, keeping its front face open. Cut a slit open at the centre of the top face of the box through which a bulb suspended from a rod can be moved. Make arrangements on the front open face to slide metal sheets 16 cm x 14 ½ cm with single, double, triple and multiple slits to be slid as required.



How to use the device

Slide the slit required on the front face of the box. Illuminate it by switching on the lamp. Use the set up to demonstrate reflection, refraction and dispersion by placing mirrors, glass slabs, lenses of different shapes and prisms made of perspex in front of the slits. The position of the lamp may be suitably adjusted for clarity.

FUNCTION OF BALL BEARINGS

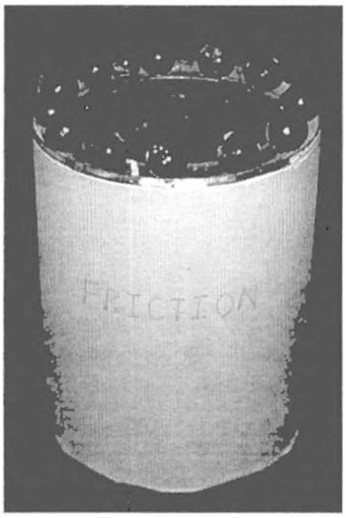
Madhulika Tripathi
II Sem B.Ed. 2001

Materials required:

- 2 empty tins (Cerelac / Bournvita) 2 Nos
- Marbles
- Paint

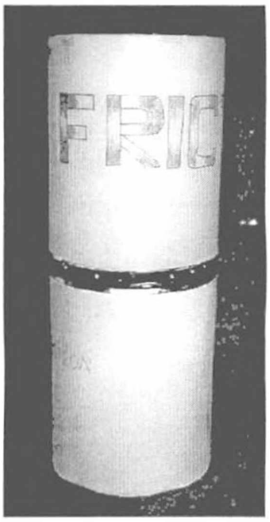
Construction

Paint the two tins red/black. Place one inverted over the other without the lid by keeping the marbles in between them on the rim of the can.



How to use the device

First invert one can over the other and rotate it. Observe whether it is easy or difficult to rotate the upper can. Now place the marbles along the rim of the bottom can and invert the other can on top. Rotate the upper can. Notice that it is easier to rotate the upper can now. The marbles help eliminate friction which is what ball bearings do.



EFFECTS OF ELECTRIC CURRENT

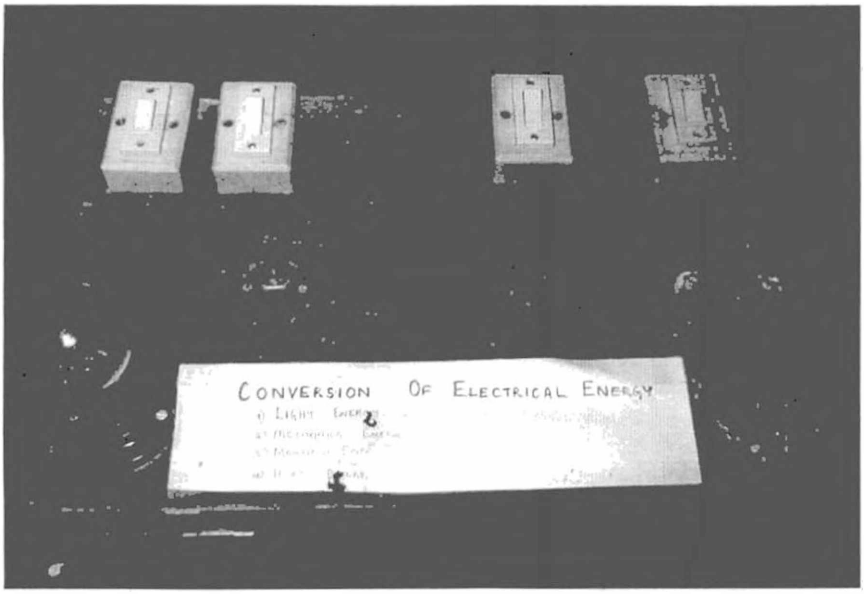
C.V. Vijayalakshmi
II Sem B.Ed. 2001

Materials Required

- A gang box 45 cm x 29 cm
- Motor
- Bulb and bulb holder
- Transformer
- Iron box coil
- Switches, wire, 2 pin plug

Construction

Connect the motor, transformer, bulb holder and the iron box coil to separate switches fixed on the gang box and in turn to the mains through a wire and plug.



How to use the device

In order to demonstrate the different effects of electric current, insert the plug into the mains. Switch on the switches in turn to demonstrate the different effects i.e. lighting, mechanical, magnetic and heating effects.

SPECTROMETER

Deepa Sudham
II Sem B.Ed. 2001

Materials Required

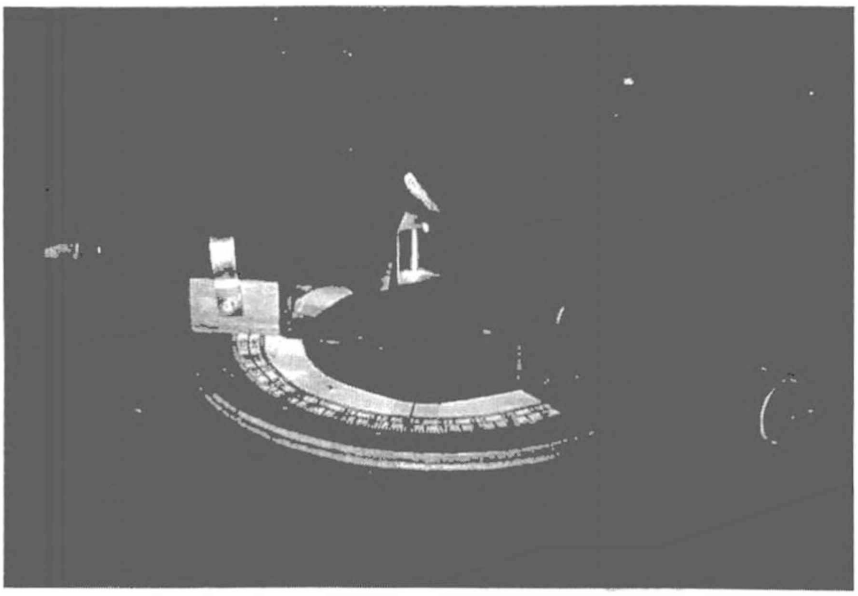
- Plastic tube of 1" dia ½ metre
- Plastic tube of 0.8" dia 40cm
- Metal sheet
- Wood
- Blades
- Lens 20 cm focal length

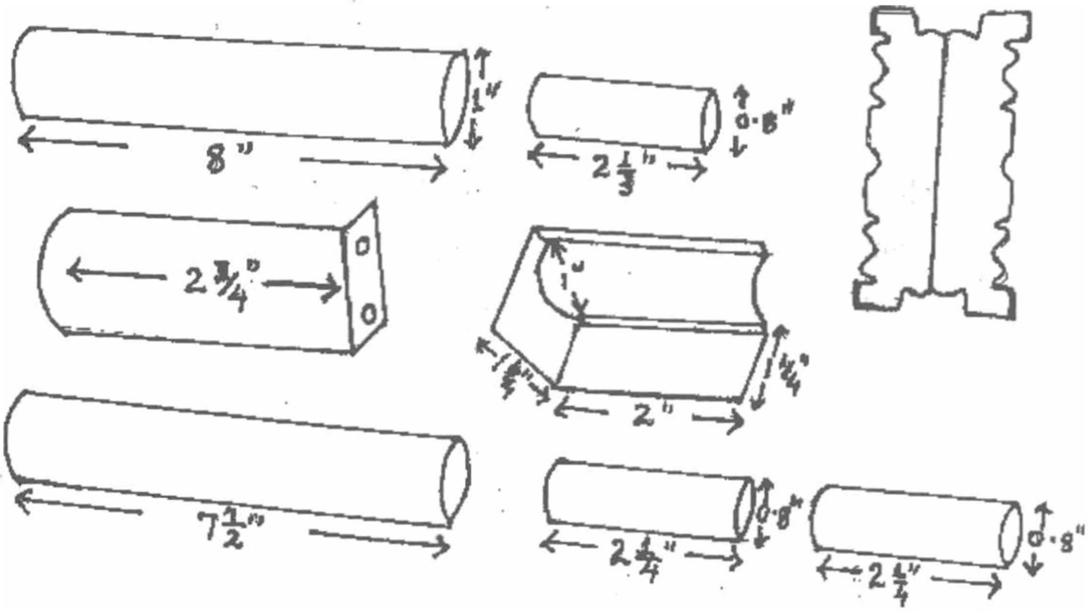
Construction

Break the blade into two and make a slit. Attach it at one end of a tube of length 2½" and 0.8" diameter. Slip this into a tube of length 7½" and 1" diameter which has a biconvex lens of 20cm focal length fixed at the other end. This arrangement forms the collimator. To make the telescope fix a biconvex lens of focal length 25 cm at one end of a small tube of length 2¼" and 0.8" diameter and slip this into the telescope tube of length 8" and 1" diameter. Take another tube of length 2¼" and 0.8" diameter. To one end of it fix an eyepiece with cross wires. Slip this into the other end of the telescope tube. The position of the eyepiece can be adjusted by moving the tube in the telescope tube.

Fix the collimator and telescope on two separate wooden blocks designed as shown in figure using two U shaped hooks.

To this attach an L-shaped metal piece (see figure). Pivot these on a circular wooden base of diameter 30" to which Xerox copy of the protractor (enlarged) is fixed on either side of its diameter. This helps read off angles. The collimator and telescope can be rotated and they should be so pivoted as to have a gap to place a block of wood to act as a prism table.





How to use the device

Adjust the telescope for a distant object. Place a mercury source in front of the collimator slit. Adjust the collimator for obtaining a clear fine image of the slit. Mount the prism on the prism table and adjust the telescope to receive the spectrum.

SPECTRUM OF WHITE LIGHT

Poornima Gupta
II Sem. B.Ed. 2002

Materials Required

- ♦ Glass Prism
- ♦ 60 or 100 watt bulb
- ♦ Tin box (Farex)
- ♦ Stand with screen
- ♦ Prism stand
- ♦ Glass trough
- ♦ Plane mirror
- ♦ Bulb holder
- ♦ Connecting wire
- ♦ Plug

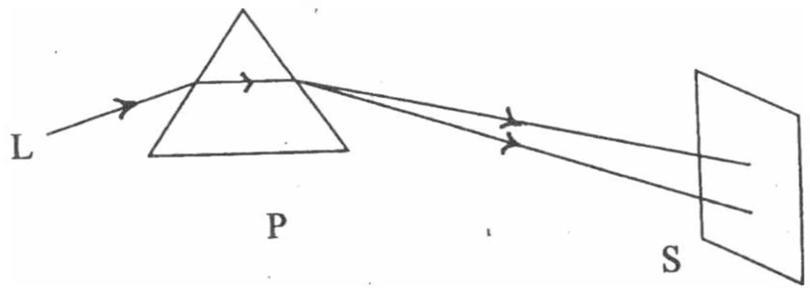
Construction

a) Make hole in the lid of the tin box so that it acts as a slit. Fix the bulb holder at the other end. Connect the wire and the plug to the plug holder. Now fix the bulb in the holder. Take a stiff cardboard and fix a white paper on it. Fix this on a stand so that it acts as a screen.

b) Place the mirror at an angle of 45^0 in a trough of water.

How to use the device

a) Place the lamp L, the prism P and the screen S as shown in the figure. Switch on the lamp and observe the spectrum on the white screen.



b) Shine sunlight on the mirror placed at 45^0 in the trough of water. Catch the spectrum on the wall and observe. White light dispersion yields seven colors VIBGYOR.

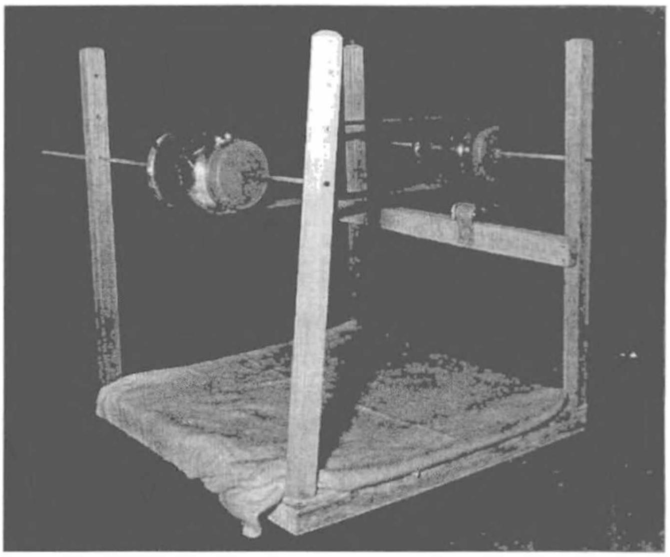
A SIMPLE MAGNETIC SEPARATOR

Thippeswamy
II Sem B.Ed. 2002

Materials Required

♦ Cycle spoke	2 Nos
♦ Plastic Jars with lid	2 Nos
♦ Disc magnets	6-8 Nos
♦ A plywood base 40cm x 30cm	
♦ Vertical pieces of plywood 5cm wide and 20 cm high	4 Nos
♦ Iron filings and sand mixture	
♦ Araldite	1 tube

Construction



Drill holes on the four vertical pieces of plywood. Fix them as shown in the figure. Drill holes at the top and bottom of the plastic bottles. The holes should be such that they just allow the spokes to pass through. Fix the disc magnets along the rim in the centre of one of the plastic jars. Now pass the spokes through the vertical pieces and the jar such that they are held in position. Connect them by a ribbon. Bend one end of the spokes of the empty jar twice at right angles so that is forms a handle which can be used to drive the second jar.

How to use the device

Put the sand iron filings mixture on the tape. Rotate the bottles by means of the handle. The sand iron filings mixture gets separated as soon as it reaches the jar containing the magnets. Magnetic separators are used to separate magnetic materials from non-magnetic ones.

WATER TIMER

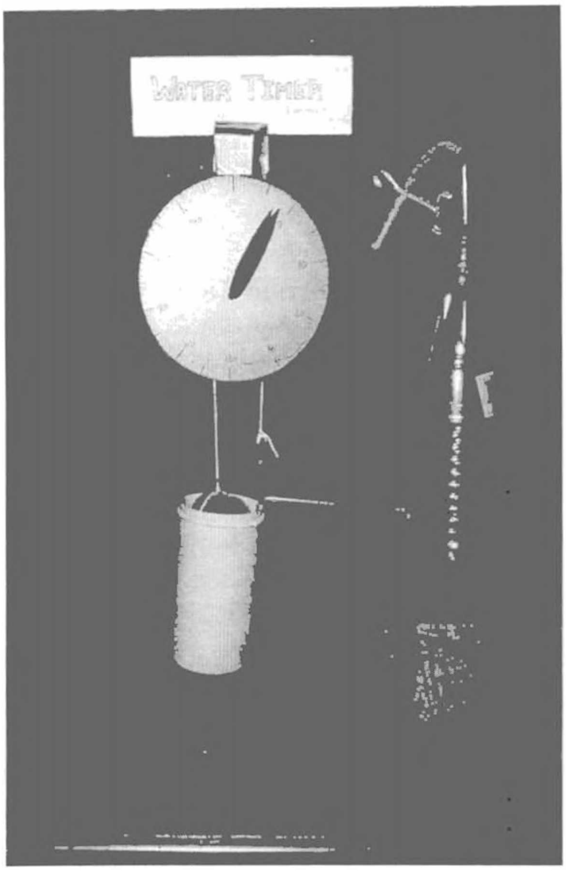
G. Kavitha
II Sem 2002

Materials Required

- Wooden base
- Needle
- Wooden upright
- Metal strapping
- Screws
- Pointer
- Wooden cube
- String
- Beaker
- Cork
- Bottle with one holed stopper (one on top and one on the side) 2 Nos.
- Pulley
- Glass tube
- Glass tube bent once at right angle
- Nut

Construction

Fix the upright to the base. Bend the metal strapping as shown and fix it to the upright. Glue the narrow end of the cork and pass a needle right through the centre of the pulley. This serves as the axle of the pulley. Fix the pulley to the strapping. Pass a string over the pulley to one end of which is tied a wooden block and to the other end a nut to keep the string taut. Fix the one holed stoppers to the bottle and pass the two tubes as shown in the figure. Place the bottle on a wooden cube near the wooden base on which a beaker is placed, such that the tube bent at right angles is inside it. Attach a graduated scale (in secs) to the strapping with a needle attached to it to act as a pointer. Insert the end of the string having the wooden block into the beaker.



How to use the device

Allow water to trickle into the beaker at a particular rate. As the wooden block is lighter than water, it starts rising up causing the pulley to rotate and in turn the needle. This process goes on and the needle completes a rotation. The device can be used to measure small time intervals.

PHASES OF THE MOON

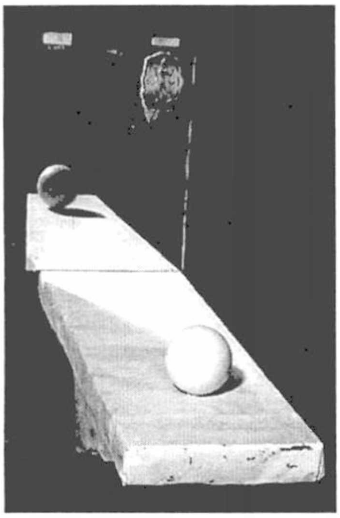
T.S. Shanmugan
II Sem B.Ed. 2002

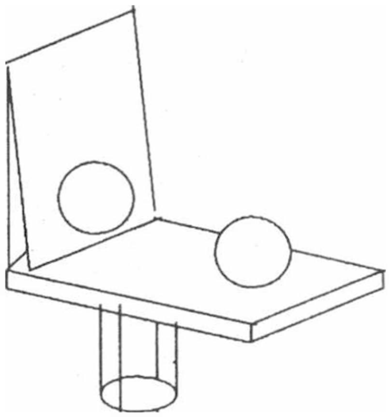
Materials Required

- Plane mirror piece 17cm x 12 cm
- Plywood pieces 36cm x 10cm x 2 cm and 18cm x 10 cm x 2 cm
- Ping pong ball
- Fevicol
- Cylindrical wooden piece 10cm high and 8 cm dia
- White formica piece 36 cm x 10cm and 18cm x 10 cm

Construction

Fix the two plywood pieces so as to form a right angle. Paste the white formica sheet on it. On one end of the longer piece paste the ping pong ball. Place the mirror piece across the L at an angle such that the image of the ball can be seen in it. Fix the cylindrical wooden piece at the bottom as shown which serves as a handle.





How to use the device

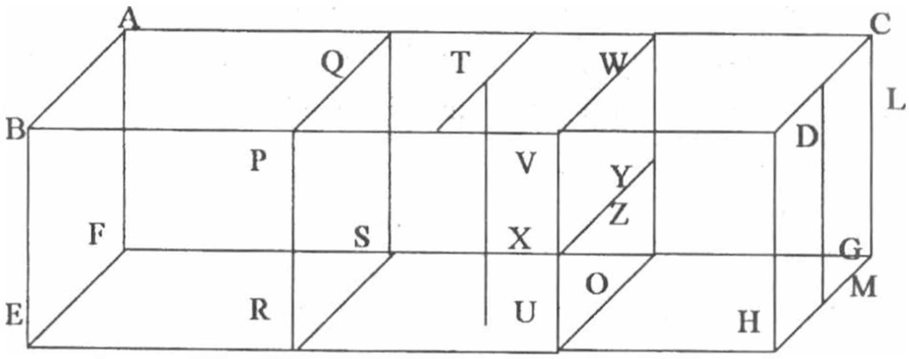
Hold the device by means of the handle. Illuminate the ping pong ball which serves as the moon. Observe the reflection in the mirror while rotating holding the device in your hand. The images seen in the mirror show the different phases of the moon.

A DEVICE FOR MEASURING THE REFRACTIVE INDEX OF A LIQUID

Suganya Kamatchi
II Sem B.Ed 2002

Materials required

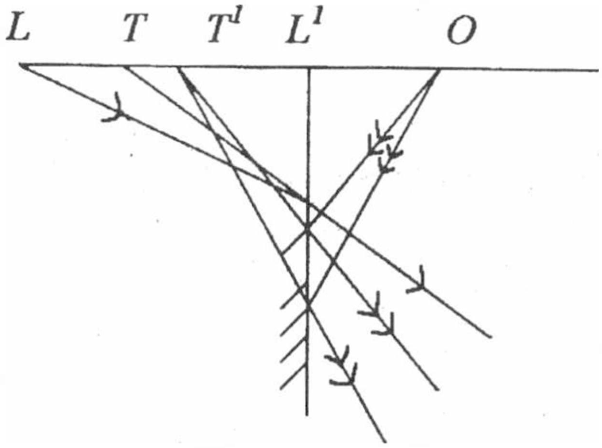
- Glass plate 10cm x 8cm 3 Nos.
- Glass plate 20cm x 8cm 2 Nos.
- Glass plate 20cm x 10cm 1 No.
- Mirror plate 10cm x 8cm 1 No. (half of the plate must be non silvered)
- Wood piece 40 cm x 9cm 2 No.
- Wood piece 40 cm x 10.5 cm 1 No.
- M seal adhesive for sealing the glass
- Thin wire bent into the form of a T



Construction

Construct the outer box ABCDEFGH using the wooden piece of dimension 40 cm x 10.5cm as base and the two wooden pieces of dimensions 40cm x 9cm as sides A FGC and BDHE and the two glass plates of dimensions 20cm x 8cm and as sides ABEF and CDHG. Construct the inner moveable box PQRSUVWZ with the glass plates of dimensions 10cm x 8cm, the plate UVWZ of dimensions 10cm x 8cm which is half silvered as sides and the plate of dimensions 20cm x 10cm as base. Use M-Seal to make the boxes so that they do not leak. A T-pointer is placed in the centre of the moveable box the position of which can be adjusted. A permanent mark LM is made on the face DCGH.

Ray diagram showing the principle



The image of T as seen through the water and the transparent part of UVWZ is at T^1 while the images of L as seen by reflection at the mirror part of UVWZ is at L^1. If the inner box is slided, TO remains fixed and T^1O (= TO/μ) remains fixed, but LO changes and hence L^1 O (=LO/δ) changes. On the other hand if the box is kept and T is slided, then L^1O(=LO/δ) remains fixed and T^1O (=TO/μ) changes. The experimenter has hence two alternatives for making T^1 coincide with L^1. Since the images of T through water and of L through the mirror in a continuous vertical line the coincidence can be judged accurately by eliminating parallax. The refractive index is calculated by using the relation.

$\mu = LO/TO$

How to use the device

Place the box PQRSUVWZ in a fixed position and adjust the position of T such that it is in line with LM as seen through the side CGLH, which can be judged by the parallax method. Measure the distances TO and LO and calculate the refractive index using the relation given above.

REFLECTION OF LIGHT AND SOUND

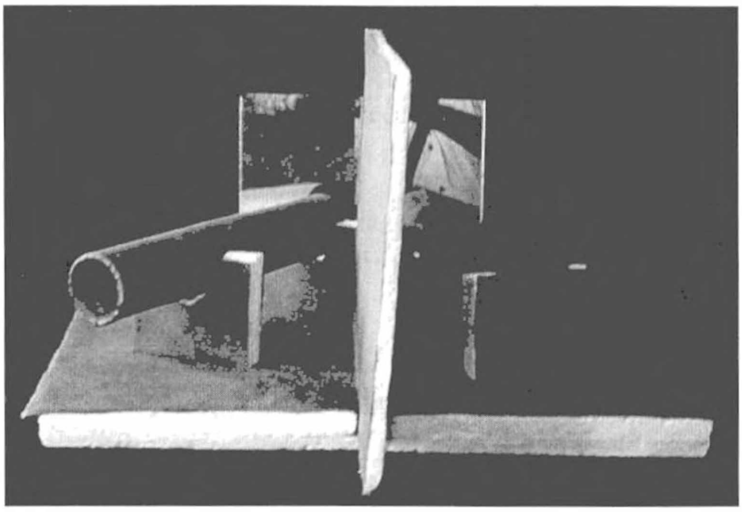
Vijayan
II Sem B.Ed. 2002

Materials Required

- Wooden base 45 cm x 45 cm
- Plane mirror 23 x 15 cm
- 2 Plastic pipes 30 cm length 5 cm dia
- Wooden screen 35 cm x 23 cm
- Watch
- Light source

Construction

Mount the mirror on the wooden base. Fix the wooden screen on the base along the perpendicular bisector to the mirror. Place the two pipes making equal angles with the wooden screen as shown in the figure to indicate the incident and reflected directions.



How to use the device

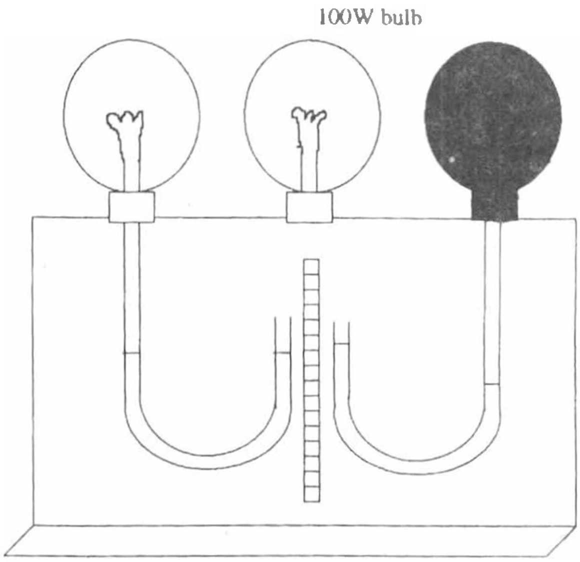
To demonstrate that sound and light exhibit the phenomenon of reflection, place a source of light and a watch in front of one of the pipes in succession. Observe the reflection of light and hear the sound reflected from the other pipe.

BLACK BODIES ABSORB MORE HEAT

Shilpa Shailaja
II Sem B.Ed. 2002

Materials required

♦ Fused bulbs	1 No
♦ 100 W bulb	1 No
♦ U tubes	2 Nos
♦ Stand	
♦ Colored Water	
♦ one holed rubber corks	2 Nos
♦ Black paint	
♦ Bulb holder	
♦ Wires	



Construction

Remove the filaments from the bulbs which are fused and close their mouths with a one holed rubber stopper. Pass U tubes through the corks. Paint one of these bulbs with a black paint. Fix the bulbs with the U tubes to a stand. Between the U tubes fix a scale or a piece of graph paper. Fix the 100 watt bulb in between the two bulbs as shown in the figure. Fill the U tubes with colored water.

How to use the device

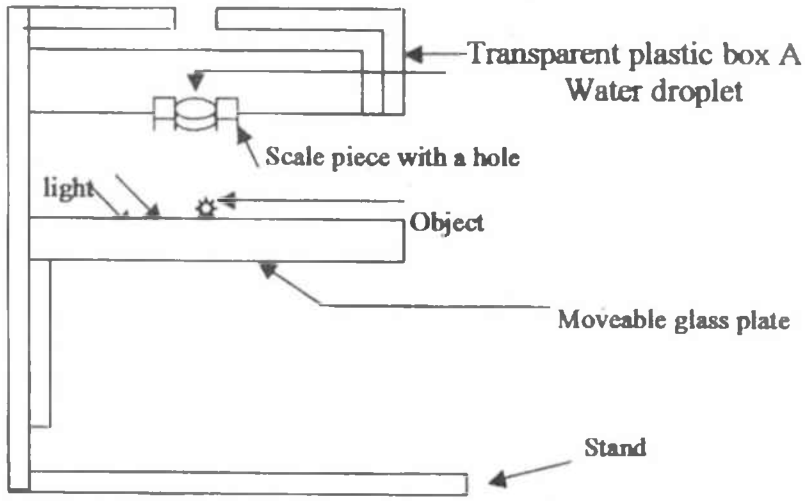
Note down the reading of the levels of the liquid in the U tube. Switch on the bulb. Observe what happens to the liquid level in the U tube. In which tube does the water level rise more? What do you conclude?

WATER DROPLET MICROSCOPE

V. Sujitha
II Sem B.Ed 2002

Materials required

- Stand
- Transparent Plastic box
- Microscope Slides
- Piece of a plastic scale with a hole
- Source of light
- Suitable glue



Construction

Fix the piece of the of the plastic scale with a hole in it inside the plastic box as shown. This enables you to place the drop of water as indicated in the diagram. Cover the box with the lid after making a hole in it to enable you to see the drop. Fix the box to the stand taking care to see that the lid can be removed whenever the water drop is to be placed. Fix the moveable glass plate below the plastic box.

How to use the water droplet microscope

Place a water droplet in the hole in the piece of scale fixed inside the plastic box. Keep the object which can be either chalk dust or lycopodium powder on the glass plate as shown. Illuminate the object by light from a source and adjust the position of the moveable glass plate to obtain a clear image of the object.

REPULSIVE PLATFORM BALANCE

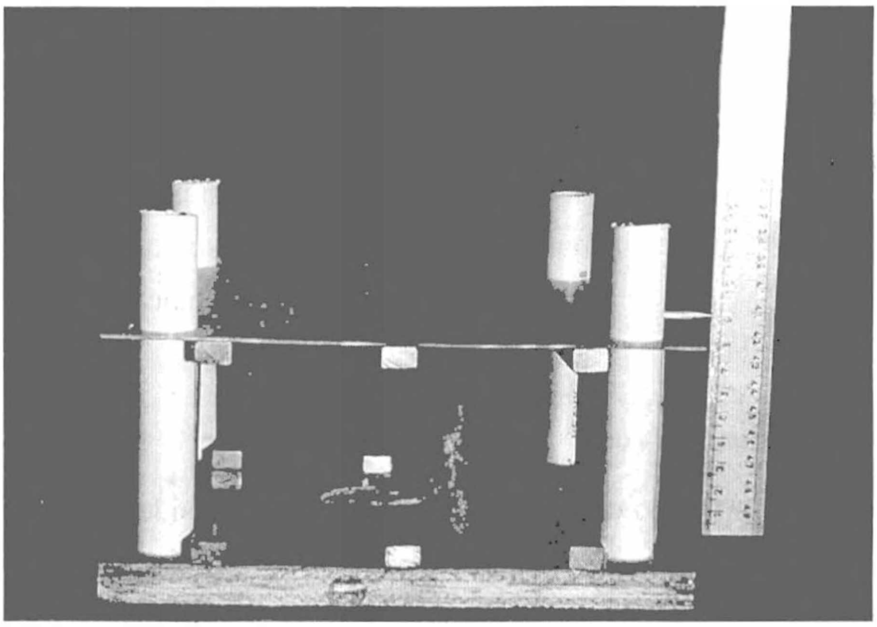
P. T. Shaly
II Sem. B.Ed. 2003

Materials Required :

♦ Light weight wooden piece 8" x 10"	1 No.
♦ Plywood piece for base 8" x 10"	1 No.
♦ 4 wooden dowels of equal length	
♦ Bar magnets	8 -10 Nos.
♦ Cardboard	
♦ Straw	
♦ Pointer	
♦ Glue	

Construction

Fix the dowels at the corners of the base. Bore holes in the upper light weight wooden piece so that the dowels can pass through as shown in the figure. Glue the magnets, 4 at the four sides and one at the centre, both on the base and the under surface of the upper board. Attach a straw to the upper platform and pass a pointer through it. Place the upper board in position by passing it through the dowels. The platform is repelled by the base. Place a calibrated index scale against the pointer. Due to repulsion between the magnets, the upper board moves up.



How to use the device

Place small weights on the upper platform. By reading off the position of the pointer on the calibrated scale, weights and be measured.

Precautions

1. Any magnets may be used but place the magnets symmetrically for accurate displacement and stability.
2. The upper platform should be of light weight.
3. Grease the dowels used for support with petroleum jelly to allow free movement of the platform.

BALLISTIC PENDULUM

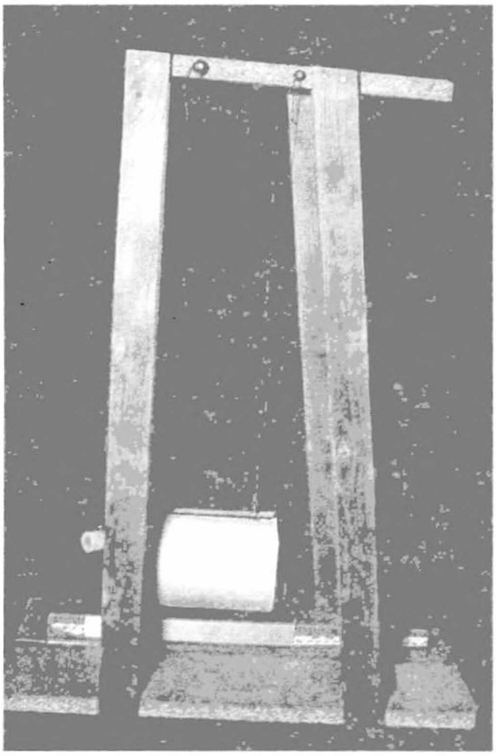
Bincy Mol Thomas
II Sem. B.Ed. 2003

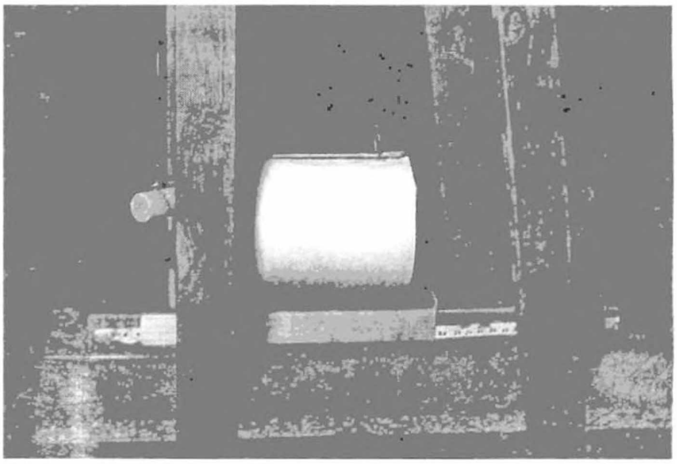
Materials Required

- Plywood piece of 4" width and length 32" 4 Nos
- 1" width plywood piece, 12" in length 4 Nos
- A Coffee can / Bournvita can
- Thread
- Plywood base
- Aluminium channel 8" in length
- Half metre scale
- Pointer
- Weights

Construction

Clamp the 4 pieces of plywood of length 32" to the plywood base as shown in the figure to make a frame. Fix the metre scale vertically such that the graduations face you. Place the aluminium channel with the pointer on the scale such that it can move freely.





How to use the device

Load the can with some weights. Place the can in contact with the pointer when it is in equilibrium. Strike the can with an arrow. The can strikes the pointer and the aluminium channel moves to its final position on the scale. The difference between this reading and the reading in the equilibrium position gives 'X' the horizontal displacement. The velocity of the arrow 'V' can be calculated if the mass of the can 'M', mass of the arrow 'm' and length of the pendulum 'L' are known using

$$V = \frac{M}{m}\sqrt{\frac{g}{L}}$$

Not only can one introduce concepts of momentum and energy conservation but also impress on students that a small vertical rise in the pendulum can be determined by measuring a comparatively large horizontal displacement.

PHOTOGRAPHIC ENLARGER

S Prajula
II Sem B.Ed. 2003

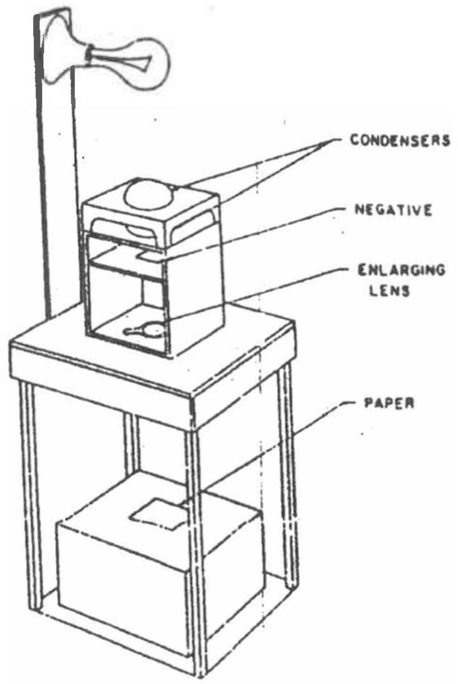
Materials Required

- Plywood
- Condensing lens (8 cm diameter, 13cm focal length)
- Negatives
- Enlarging lens (8.5 cm focal length)
- Paper
- 200 watt bulb
- Black tape
- Screws
- Nails

Construction

The upper section holds the condensing lens, negative and enlarging lens. Mount the condensing lenses on top of each other as close together as possible. Place this on a piece of plywood (stage) as shown in the figure. Make a square hole in a piece of plywood. Place the negative on top of the hole, sandwiched between two pieces of thin clear glass. Use black tape to mark the glass to accommodate the negative. This constitutes stage 2.

The enlarging lens of 8.5 cm focal length is placed on a piece of plywood with a hole in it. To cut down on the aperture one can place a cardboard piece with a hole at the centre. The lower part of the model supports the upper part and provides a surface on which to expose the printing paper. To keep the entire construction together, screws, nails and tapes are used. The 200 watt bulb is fixed in position as in the figure.



How to use the device

The position of the bulb is adjusted by moving it both horizontally and vertically to get a uniformly bright image. The position of the paper that will give the image the sharpest focus is also found by trial and error. A raised platform with a wooden frame can hold the printing paper down flat.

The magnification produced is extremely sensitive to the object distance. For a magnification of 3 with this set up an object distance of 11 cm produces an image distance of 34 cm. Magnification can be conveniently changed by adjusting either the lens or the negative thereby changing the object distance.

HEATH'S ROBINSON COMPASS

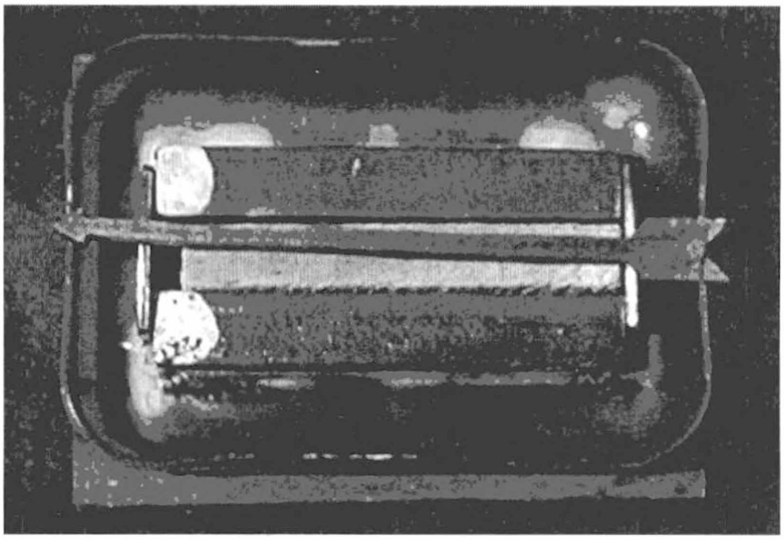
A. Ramya
II Sem B.Ed. 2003

Materials Required

- A pair of powerful bar magnets
- A plastic box
- Hard plastic tube
- Jumbo paper clips
- Glass trough
- Yellow spot stickers

Construction

Mark the north pole of the magnets with yellow stickers. Place the bar magnets along the opposite sides on the bottom of a plastic box such that both spots point in the same direction. Fix the plastic tube as pointer across the top of the box such that it is parallel to the magnets using clips.



How to use the device

Float the whole assembly in a trough/bigger plastic box that contains water. Immediately the pointer swings northward.

CONSERVATION OF ENERGY

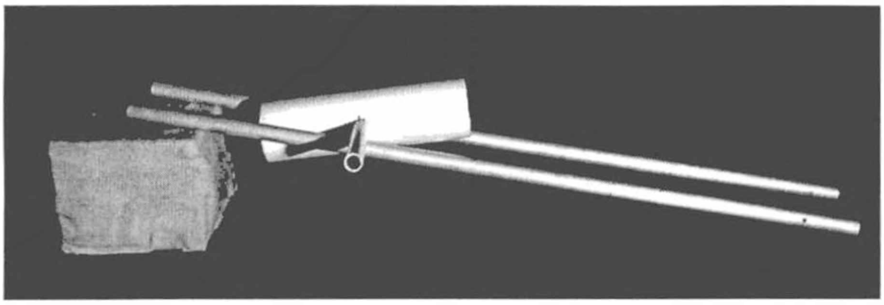
N. Senthamil Selvi
II Sem. B.Ed. 2003

Materials Required

- 20 cm long, 4.5 cm diameter cardboard tube.
- 30 cm long, 1 cm diameter long aluminium rod
- Two rubber stoppers
- Two 12m length aluminium curtain rods

Construction

Fit the rubber stoppers to the ends of the cardboard tube. Bore 1cm holes through the stoppers and also through the centre of the cardboard tube. Mount the aluminium rod through the rubber stoppers once and then through the hole in the centre of the cardboard tube.



How to use the device

Place the two aluminium curtain rods at an incline by placing them against either two boxes or two chairs. Roll the object down the incline first with the rod along the rotational axis and then perpendicular to it. Note the difference in rates of descent. What does this indicate?

MAGNETIC FIELD DUE TO MAGNETS OF DIFFERENT SHAPES

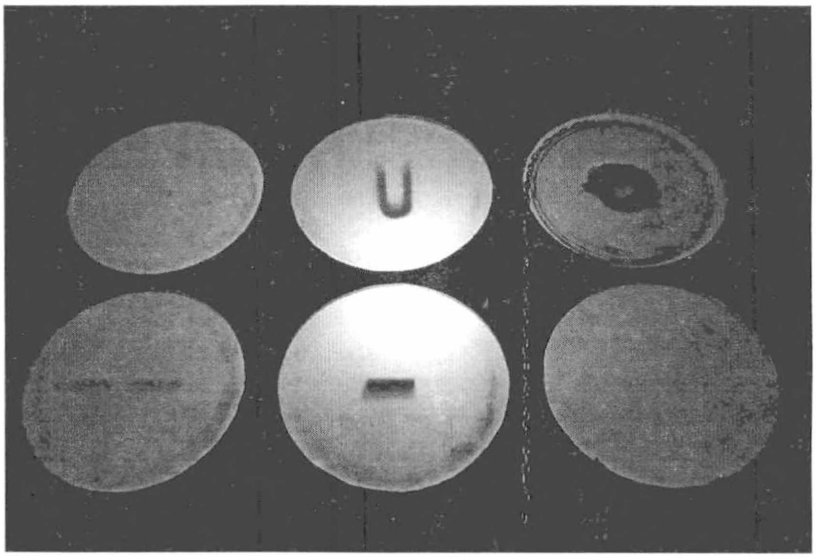
Ganesh Nag P V
II Sem 2003

Materials Required

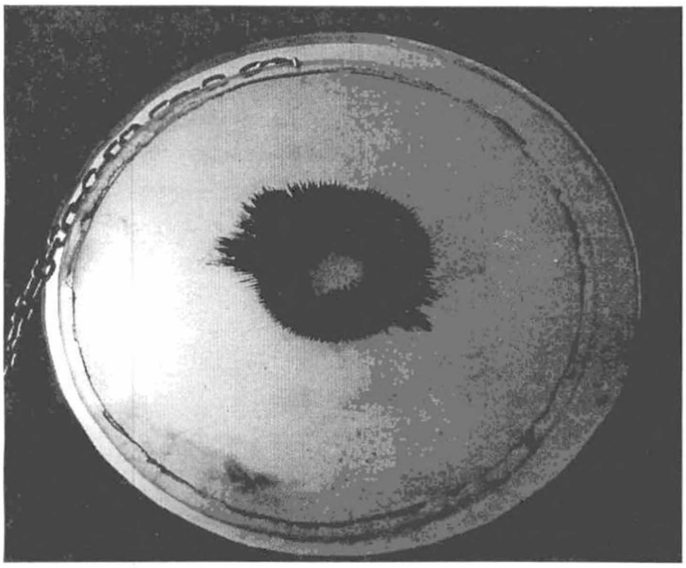
- Iron filings
- Bar magnets
- Horse Shoe magnets
- Circular magnet
- Plywood
- Fibre glass sheet
- Transparent acrylic sheet
- Wire
- Plug
- Lamp holder
- Bulb

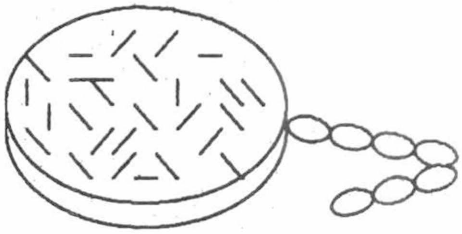
Construction

Construct a box of dimensions 1m x 60cm x 15cm out of the plywood sheet. Cut six circular holes of equal diameter as shown in the figure. Cut 6 circular pieces from fibre glass which can fit into these holes. Fix the different magnets on one side of these circular pieces of fibre glass as shown in the figure below and fix them to the circular holes in the box such that the magnets are not visible from outside.



Make two circular plates of the same diameter but wider than the circular holes in the box. Place them one above the other such that there is a small gap so that iron filings can be filled in before sealing the gap. Fix this to the box by means of a chain so that it can be placed over the circular discs of the box below which magnets are placed.





How to use the device

Keep the circular plates containing iron filings on the circular holes in the box in succession, tap it gently and observe the arrangement of the iron filings. This represents the magnetic lines of force.

SLIDING FRICTION APPARATUS

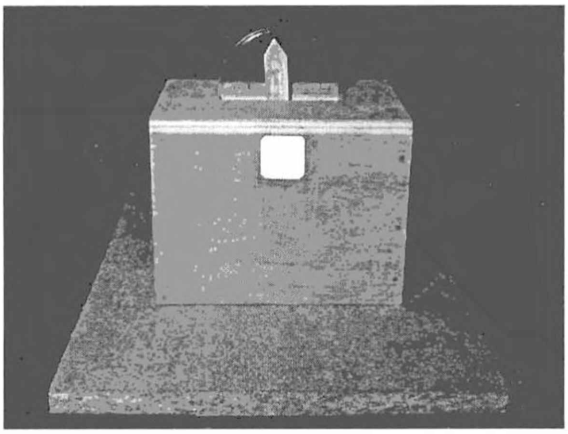
Betty Devasikutty
II Sem B.Ed. 2003

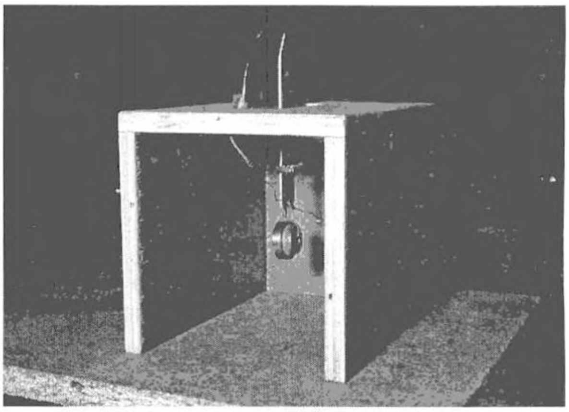
Materials Required

- Plywood box 30 cm x 15 cm x 15cm
- Aluminium pointer
- A rod bent into an arc
- A small disc to act as weight for the pointer
- A thin steel rod
- 2 bolts to hold the pointer in place
- A knob

Construction

Keep one end and the bottom of the box open. Cut a slot in the top as shown in the figure. On the inside, place a pivoted aluminium pointer. A rod of small diameter, bent into a circular loop at one end, protrudes through a hole in one end of the box. At the other end, a rod which is bent is inserted in a hole in the pointer below the pivot.





How to use the device

By pulling or pushing on the free end of the rod, the box can be made to move forward or backward. The pointer then moves over the graduated scale. Calibrate the scale in some convenient force units which will enable one to find the relative magnitude of the frictional force. The device can be used to measure frictional forces exerted by different surfaces, the difference in magnitudes of the static and dynamic frictional forces and frictional forces involved when the box is weighted. Knowing the total weight of the apparatus, the coefficient of friction for various forces can be calculated.

THE SAND PENDULUM

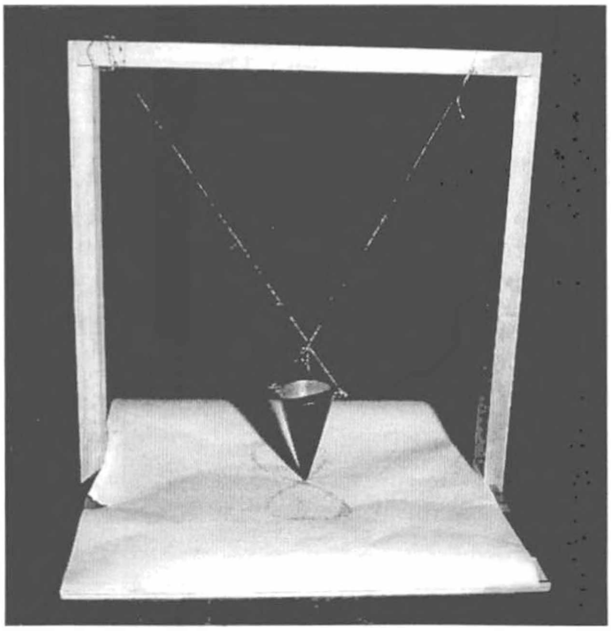
S Divya
II Sem. B.Ed. 2003

Materials Required

- Plywood sheet
- Funnel
- Thread
- Clip
- Black paint
- Sand/Coloured Rangoli powder
- Two tall rods (either circular or flat)
- A wooden cross bar

Construction

Cut a plywood sheet 3' x 4' and paint it black. At the centre of the two opposite long sides, fix the two tall rods as shown. Fix the cross bar. To this suspend the funnel and clip the thread as shown in the figure.



How to use it

Close the end of the funnel with your finger. Fill the funnel with sand or rangoli powder. Pull the funnel to a side and let it go. The pendulum traces Lissajous figures.

PLUCKED STRING

J. Jisha
II Sem. B.Ed. 2003

Materials Required

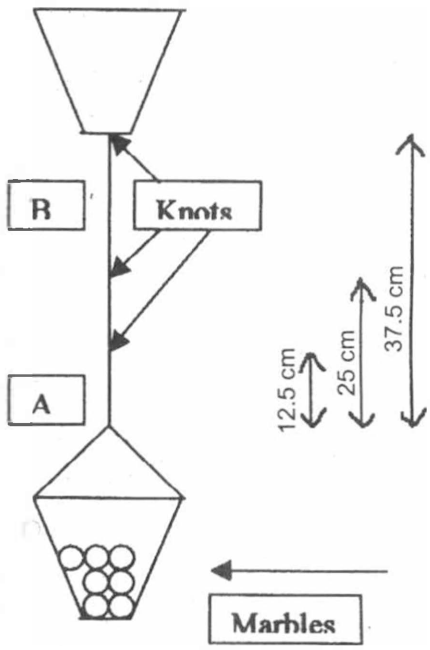
- 2 Styrofoam cups
- String
- Marbles 100 Nos
- Scale

Construction

Hang one cup from the string, as shown in the figure by passing it through holes made at the top on opposite sides. Tie the string at A and small knots in the string at 12.5 cm, 25.0 cm and 37.5cm from A. Pass the other end of the string through a small hole drilled in the bottom of the other cup. Fix the cup B using a stand.

How to use the device

Place ten marbles in the cup and pluck the string. Hear the note with your ear. Now pull the string up until the 12.5 cm knot is at B. Again pluck the string and hear the note. Drop the string till the knot at 25 cm is at B and repeat the activity. Once again repeat the activity by dropping the knot so that 37.5cm knot is at B. Pluck the string and hear the note. How does the frequency of the note vary with the length of the string? Repeat the experiment for a known length of string between A and B, but increase the tension by adding 20 more marbles each time. Note the change in the frequency of the tone. What are the factors on which the frequency of vibration of the string depends?



REFLECTING TELESCOPE

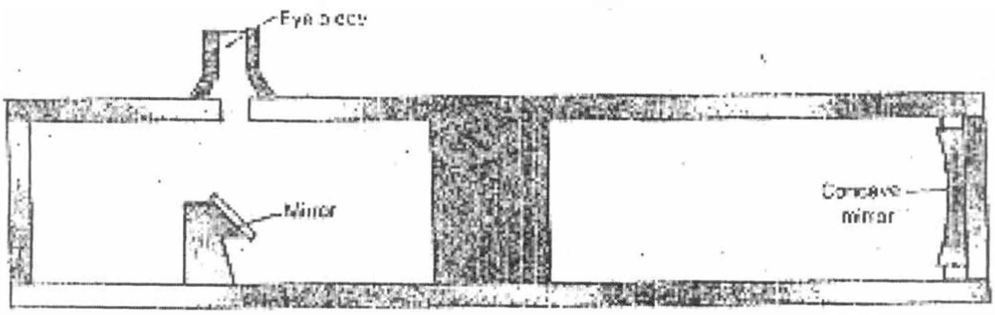
Sharad Sure
I Sem. B.Ed. 2003

Materials Required

- ♦ PVC pipe 2½" diameter and 1½" in length
- ♦ Eye piece
- ♦ Concave mirror 2½" diameter and 20 cm focal length
- ♦ Thermocol
- ♦ Plane mirror piece

Construction

Fix the concave mirror at one end of the pipe using the thermocol. At the focus of the concave mirror, fix the plane mirror by placing it on a thin rod passed through the pipe diametrically. Make a hole in the pipe right above where the plane mirror is placed. In this hole, place the eye-piece. Seeing through the eyepiece, fix the inclination of the plane mirror at an angle of 45^0 by rotating the rod. This enables us to see the image of an object through the eyepiece.



How to use the device

Direct the open end of the pipe towards a distant object. Light rays falling on the concave mirror from the distant object converge to a focus where the plane mirror is kept. The plane mirror reflects the light towards the eye piece and the image of the object is seen.

A MODEL TO ILLUSTRATE ECLIPSE FORMATION

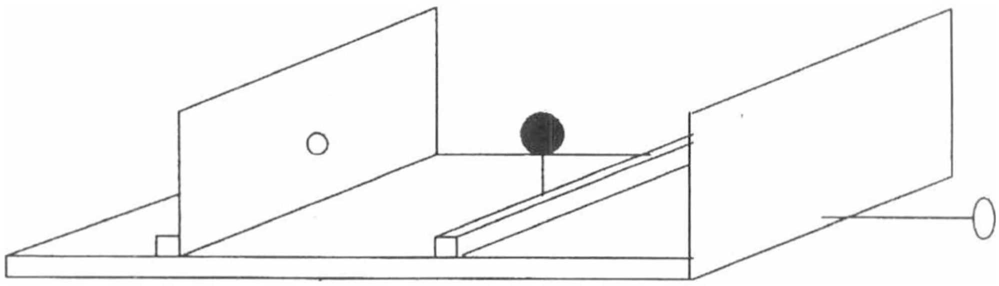
A. S. Pratibha
II Sem B.Ed. 2003

Materials Required

♦ Opal Electric Bulb	1 No.
♦ Blackened Cardboard Sheet	1 No.
♦ Red Crayon	1 No.
♦ Wooden ball 2.5 cm diameter	1 No.
♦ Knitting needle	1 No.
♦ Cycle spokes	1 No.
♦ Screen	1 No.
♦ Plywood base	1 No.

Construction

Take the blackened cardboard / plywood sheet and drill a hole of 5cm diameter. Fix it vertically on the base. Place it in front of an opal electric bulb, which represents the sun. Draw the corona with red crayon around this hole Place the wooden ball of 2.5cm diameter which serves as the moon mounted on a knitting needle in front of the blackened cardboard as shown in the diagram which serves as the moon. Place a screen with a number of holes drilled in it, in front of the ball and fix it to the base. Drill a hole very close to the base of the screen and pass a spoke through it, the other end of which is attached to the mounted ball. The position of this mounted ball can be varied by moving the spoke.



How to use the device

Illuminate the hole. Looking through the holes in the screen, adjust the position of the moon by moving the spoke until a total eclipse becomes visible. At this stage, the corona becomes visible. The intermediate stages indicate the different stages of formation of the eclipse.

VIBRATING AIR COLUMN

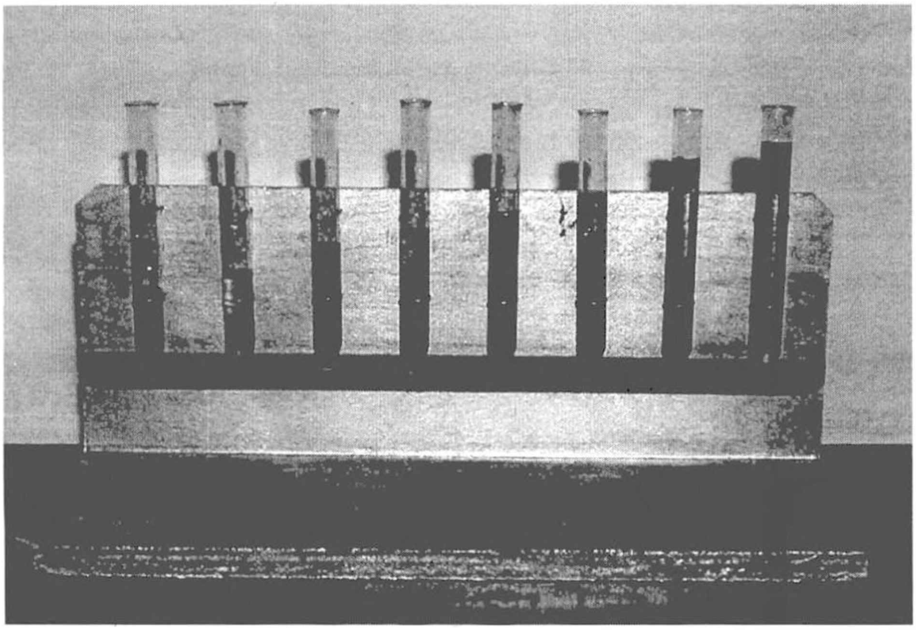
R. Raghu
II Sem B.Ed. 2003

Materials Required

♦ Sheets of Plywood 50 cm x 25 cm	2 Nos
♦ Test Tubes	8 Nos
♦ Fevicol / nails	
♦ Jerry Clips	8 Nos

Construction

Fix the two plywood sheets perpendicular to each other by means of fevicol or nails as shown in the figure. Fix the test tubes by means of the tiny clips to the vertical board such that they protrude a little beyond the sheet.



How to use the device

Fill the test tubes with water. Adjust the levels of water such that when air is blown across the rims of the test tube they produce a tuned scale, an octave.

TWO DIMENSIONAL MODEL OF LIQUIDS, GASES AND BROWNIAN MOTION

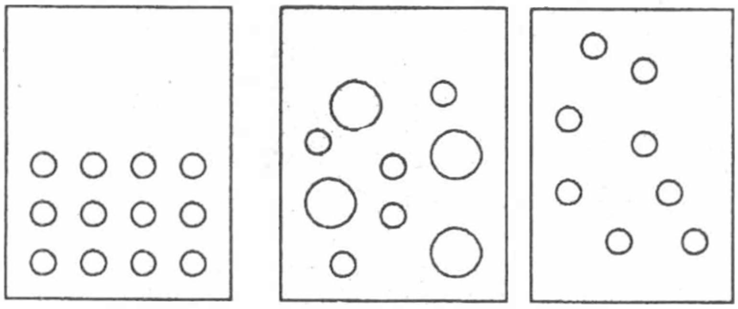
B Jayalakshmi
II Sem B.Ed. 2003

Materials Required

- Tray 1 No.
- Marbles enough to fill quarter tray
- Large marbles 10 Nos

Construction

1. Place the marbles in the tray filling quarter of it for demonstration of liquids.
2. Next add 10 large marbles for demonstration of Brownian motion.
3. Place few marbles in the tray to demonstrate molecular arrangement in gases.



How to use the device

1. Agitate the marbles in the tray by holding it slightly inclined. Watch the motion of marbles. The motion of marbles show how the molecules are arranged in a liquid.
2. Agitate the tray with the larger marbles added. Compare its motion with that of smaller ones to demonstrate Brownian motion.
3. Agitate the tray by keeping the tray with fewer marbles horizontally on the table. This represents gas molecules.

RIPPLE TANK

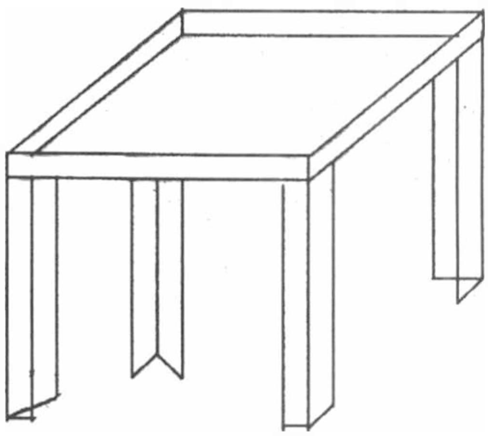
Sridevi Karnam
II Sem B.Ed. 2003'

Materials Required

- Plywood uprights
- 4-wooden pieces 52 cm length
- 50 cm square glass plate
- Ink filler
- Wooden dowel
- Bent rubber tube
- Fevicol
- 100 watt lamp

Construction

Make a square frame out of the wooden pieces and fix the glass plate to it. Fix this frame with the glass plate on the four uprights.



How to use the device

Fill the tank with water. Illuminate the tank using the 100W lamp from above. Generate circular waves by using the ink filler and dropping drops of water from it. The ripples so formed can be seen on a sheet of white paper placed below the tank. To generate straight waves roll the wooden dowel in the tank. To show reflection of waves, place a rod at an angle in the path of the straight waves generated. To show reflection place a rod at an angle in the path of the straight waves generated. To show reflection at spherical surfaces place the rubber tube in the form of a concave surface.

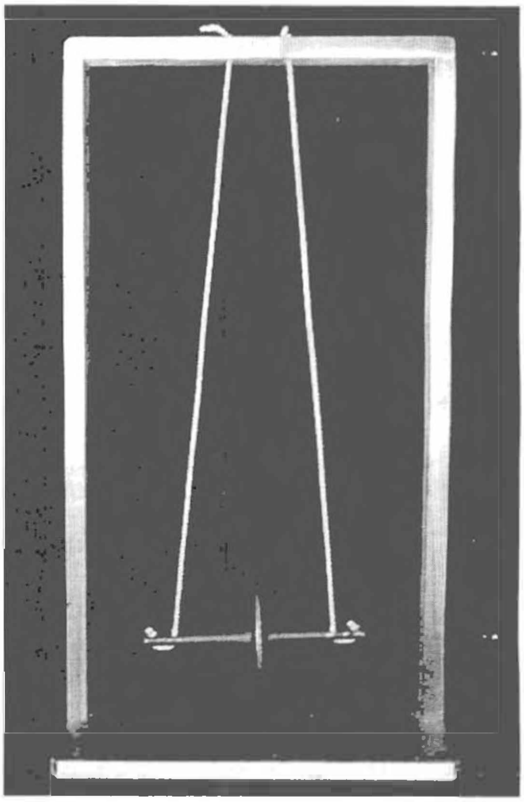
CONSERVATION OF ENERGY

B Parasuram
II Sem B.Ed. 2003

Materials Required

- Plywood base 25 cm x 20 cm
- 2 uprights 85 cm height and width 8 cm
- Steel disc 15 cm dia with axle
- String
- Wooden cross bar 25 cm length

Construction



Fix the two uprights on either side of the base. Fix the cross bar on top of the uprights. Suspend the disc by means of two threads passing through holes in the upright.

How to use the device

Roll the disc up and let go. Observe its motion. It goes up and down several times. This is because there is an exchange in energy between the potential and kinetic forms.

A SIMPLE MAGNETIC SEPARATOR

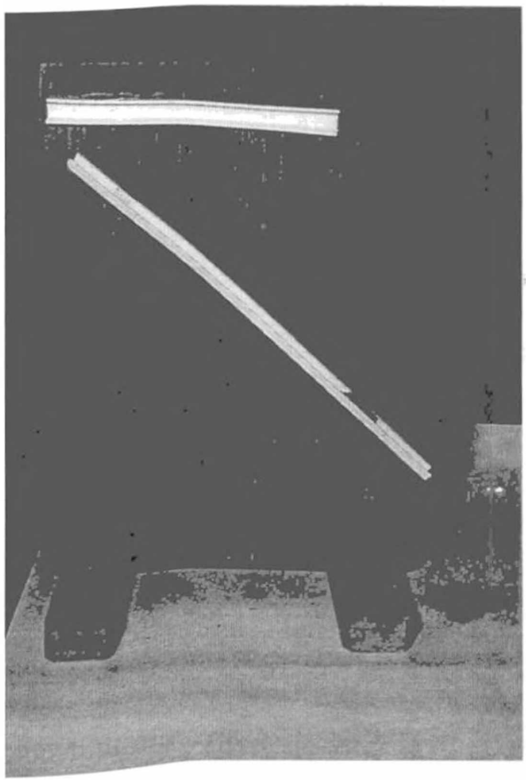
S.N. Neelima
II Sem B.Ed.

Materials Required

♦ Plywood sheet 22 cm x 36 cm	
♦ Disc magnets	3 Nos
♦ Wooden blocks 20 cm x 4 cm x 3cm	2 Nos
♦ Plastic channels 35cm length 1 cm wide	2 Nos
♦ Formica sheet 33 cm x 36 cm	
♦ Fevicol	
♦ Funnel	

Construction

Glue the formica sheet using fevicol on to the plywood sheet. Fix the plywood sheet at the centre of the 2 wooden blocks which serve as the base. Glue the disc magnets on the board in a slanting position. On top of the disc magnets glue the plastic channel.



How to use the device

Pour the sand iron filings mixture through a funnel on the plastic channel. Collect the sand at the other end of the channel. The iron filings which remain on the channel can be separately collected.

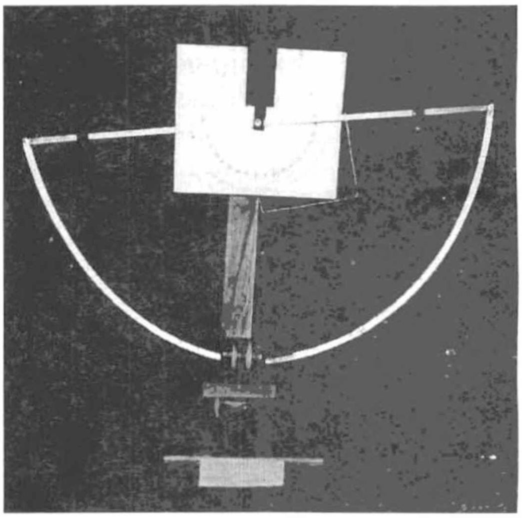
ELECTROMAGNETIC INDUCTION

Parthiban & Sashikumar
II Sem B.Ed. 2003

Materials Required

- Plywood base 24 cm square
- Formica sheet
- Plywood upright 70 cm x 10 cm x 2cm
- Wooden piece 10 cm x 10cm
- Thin plywood sheet 29cm x 24 cm
- Nuts and bolts
- Two coils of 10,000 turns copper wire
- Aluminium channel 2½ m length
- Magnet
- Movable mass 2
- A wooden mass 2
- A wooden stand 5 cm x 10 cm
- Square bracket

Construction



Prepare an arc of a semicircle of radius 50 cm by passing it through the two coils connected in series or parallel such that they loop the arc as shown. Fix the movable weights on the diagonal arm such that they can be fixed in any position. Fix the plywood upright on the base. Glue formica sheet to it and the base. Fix the wooden piece onto the upright perpendicular to it. To this attach the square bracket at its bottom. Make graduations on the thin circular disc by drawing a circle and marking 0 to 180^0 on either side of the centre as shown. Fix this behind the square bracket. Make a hole in the square bracket, pass a bolt and nut. Suspend the semicircular frame from the bolt such that it freely oscillates in its plane through the centre of the coil placed on the wooden stand fixed on the base as shown. Attach a U-shaped pointer to the diagonal frame such that it can read the amplitude of the swing.

How to use the device

Connect the ends of the coil to a sensitive galvanometer. Set the semicircular arc into oscillation and observe the motion of the pointer in the galvanometer. The device can be used to measure the emf induced as a function of the velocity of the magnet.

BEAM TENSIOMETER

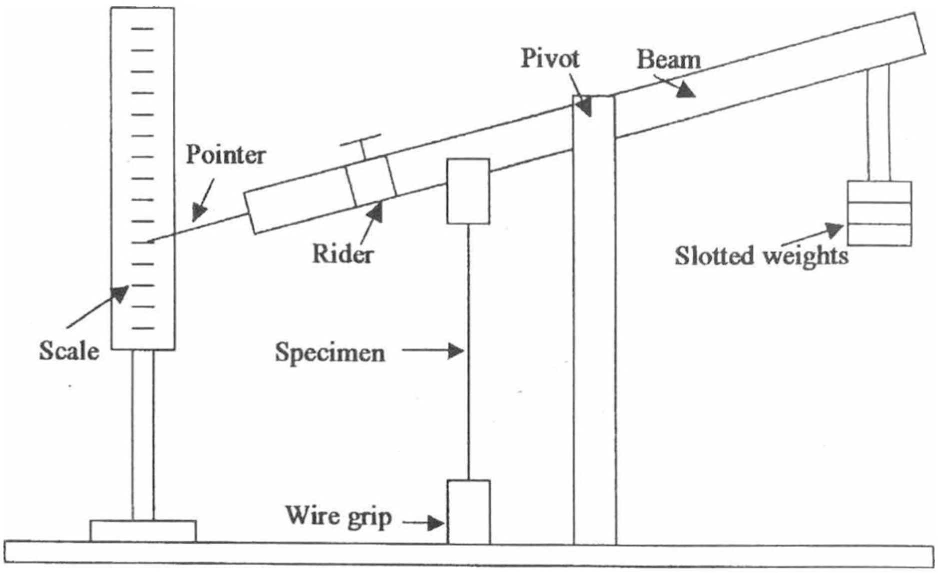
Rajendra
II Sem B.Ed. 2003

Materials required

- 1 metre long aluminium tube
- Pointer
- 2 Specimen grips
- Weight hanger
- Metre rule
- Rider
- Wooden base
- Threads of different varieties

Construction:

The tensiometer is prepared by fixing the moveable rider on the beam and the pointer at one end of it. The beam is then pivoted at its center to the stand. The wire grips are fixed, one on the beam and the other to the base of the stand. Provision is made to hang the slotted weights at the other end of the beam as shown in figure. The pointer moves on a scale fixed to a stand. Readings for extension are noted on the scale.



How to use the device

The wire whose tensile strength is to be measured is placed between the wire grips and loaded by using slotted weights as shown. The extension produced is measured by reading the pointer on the scale. Loading the beam further one can determine the tensile strength of the specimen used by determining the load at which it gives way.

DOUBLE CONE

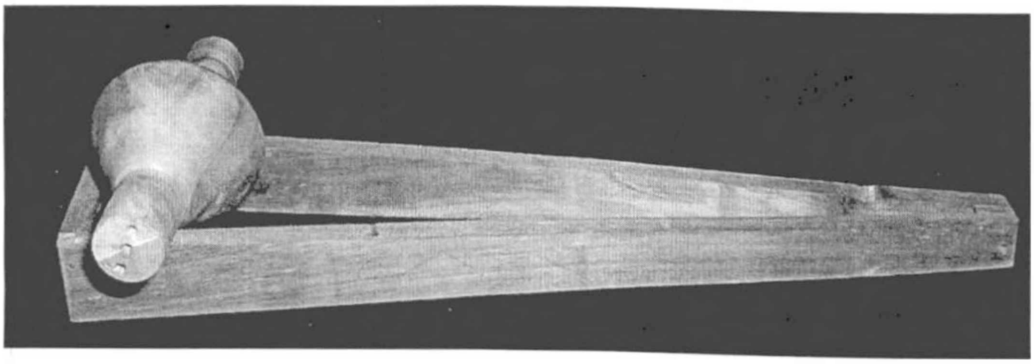
B. Nagabhushan
II Sem B.Ed 2003

Materials Required

- Wood

Construction

Make a V shaped frame and a double cone as shown in the figure.



How to use the device

Place the double cone a the lower end of the V. Surprisingly enough observe that it moves upwards towards the wider end. Explain why the cone moves upwards while in the normal course, the direction of movement would be from a higher level to a lower level.

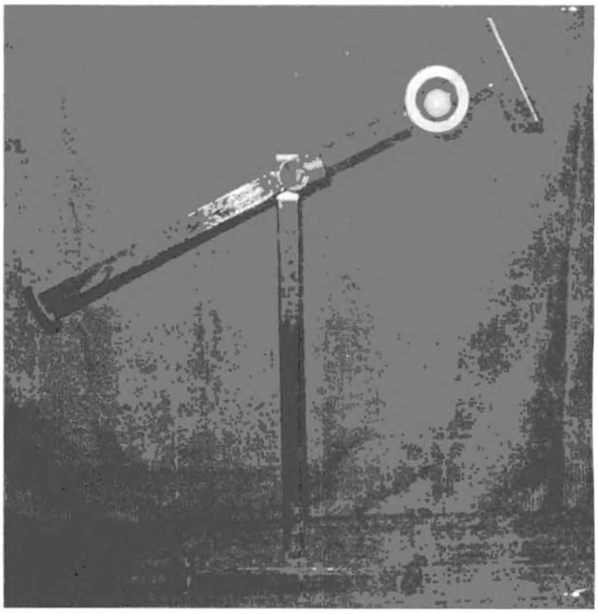
SATURN'S RINGS

G. Rajendra Kumar
II Sem. B.Ed. 2003

Materials Required

- Wooden stand
- Curved thin iron sheet
- 1½ m length iron rod / wooden rod
- a wooden ball with a circular ring
- L shaped lead or plastic bend
- Plane mirror piece
- Convex mirror
- Weight

Construction



To one end of the iron/wooden rod fix the curved iron sheet. Paint the wooden ball with circular ring yellow (representing Saturn) and fix it in front of the curved iron sheet on the rod as shown in the figure. Take the L-shaped bend and fix the plane and convex mirrors in it. Mount this at the centre of the rod. To the other end, attach a weight. Fix the entire arrangement on the stand so that it can be rotated freely.

How to use the device

Rotate the rod and observe through the front portion of the bend. The image obtained represents Saturn and its rings.

MEASUREMENT OF UNKNOWN MASS OF AN OBJECT

A Jayaprakash
II Sem B.Ed. 2003

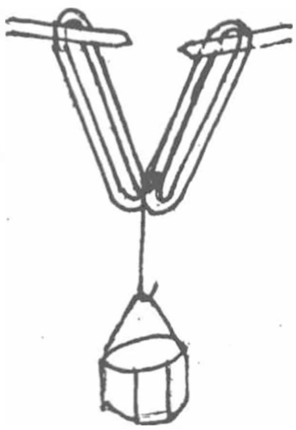
Materials Required

- Wooden Base 30 cm x 19 cm
- Uprights 48 cm - 2 Nos. 35 cm - 1 No.
- Wooden piece 6 cm x 4 cm x 1½ cm Scale 46 cm - 1 No. 42 cm - 1 No.
- Nails 2 Nos.
- Scale pan with hook 1 No.
- Weights
- Elastic band
- Marbles

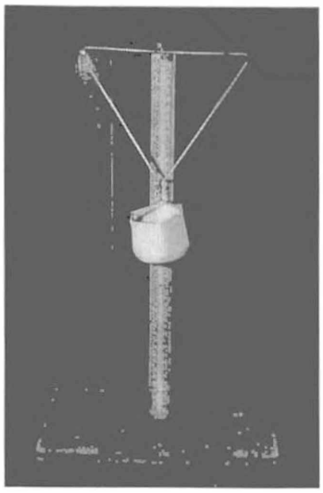
Construction

Fix the wooden uprights and scales on the wooden base as shown in the figure. Suspend the scale pan using the elastic band and hook.

a.



b.



c.

How to use the device

First suspend the scale pan from a single nail (Fig. a) Using known weights draw a calibration curve of tension (T = W/2) as a function of the band circumference (C=2L). Take care to see that the band remains within elastic limits.

Now suspend the scale pan from two nails successively as shown in the two figures (b) and (c). Use unknown weights in the scale pan and determine the value by using the calibration curve drawn. Marbles can be used to draw the calibration curve.

THE PRECESSING WHEEL

Narasimma Ramapriya
II Sem B.Ed. 2003

Materials Required

- An iron stand
- A bicycle wheel with an extended axle ending in a cup

Construction

File the iron stand such that it is pointed. Take the bicycle wheel, extend the axle at one end by means of a rod and make a cup at the other end such that it can rest on the pointed edge of the stand.

How to use the device

Turn the bicycle wheel by holding its axle. Place the wheel on the stand such that it rests on it (see figure). Observe that the wheel not only rotates about its axis but also precesses like a top about the axial support.

SIMPLE MACHINES
LEVERS

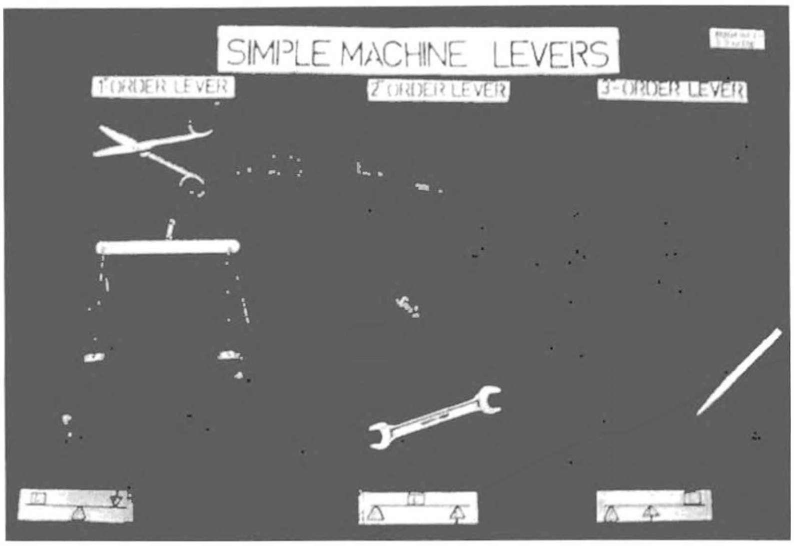
J.V. Akshatha
II Sem. B.Ed. 2004

Materials Required

- Board 2' x 2'
- Scissors
- Small balance (toy)
- Nut cracker
- Bottle opener
- Forceps
- Model of broom
- Fishing rod

Construction

Fix the scissor, balance, nut cracker etc. according to the order of the levers as shown. Mark the positions of the fulcrum, load and effort for all the three types of levers.



How to use the device

The device can be used in the classroom to demonstrate the different types of levers and their classification on the basis of the position of the effort, load and fulcrum.

PULLEYS

Shaikh Naziya Sultana
II Sem. B.Ed. 2004

Materials Required

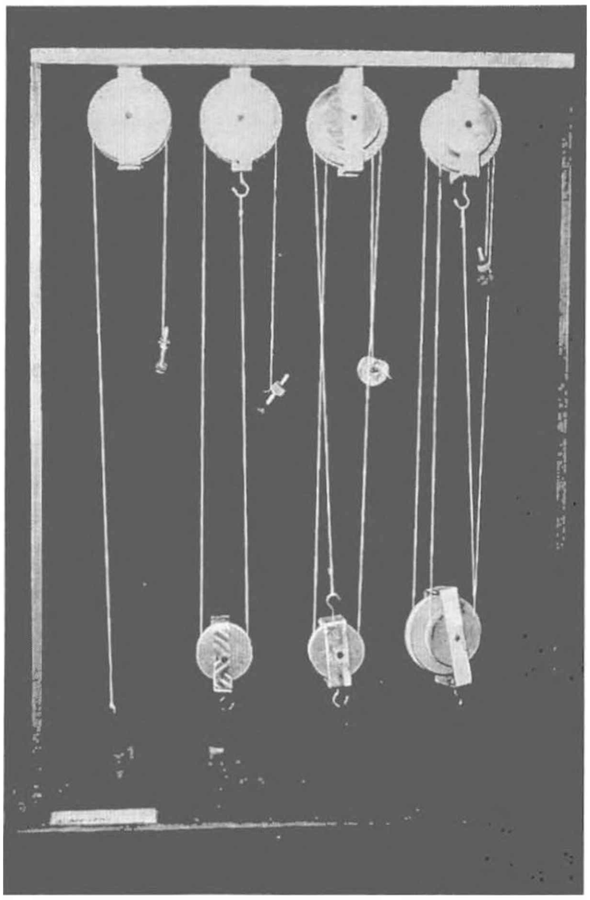
- Wooden frame 2' x 2' 1 No.
- Hooks
- Pulley 7 Nos.
- String
- Weights

Construction

Fix the pulleys as in the diagram shown aside. Hang the weights also as shown in the diagram.

How to use the device

Pull the free end of the strings and find out in which case it is easier to lift the weight.



ACTION AND REACTION

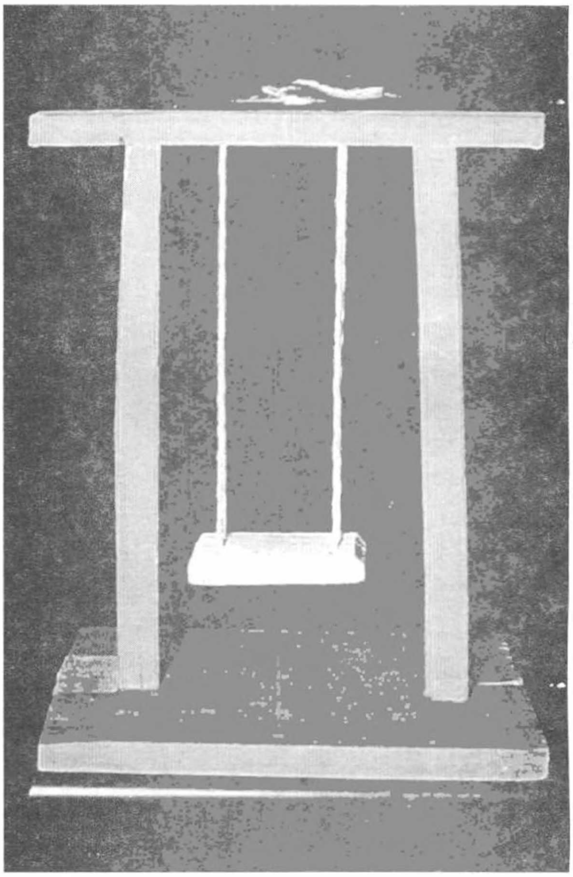
K. Prema
II Sem. B.Ed. 2004

Materials Required

- Model of a swing
- Weights
- Rollers made of conduit 4 Nos

Construction

Place the working model of the swing on the rollers as shown in the diagram.



How to use the device

Place a known weight on the swing and give it a gentle push. Observe how the swing moves on the rollers. Which law does it follow?

PENDULUM WAVES

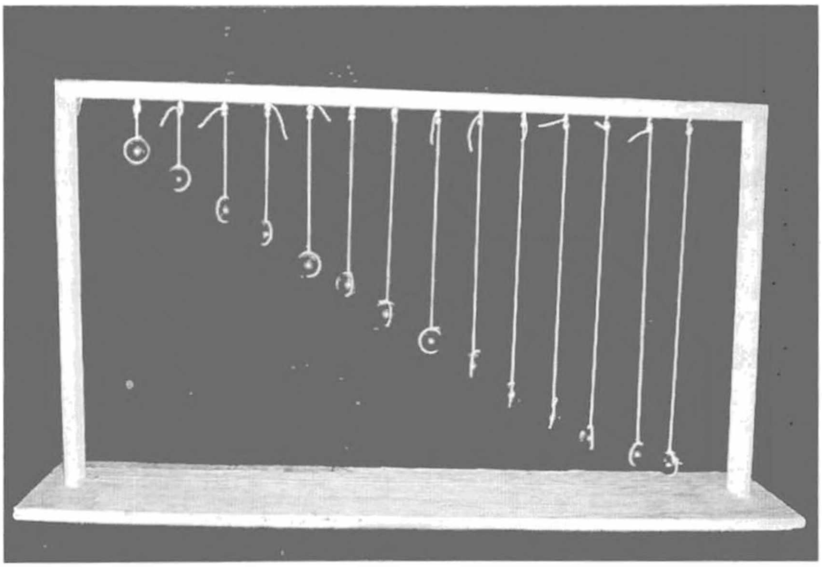
B. Rashmi
II Sem B.Ed. 2004

Materials Required

- String
- Wooden frame 2½ ' x 2' as a base
- Bobs ½" in diameter 15 Nos
- Hooks or thumb screws 15 Nos

Construction

Fix the bob with the string as you do for a simple pendulum. Hang the pendulum by means of hooks as shown in the figure. The lengths of the pendulum must be so adjusted that each of the successive pendulam perform one additional oscillation compared to the previous one in a time T. An array of pendula is thus obtained in which phase change/ unit time is the same for any two adjacent pendula.



How to use the device

Start all the pendulam in phase by means of a half meter scale. It will be observed that after going through a sequence of travelling waves, standing waves, periods of apparent random motion and a sequence of travelling waves moving in the direction opposite to original travelling waves all the pendula come back in phase.

DARE DEVIL JUMP

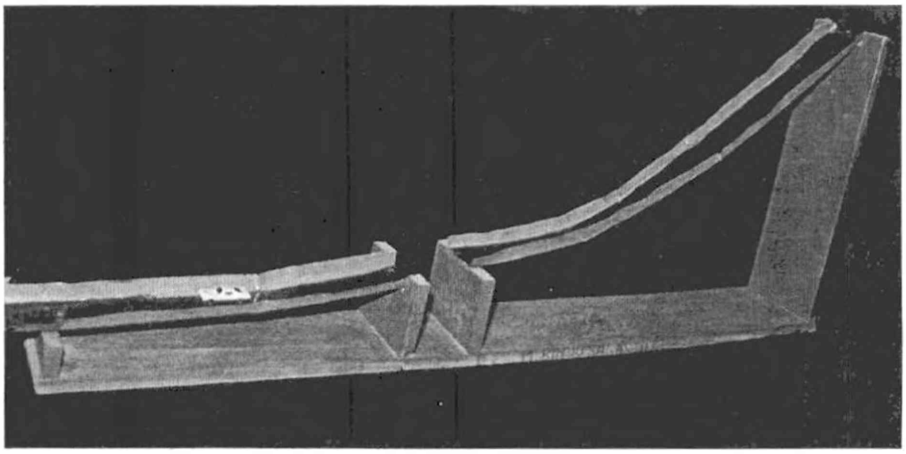
M Bindu Sagar
II Sem B.Ed. 2004

Materials Required

- Wood pieces 8 cm width 3½ m length
- Tin / aluminium sheet (thin) width 10 cm
- Hot wheel car
- Wooden uprights 10½ cm x 8 cm — 2 Nos.
- Wooden upright 50 cm x 8 cm — 1 No.
- Wooden upright 3½ cm x 8 cm — 1 No.

Construction

Fix the 10 ½ cm x 8 cm upright at one end of the base and at the other end fix the 3½ cm x 8 cm upright. At the center fix the 2 wooden uprights 10½ cm x 8 cm with a gap of 40 cm between them. This constitutes the double ramp as shown in the figure below. Let the length of the entire ramp be 2½ m. Use the tin / aluminium sheet of width 8 cm over the ramp with the end bent upwards 2 cm on the sides to get a U shape to prevent the car from falling. Let the angle of inclination of both the ramps be 15^0.



How to use the device

Release the car from a height of 50 cm on Ramp I. The car moves down gaining sufficient energy to jump the gap between the ramps when it is in air. The apparatus demonstrates how the kinetic energy at the bottom of the ramp equals the loss in gravitational P.E. from the starting point on the track.

FORCE DISTRIBUTION ON PLATFORMS SUPPORTED BY SPRINGS

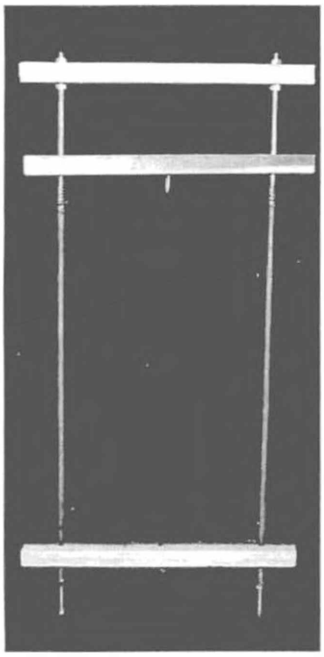
K.G. Seema
II Sem. B.Ed. 2004

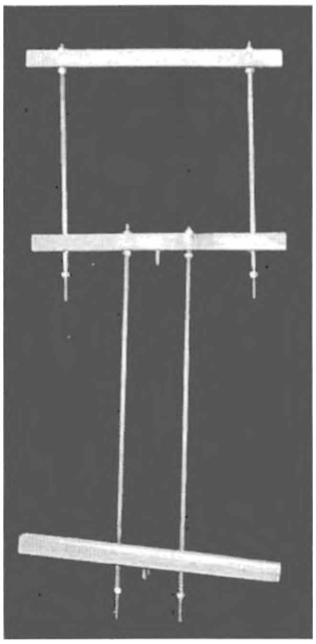
Materials Required

♦ Threaded rods	4 Nos
♦ Pegboard strips	3 Nos.
♦ Hooks	2 Nos.
♦ Nuts	12 Nos.
♦ Weights	
♦ Springs	8 Nos
♦ Stands	2 Nos

Construction

Fix the threaded rods to the pegboards using springs and nuts as shown in the figure. Fix the hooks at the centre of the 2 lower pegboards.





How to use the device

Load the pegboards with the weights as shown and observe the compression in the springs. The extent of compression which gives an idea of static forces and their distribution is used in the construction of a 'walkway'.

PROPAGATION OF A TRANSVERSE WAVE

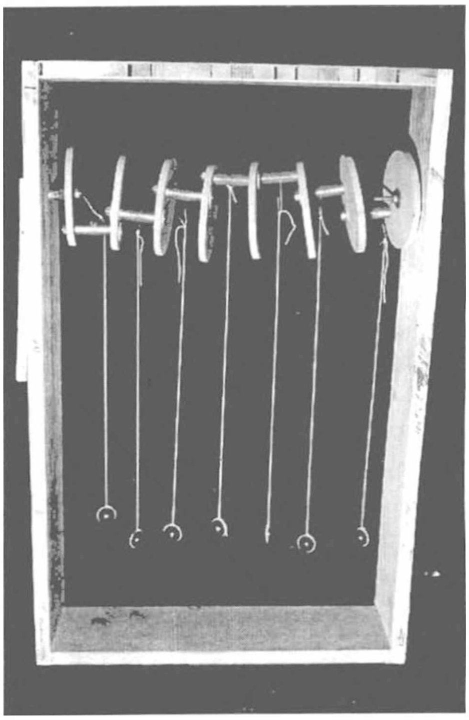
Natam Janardhan
II Sem. B.Ed. 2004

Materials Required

- Eight circular discs with two holes at angular intervals of $2\pi/8$.
- 7 link rods with grooves half way along its length
- 7 pendulum bobs
- Wooden frame
- Screws
- Thread
- Handle

Construction

Fix the discs with the linking rods and screws in a circular array such that the adjacent rods are $2\pi/8$ radians apart. Fix the entire arrangement to the wooden frame and provide a handle so that the discs can be rotated. Suspend the pendula by means of threads attached to the wire hooks fixed in the grooves at the centre of the linking rods (see figure).



How to use the device

Rotate the discs by means of the handle. The pendula with fixed relative phases trace a sine wave.

DEMONSTRATION OF WAVE MOTION

H.S. Sheela
II Sem. B.Ed. 2004

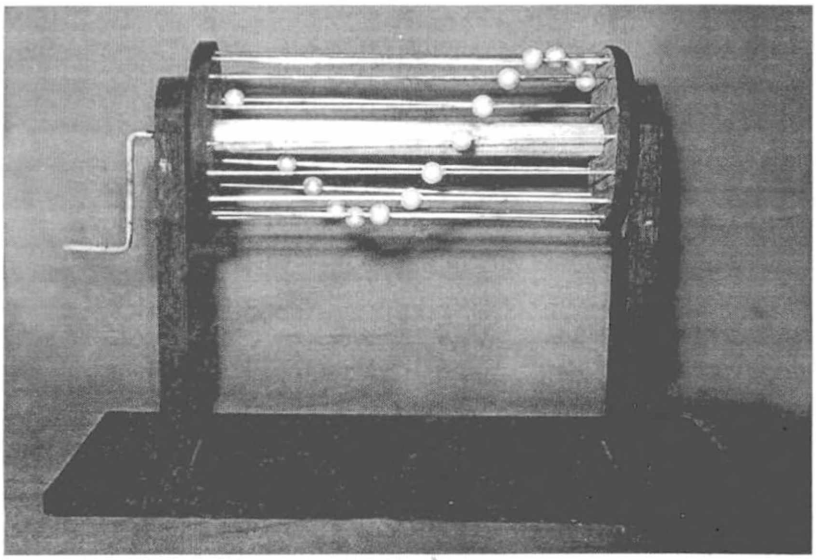
Materials Required

- Discarded bicycle spokes (16") 16 Nos.
- Beads (or clay balls) 16 Nos.
- Wood
- Iron rod 1cm diameter, 30 cm long

Construction

Prepare two wooden circular discs 12 cm diameter and 1 cm thick. Make 16 holes 1 cm from the edge along the circumference of each disc at an angle of 22.5^0. Cut 1.5 cm diameter holes at the centre of each disc. Cut the spokes of 45cm length. Insert one bead in each spoke. Insert the spokes into the two discs. Place the beads along increasing distance from one end and fix them in their position with quickfix. Make a wooden stand as shown in the figure. Make a wooden axle 1.5cm diameter. Bend the iron rod and insert one of its ends into the wooden axle. Cut holes in the stand to let the axle pass through its holes and the discs.

The arrangement looks as shown in the figure.



How to use the device.

Rotate the handle such that the discs also rotate. Wave motion can be demonstrated by throwing light on the beads and watching the shadow of the wave on the wall.

HIGH AND LOW ROADS

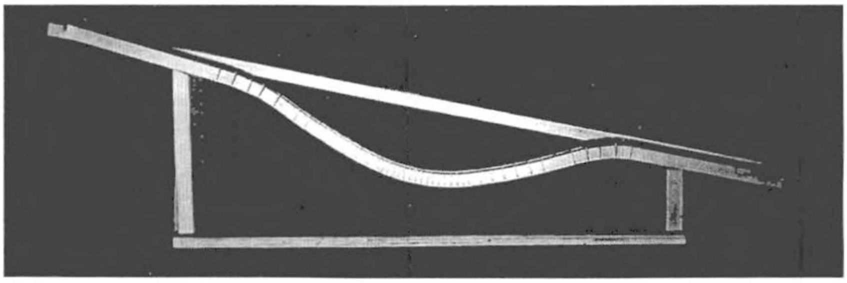
K Pavani
II Sem B.Ed. 2004

Materials Required

- Aluminium channels 1½ - 2 m long 2 Nos.
- Plywood sheet - 3' x 3'
- Steel balls 2 Nos

Construction

Make two bridges as shown in the figure. Fix one of the aluminium channels without bending it. By the side of this, fix the second aluminium channel by bending it slightly so as to have a 'U' shape in the middle. The straight track forms the high road and the bent track the low road.



How to use the device

Roll the two balls simultaneously on the two roads. Find out which reaches the bottom faster.

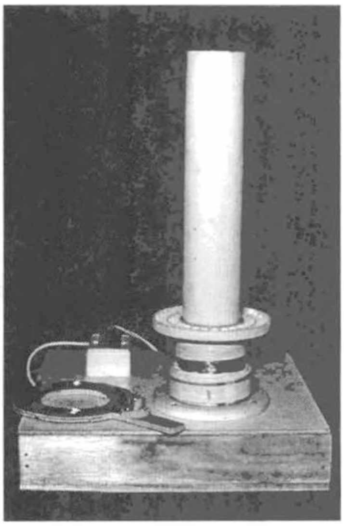
ELECTROMAGNETIC INDUCTION

T.M. Bindu
II Sem B.Ed. 2004

Materials Required

- Iron core
- Insulated copper wire
- Bobbin
- Bangles
- Wooden base 35cm x 30cm
- Connecting wire
- Plug
- Switch

Construction



Take the copper wire and wind 250 turns over the bobbin. Fix the bobbin on the wooden base. The iron core can be slid into the bobbin whenever required. Make a slit in one of the bangles. Connect the end of the wire wound on the solenoid to a plug through a switch.

How to use the device

Insert the soft iron core into the bobbin. Insert the plug into the mains socket. Put the switch on. When the current flows through the wire, an emf is induced which can be tested by sliding a bangle through the core. The bangle flies off. Place the bangle with the slit and observe what happens.

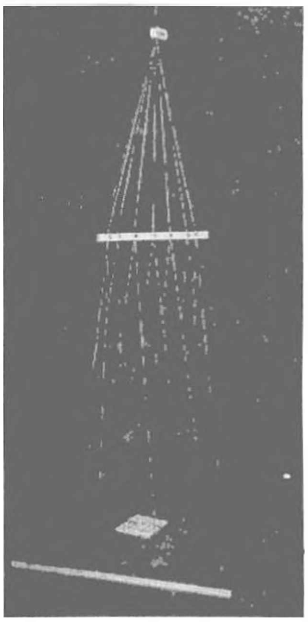
MODEL OF ASTIGMATISM

V Rajesh
II Sem. B.Ed. 2004

Materials required

- Board - 35 cm square.
- Wooden rods 22 cm long 2 Nos
- Strings

Construction



Draw a 30 cm circle on the board as shown in the figure. This represents the mirror. Bore nine holes in the two wooden rods. They represent the sagittal and tangential image lines. Run the strings from the mirror board through the tangential image rod and then through the sagittal image rod. The numbers in the figures 1, 2 and 3 indicate how to associate strings and holes. Above the latter, the strings are tied together. The rods may be moved along the strings until the strings are straight. The straight strings represent the reflected rays.

How to use the device

Hold the device such that the mirror hangs down. You will find that the rays converge on the sagittal image line. Rotate the board through 90^0. Now observe that the rays converge on the tangential image line. The model can be used to describe 'astigmatism' and how the reflected rays form images on the sagittal and tangential lines.

CYCLOIDAL PATH

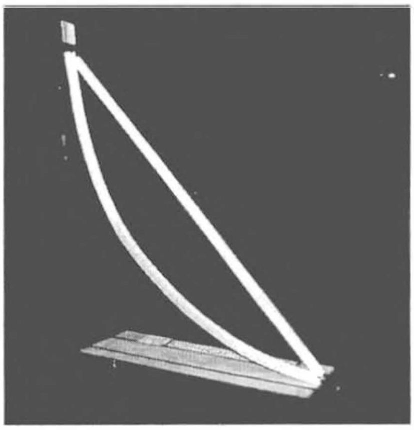
T. Praveena
II Sem. B.Ed. 2004

Materials Required

- Aluminium channels 110 cm
- Plywood piece : 70 cm high and 2cm wide; 1 m long and 25 cm wide
- Steel balls 2 No.

Construction

Fix the 70 cm high plywood piece on the base about 1 m long. Bend one of the aluminium channels to obtain a cycloidal path of length 110 cm. Clamp this channel as shown in the figure. Clamp the second channel such that it is straight, by its side.



How to use the device

Allow the two steel balls to roll down simultaneously from the 2 paths. Observe which reaches the bottom earlier. This device helps us to find out the path of shortest time and not shortest distance.

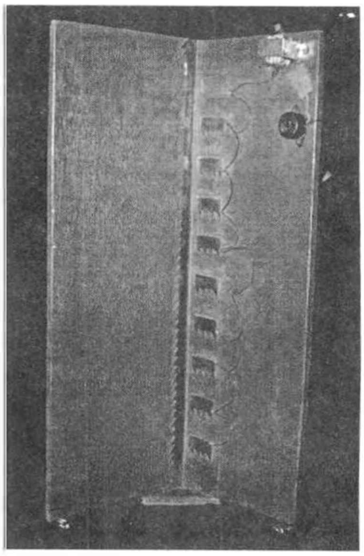
INCLINED PLANE - CASE OF FREE FALL

G. Ravi
II Sem. B.Ed. 2004

Materials Required

- A V- shaped trough
- Aluminium foil
- 1/2" square aluminium foil contacts
- 24 gauge wire
- Battery
- Electric Bell
- Metal Ball

Construction



Cover one side of the V-trough with aluminium foil and with ½" square aluminium foil contacts on the other side. The contacts must be placed equidistant from each other and connected in parallel outside the trough. The wires from the trough on each side are connected in series to an electric bell and batteries.

How to use the device

Roll the metal ball down the trough. As it passes each contact, the circuit is completed momentarily. The bell rings. As the ball gains acceleration while rolling down the bell rings frequently. The acceleration due to gravity can be computed by measuring the distance traversed and the time taken using the relation $d = \frac{1}{2} gt^2$.

TRANSVERSE WAVE DEMONSTRATION

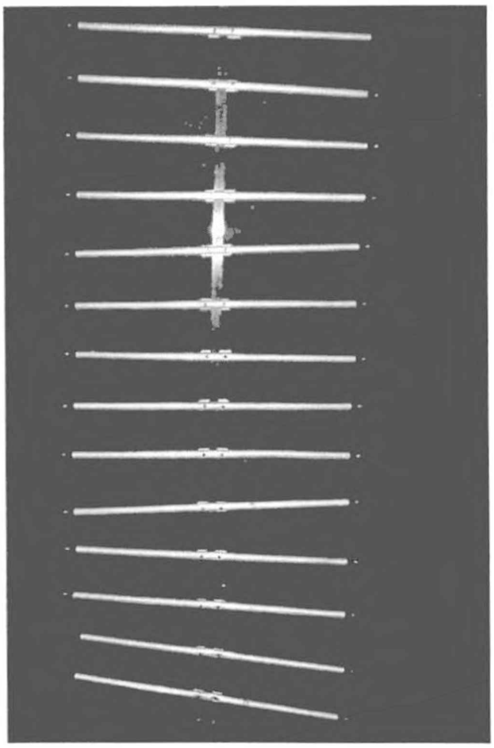
S. Swarnalatha
II Sem B.Ed. 2004

Materials Required

- 2 ½" cm wide steel tape 5 ft long
- ½ m long antenna rods
- Plastic balls
- Metal handles 2 Nos.
- Screws

Construction

Fix the metal handles to the ends of the steel tape. Fix the plastic balls at the ends of the antenna rods. Fix these rods at equal intervals all along the steel tape as shown in the diagram



How to use the device

Give a tap to the bottom most rod. A transverse pulse moves upward toward the fixed end and is reflected back.

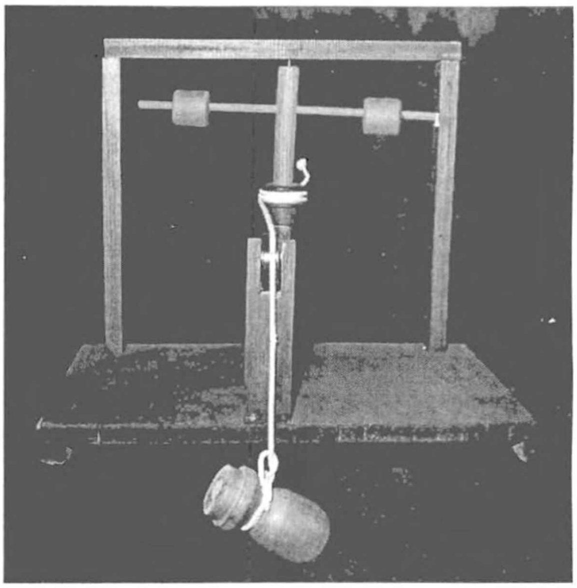
DEMONSTRATION OF ROTATIONAL INERTIA

S.V. Reddy
II Sem. B.Ed. 2004

Materials Required

- ½ inch aluminium rod 60 cm long
- ½ inch wooden dowel
- Floor clamps 2 Nos
- 0.5 kg weight 1 Nos
- Nail
- Pulley
- Thread
- Roller skate wheels 2 Nos
- Wooden rods to fit into floor clamps
- Wooden cross bar with two clamps
- Plywood base 75 cm x 75 cm

Construction



Fix the two floor clamps on the base. Insert the two wooden rods into the clamps such that they just fit in. Fix the cross bar with the clamps. Drill a $^1/_{16}$" hole at the centre of the cross bar about $^1/_8$" deep. Fix the pulley on the ½" wooden dowel as shown in the figure. Drill holes at its ends, in the centre such that 1" nails can be inserted through them. Sharpen their ends. Position this rod with the centre of the frame such that the tip of the nail at the top lies at the central hole of the cross bar and the tip of the nail at the bottom lies at the centre of the hole located at the centre of the frame. Pass the ¼" aluminium rod through the wooden dowel and make holes in it at equal distances to push stoppers (nails) for the roller skaters. Slip the two roller skaters at the ends of the rod. Wind thread round the pulley and pass it over a pulley fixed to the table, to the end of which a weight is added. The apparatus is now ready to demonstrate rotational inertia.

How to use the device

Rotate the dowel once to check for friction. The dowel must be capable of rotating smoothly. Place the roller skater wheels in different positions, wind the thread round the pulley and allow it to rotate by adding a ½ kg weight at the end of the thread. (Find the time taken by the weight to fall down through a known distance). Change the position of the roller skater wheels. Once again allow it to rotate keeping the weight constant. Find the time taken by the weight to fall through the same distance. The experiment can be repeated by keeping the position of the skaters the same but changing the weight. Compare the times. What does it give a measure of ?

COLLISIONS AND COUPLED PENDULA FOR OVERHEAD PROJECTION

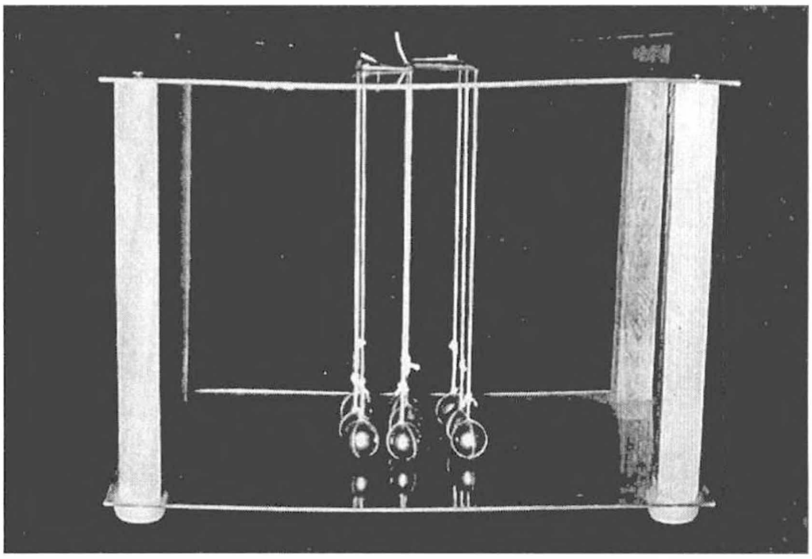
V. Selvi Mary
II Sem B.Ed. 2004

Materials Required

♦ Transparent Acrylic sheets	2 Nos
♦ Wooden dowels	4 Nos
♦ Steel balls	9 Nos
♦ Thread	

Construction

Fix the wooden dowels in between the acrylic sheets and suspend the steel balls by means of threads as shown in the figure such that they are kept within a centimetre or less of the bottom plate.



How to use the device

Place the arrangement over an overhead projector (for large classes). Allow one or more balls to collide with the array first predicting what the results would be and then making students observe the effects. Behaviour of coupled pendula can also be demonstrated using this device.

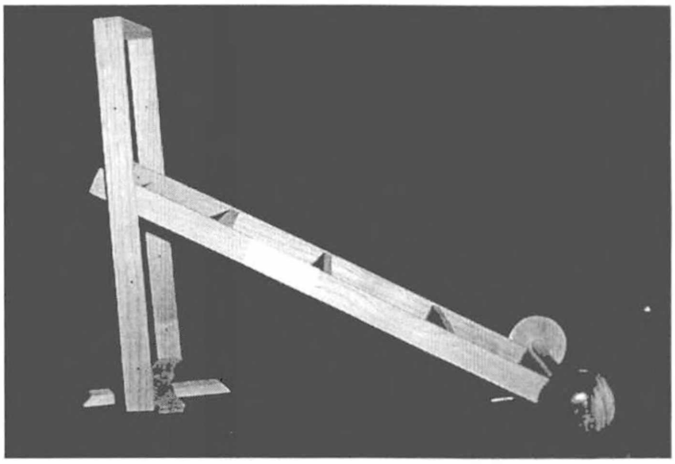
ROLLING SPOOL

G Vennila
II Sem B.Ed. 2004

Materials Required

♦ Rectangular wooden pieces with holes drilled at regular intervals 2ft in length.	2 No.s
♦ Rectangular wooden pieces of 23 cm width	2 Nos
♦ Wooden ladder 19 cm x 20 cm	
♦ Aluminium rod to pass through the holes.	
♦ Adjustable rod stand with base 26 cm x 3 cm	1 No.
♦ 16" dia wooden / aluminium half spheres	
♦ ½" diameter aluminium axle	
♦ Wooden pieces 20 cm x 2 cm	2 Nos

Construction



Prepare the spool using the half spheres and axle. Make a rectangular frame 46 cm x 23 cm with holes drilled in it at regular intervals. Use the ladder as an incline. Drill hles at one end of the ladder and pass the aluminium rod through it. The aluminium rod helps in adjusting the height of the incline. Use the rod stand at the bottom of the incline to support it. Take care to adjust the incline such that the spool rolls down without sliping and also moves along the axis of the incline after it leaves it.

How to use the device

Fix the inclined plane at a particular height and allow the spool to roll down. Observe how it moves along the incline and the distance it covers on different surfaces placed in front of it after leaving the incline. Repeat the activity with different angles for the incline.

PARADOXICAL MANOMETER

B.S Sonia
II Sem. B.Ed. 2004

Materials Required

- 6m length soft polythene tube 2.5cm inner diameter
- 25 cm diameter plastic / wooden cylinder
- 2 vertical pieces of wood $1\frac{1}{2}$ m height
- Wooden base
- Clamps 6 Nos.
- Metre Scales 2 Nos

Construction

Fix the cylinder between the two wooden pieces about 20 cm from the bottom so as to form a frame as shown in the figure. Fix the frame to the wooden base. Wrap about $7\frac{1}{2}$ to $8\frac{1}{2}$ turns of the tube around the cylinder. Fix the two protruding ends of the tube to the frame by means of clamps such that it protrudes 1 m on one side and $^3/_4$ m on the other. Fix the scales along side the tube.

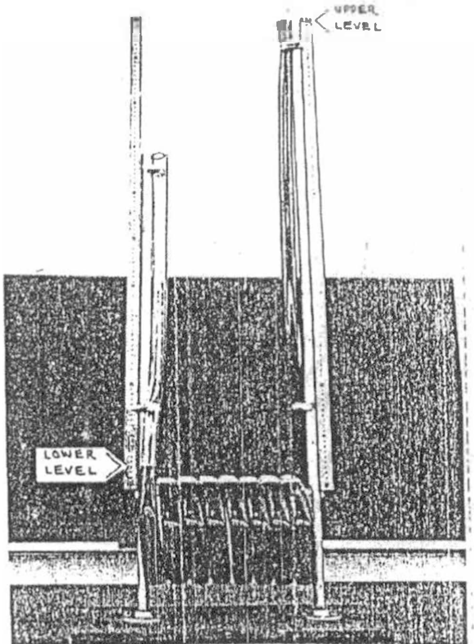


Fig. 1. In this "manometer" the water levels are not the same in

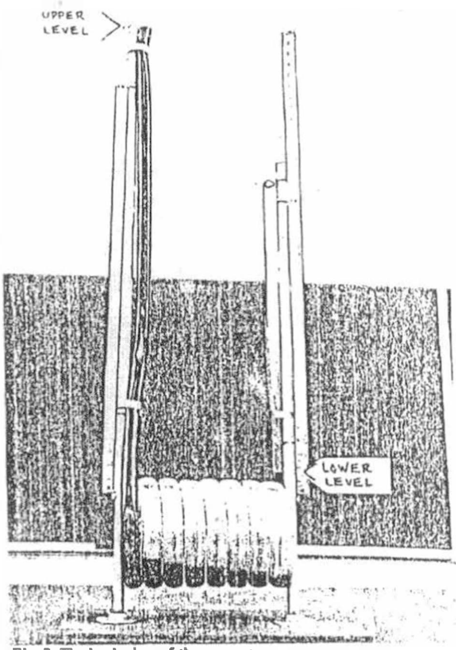


Fig. 2. The back view of the apparatus.

How to use the device

Fill the manometer by slowly pouring coloured water into the manometer arm to have the highest vertical column of liquid in the finished model. This care must be taken so that the displaced air moves freely without being pushed in large trapped bubbles. Ask the students to observe the back of the manometer. It will be observed that the amount of air trapped is approximately the same in all the columns but the volume decreases as we move towards the left. This is because of an increase in pressure as we move towards the left. The water levels are not the same in the two arms in this manometer which we normally see in an ordinary manometer made of a U-tube with limbs.

PERSISTENCE OF VISION

Sanju S
II Sem B.Ed. 2004

Materials Required

- Wooden base
- Handle (metal / wooden)
- Ball bearings
- Vertical rod
- Pulley 2 Nos
- Metal Sheet
- Belt 1 No

Construction

Cut a picture of a flower in the metal sheet showing the petals / base independently. Color the petals red and the base green. Mount it on the wooden rod to which a pulley is attached as shown in the figure. In turn, mount this rod and the other rod carrying a pulley and handle on the wooden base as shown. Connect the pulleys by a belt.

How to use the device

On rotating the metal handle by gradually increasing the speed the individual petals are no longer seen separately but instead a flower is seen. This is due to persistence of vision.

LIQUID SURFACE IN ROTATION

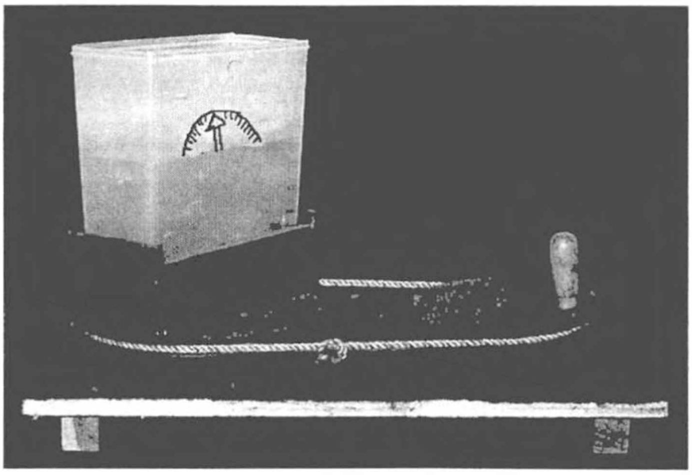
K. Mokshaprada
II Sem B.Ed. 2004

Materials Required

- A plastic box 30 x 30 x 1cm
- A rod
- A weighted pointer
- A calibrated circular scale / graph paper
- 2 wooden pulleys
- A small handle
- Wooden base
- Belt
- Ball bearings

Construction

Fix the box onto a rod. To the other end of the rod attach a pulley as shown in the figure. The arrangement is then fixed on a wooden base. Fix a second pulley with the handle, by its side. Connect the two by means of a belt. To make the motion of the pulleys smooth use ball bearings. Stick the circular scale behind the plastic jar above the water surface.



How to use the device

Fill the box $^{2}/_{3}$ with water and add color to it by adding potassium permanganate or ink drops. Place the weighted arrow on the surface of water. Rotate the jar gradually. The liquid surface assumes a parabolic shape. The Speed of rotation can be read off on the circular scale.

FOUCAULT'S PENDULUM

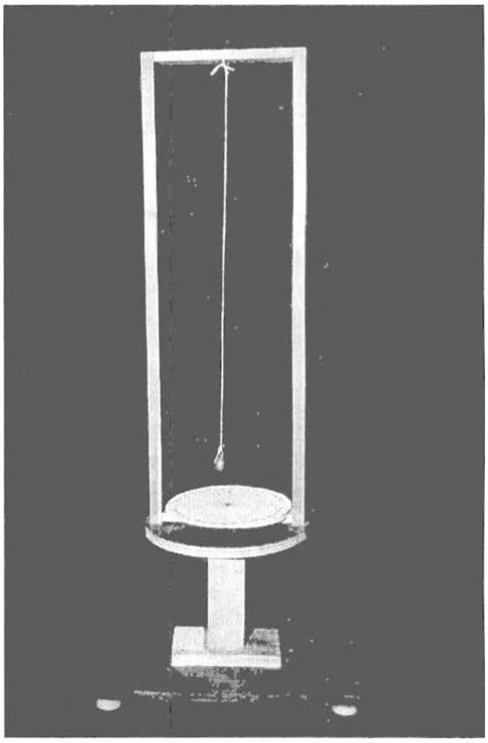
V Sujatha
II Sem B.Ed. 2004

Materials Required

- A revolving stool
- Wooden bracket 2 ft high
- Thread
- Pendulum bob
- Hook

Construction

Place the wooden bracket on a revolving stool as shown in the figure. Suspend a pendulum inside the bracket.



How to use the device

Rotate the stool slowly and observe what happens to the swinging pendulum. It rotates in a single plane in spite of the stool undergoing a rotation. The rotating stool represents the earth. This arrangement represents a Foucault pendulum which is made by hanging a weight from the ceiling of a room and made to swing. The Foucault pendulum swings as the earth is rotating. It takes long time for it (about an hour) to show any significant movement of the earth.

GRAVITY DEFYING CUPS OF WATER

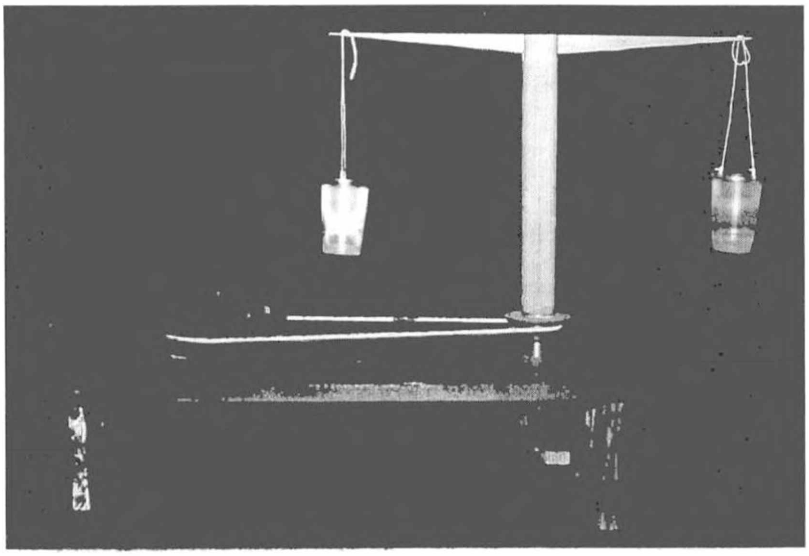
A Ravi
II Sem B.Ed. 2004

Materials Required

- T-frame of wood
- Pulleys 2 Nos
- Handle 1 No.
- Belt
- Wooden base
- 2 cups
- Strings

Construction

Fix a pulley to the bottom of a T-figure which is in turn fixed to the wooden base as shown in the figure. Fix the second pulley opposite to the first one and connect the two by a belt. To the ends of the T-frame, fix two cups with strings.



How to use the device

Fill the cups $^2/_3$ with water. Rotate the T with increasing angular velocity till the cups are almost horizontal. The water does not fall from the cups. Identify the forces responsible for this.

CONVERSION OF KINETIC ENERGY TO HEAT ENERGY

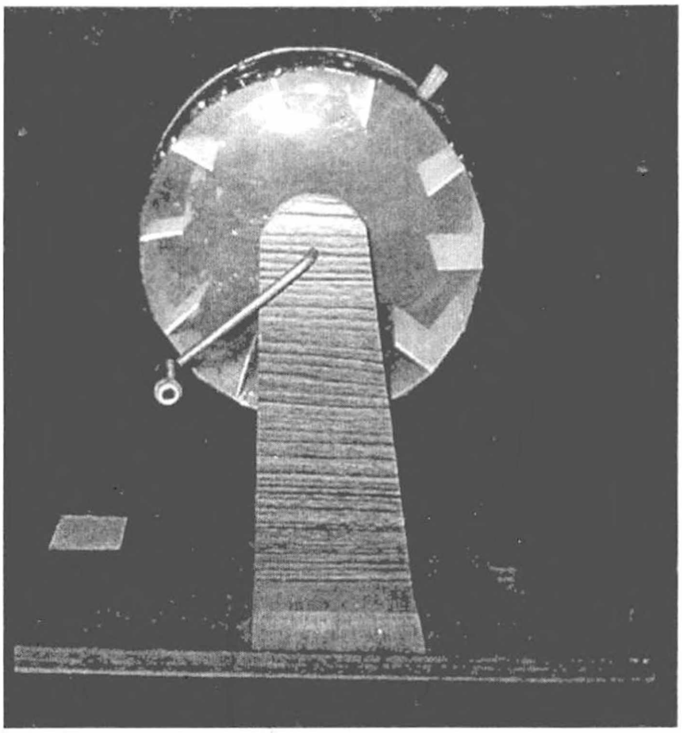
A Anitha
II Sem, B.Ed. 2004

Materials Required

- Hollow cylinder of 14 cm diameter and length 7 cm
- Shaft 0.4 cm in diameter
- 12 metal vanes
- One holed cork
- Thermometer

Construction

Mount the cylinder after fixing the vanes in it on the shaft. Place lead shots in the cylinder. Pass a thermometer through the one holed stopper and insert it into the cylinder.



How to use the device

Turn the cylinder by means of the shaft. On rotating the cylinder, the lead shots are lifted by the vanes and dropped back into the cylinder. The temperature increases because kinetic energy is converted into heat energy and the rise in temperature can be measured by a thermometer.

ANGULAR VELOCITY

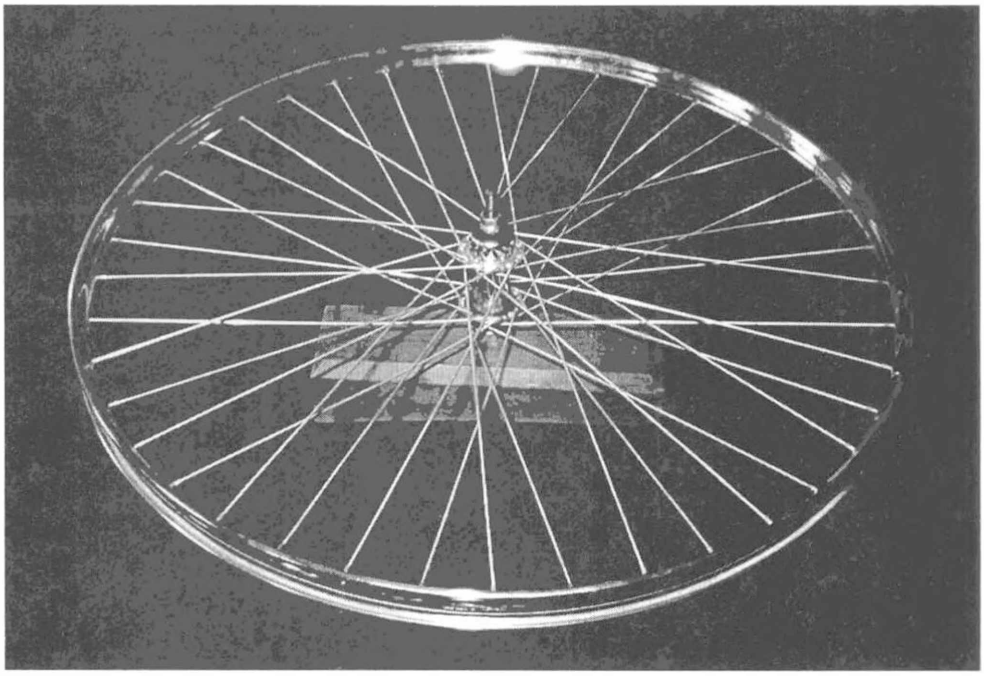
A. Balu
II Serm. B.Ed. 2004

Materials Required

- Wooden blocks 25cm x 25cm and 12 cm x 12cm
- Bicycle Wheel
- Pointer

Construction

Fix the small wooden block on the bigger one. On top of this mount the bicycle wheel as shown in the figure so that it can rotate freely.



How to use the device

Make a mark on the rim of the bicycle. Place a pointer in front of it, Rotate the bicycle wheel and determine the time required for it to make a known number of rotations and hence compute its angular velocity.

LENZ'S LAW

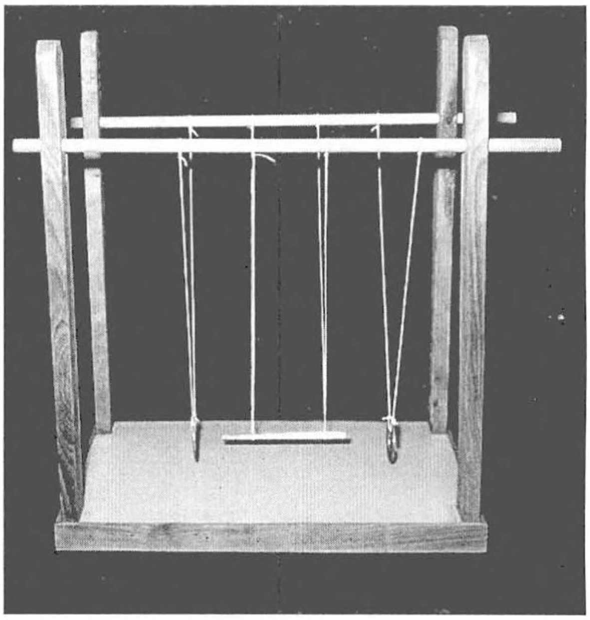
Pradeep Raj
II Sem B.Ed. 2004

Materials Required

♦ Wooden base 48 cm x 32 cm	
♦ Uprights 52 cm high, 4 cm wide and 2 cm thick	4 Nos
♦ Rods of length 55 cm	2 Nos
♦ Magnets	
♦ Rings (one complete and the other split)	2 Nos
♦ Twine	

Construction

Fix the uprights on the base as shown. Pass the rods through holes in the uprights. Suspend the magnet by means of a thread from the two rods in between the suspended rings (one complete and other split).



How to use the device

Oscillate the magnets laterally between the 2 rings. Observe that the magnet is drawn toward the complete ring rather than the split one. This is because a magnetic field is set up in the complete ring while the circuit is not completed in the split ring.

NEWTON'S CRADLE

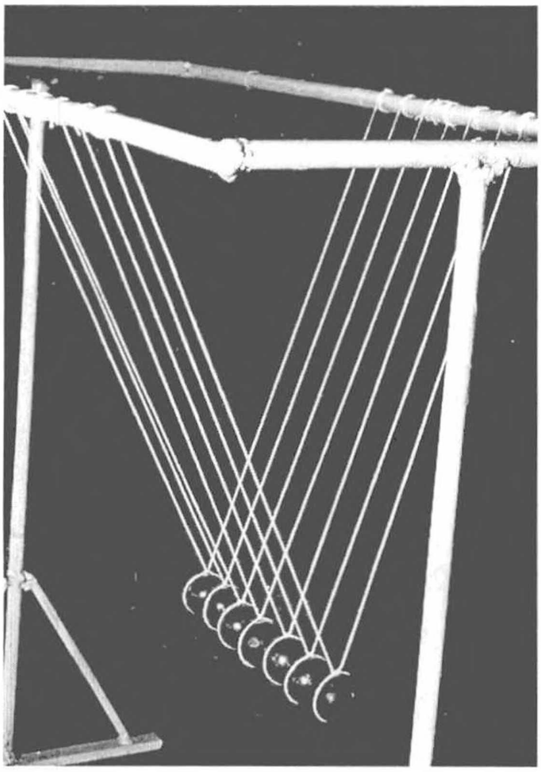
S. Sridevi
II Sem 2003

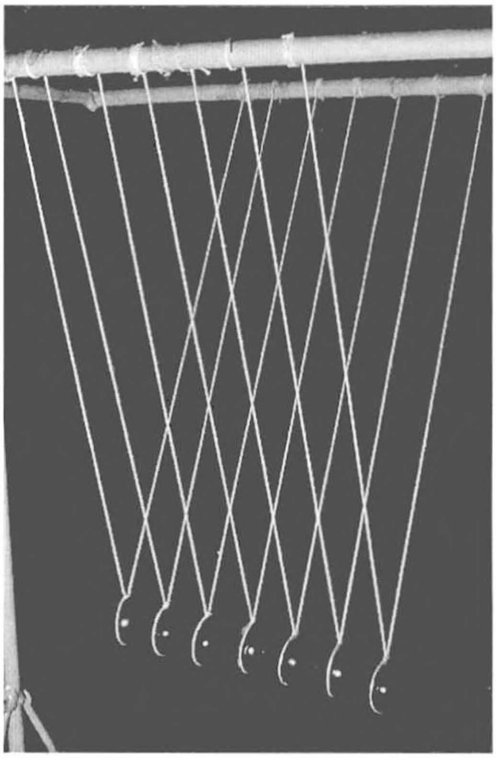
Materials Required

- Wooden frame 70 cm x 40 cm
- Wooden uprights
- 8 steel marbles
- Thread

Construction

Fix the wooden frame on the uprights as shown in the figure. Tie the steel balls to the frame by means of threads as shown.





How to use the device

Pull one ball and release it. See how many balls come out on the other side. Repeat by pulling and releasing more than one steel ball and observe how many balls are released on the other side.

3 - D PENDULUM

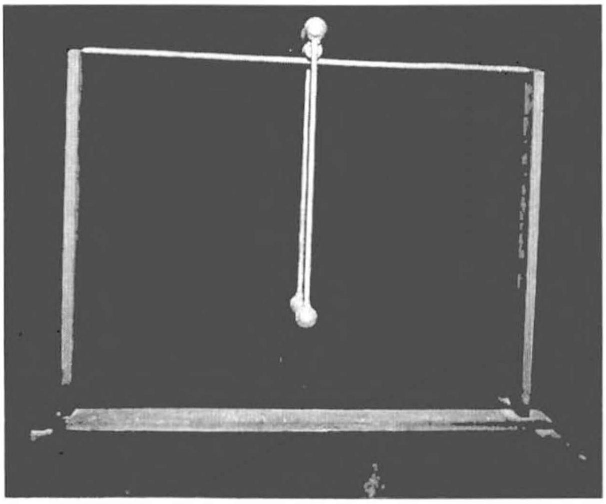
P.V. Narayana Reddy
II Sem B.Ed. 2004

Materials Required

- Wooden base 76 cm x 20 cm
- Uprights 34 cm x 4 cm — 2 Nos
- Rod 55 cm long to act as cross bar
- Metallic rods 22.0 cm — 2 Nos
- Metallic spheres — 4 Nos
- A small cylinder to act as knife edge
- Blue and red transparencies

Construction

Fix the two uprights to the base at a distance of 10cm from each end as shown. Make holes in the upright at a convenient distance from the top and pass the cross bar through it. Fix the metallic spheres at the end of the rod. Fix the two pendula on either side of a cylinder such that they are capable of free oscillations about an axis passing through the centre of the cylinder. Weld the cylinder on the cross bar at its centre. Cut circular pieces from the transparencies to make a view finder by pasting it on a cardboard piece.



How to use it

Displace the pendula in opposite directions and observe it through a view finder made of the two transparencies, while keeping both your eyes open. The pendula seem to oscillate in a horizontal circle thereby presenting a 3-D view.

MOTION OF OBJECTS OF DIFFERENT SHAPES DOWN AN INCLINED PLANE

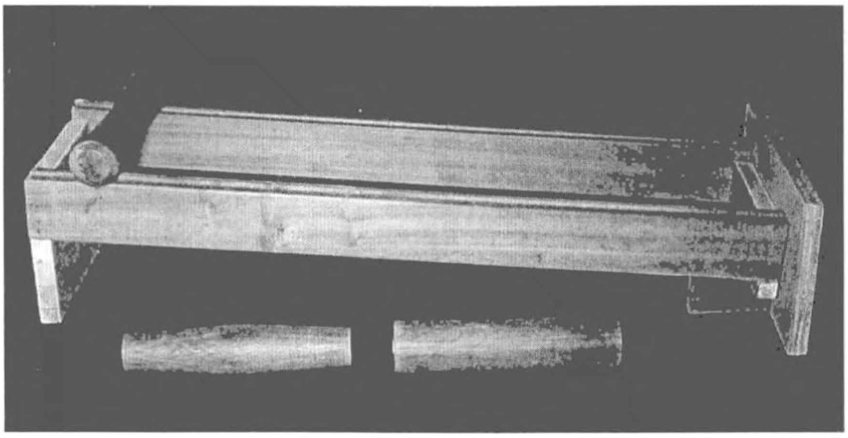
T.V. Deepa
II Sem. B.Ed. 2004

Materials Required

- Plywood sheet
- Wood

Construction

Make an inclined plane of length 75 cm, height 20 cm and width 15cm. Make objects of the shapes shown in the diagram out of the wood whose length is 15 cm to enable them to roll down the inclined plane.



How to use the device

Roll the objects of different shapes down the incline and observe the time required to reach the bottom. Do they take the same time to travel down the plane or are the times different?

MULTIPLE IMAGES

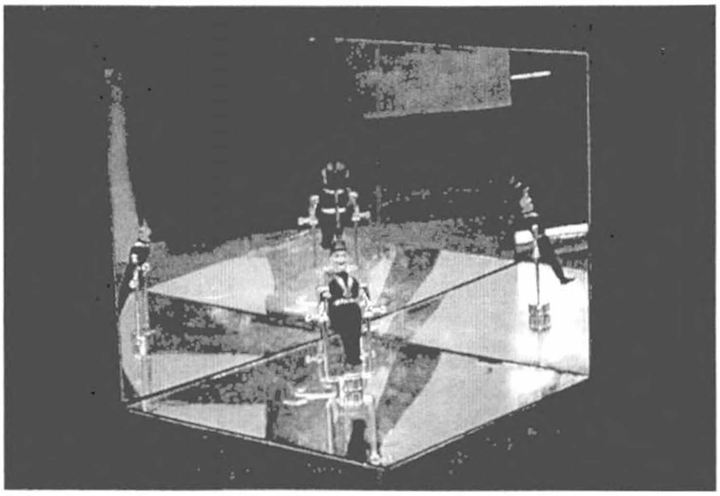
K.M. Bindu
II Sem B.Ed. 2004

Materials Required

- Plane mirrors 31 cm x 31 cm   3 Nos
- a doll / coin   1 No.

Construction

Glue the mirrors as shown in the diagram such that one of them forms the base.



How to use the device

Place a toy on the mirror at the base. Observe the number of images formed.

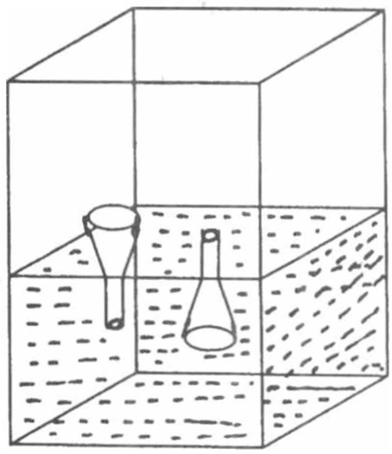
FUNCTION OF A DIODE

Basanna Gowda
II Sem B.Ed. 2005

Materials Required

- A rectangular plastic jar
- 2 small funnels
- A plastic disc which can fit into the centre of the jar
- M seal
- Cellotape/ packing tape

Construction



Make two holes in the plastic disc and fit the funnels inverted with respect to each other as shown in the figure. Fix the plastic sheet at the centre using M-seal. Seal the lid of the jar such that the water does not flow out when inverted.

How to use the device

Fill half the jar with coloured water. On inverting the jar, the water flows down into the lower portion. Observe that the water can flow in one direction only. This model is used to show the rectification action of a diode (i.e. unidirectional flow of current).

REFLECTION OF SOUND

(FIRST VERSION)

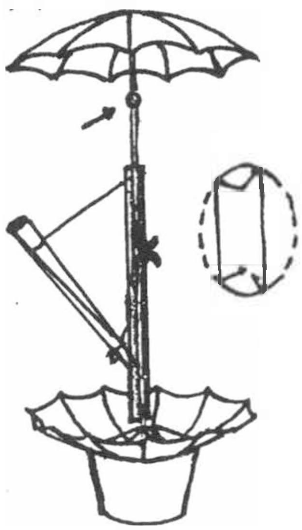
M. Tamilnesan
II Sem B.Ed. 2005

Materials Required

- Umbrellas 2 Nos
- Plastic pipes 2 Nos
- Binding wire
- A ticking watch
- Carton or bucket

Construction

Fasten the two umbrellas to a pipe as shown in the figure. Place the lower umbrella on a carton or bucket. Attach the second pipe with binding wires such that it can be moved along the first one.



How to use the device

Place the ticking watch on the handle of the First umbrella as shown. Move the Second pipe along the first one to locate the position where the ticking is heard which is usually a short distance above the lower umbrella.

REFLECTION OF SOUND

(SECOND VERSION)

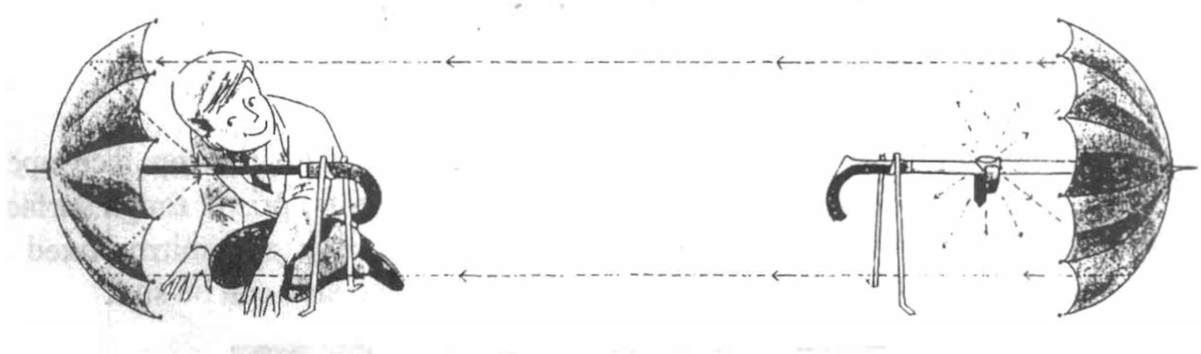
R. Rajesh
II Sem B.Ed. 2005

Materials Required

- Umbrellas 2 Nos
- A ticking watch
- Wooden stands 2 Nos

Construction

Place the two open umbrellas on the two stands by fastening them to it. Align the stands on a table as shown in figure with the umbrellas facing each other. Place the ticking watch on the handle of one of the umbrellas.



How to use the device

Place your ear on the handle of the second umbrella and move it to locate the position where you can hear maximum sound. It is important that the axes of the two umbrellas be along the same straight line.

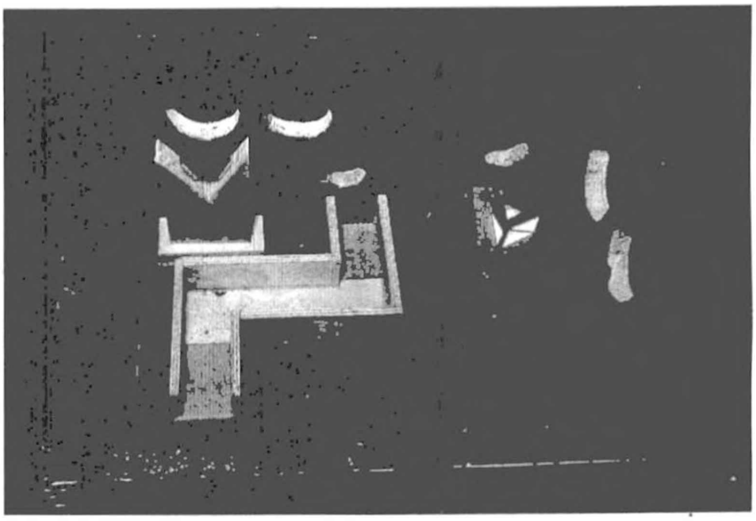
OPTICS KIT

K Rajitha
II Sem B.Ed. 2005

Materials Required

- Plywood sheet
- Slits
- Glass sheet to cover the box 38 cm x 35 cm
- Glass prism
- Convex lens
- Concave lens
- Convex mirror
- Glass slab
- Rough surface
- Plane mirror pieces
- Laser torch
- Conduit

Construction



Make a plywood box 38cm x 35cm x 25cm with the top face open. Place the lenses, glass slab, plane mirrors, curved mirrors, prism, rough surface, conduit with oppositely directed right angles at its ends and the mirror fixed as shown. Make holes at appropriate positions into which slits can be slid

How to use the device

Shine laser torch light through the slits fixed in the holes and observe the path of the rays when it falls on the different optical elements. This kit can be used to demonstrate fundamental phenomena like reflection and refraction at plane and curved surfaces and dispersion of light.

TRANSVERSE WAVE DEMONSTRATOR

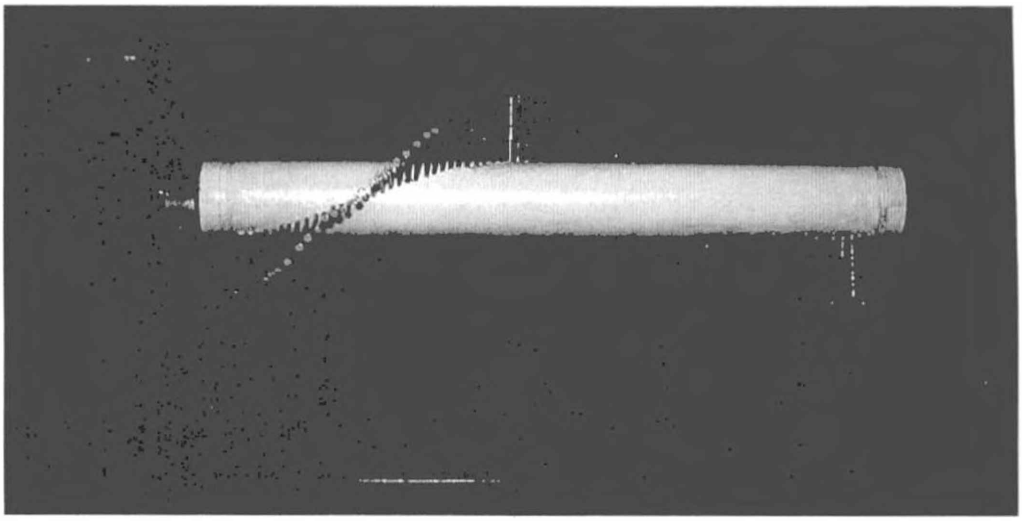
T. Lateesh and M. Ramya
II Sem B.Ed. 2005

Materials Required

- A wooden cylinder
- Nails
- Beads
- Yellow and black paint
- Handle
- Plywood base
- Plywood upwrights

Construction

Drill holes onto the wooden cylinder so as to form a sine curve. Fix nails into these holes and coloured beads to its head. Fix the handle to the cylinder and mount it on upwrights fixed to a wooden base as shown in the figure. The cylinder should be so fixed that it can be rotated freely. Paint the cylinder yellow and the nails black.



How to use the device

Place the arrangement in front of a wall. Shine light on to it from behind. While the light is on, rotate the handle. The shadow cast on the wall depicts a transverse wave.

FUN WITH AN INCLINED PLANE

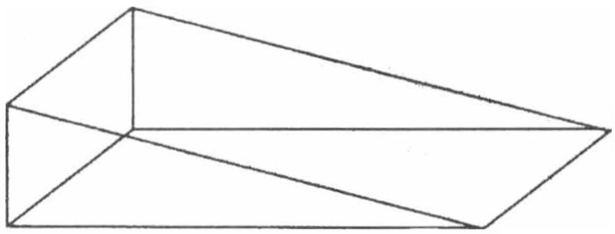
M. Sumithra
II Sem B.Ed. 2005

Materials Required

- Plywood sheet
- Cylindrical plastic boxes 6 Nos
- Oil of high viscosity
- Araldite

Construction

Make an inclined plane with a double track out of the plywood sheet, such that its height is adjustable. Fill one of the cans partially with water, one partially with soap water and the other partially with highly viscous oil. Fix the two ends with lids using araldite. This forms a cylinder which can roll down the ramp freely.



How to use the device

Roll the cylindrical box with water and soapy water down the plane. They both reach the bottom at the same time. Now shake the plastic box with soapy water and roll it down the plane along with the can containing water. The soapy can slows down because of the bubbles, causing the fluid to rotate with the can. Some of the energy is lost in transforming into rotational energy of the fluid. Now roll the box partially filled with water and the one with oil, together. Observe that the one with the viscous oil reaches the bottom because it sticks to the walls and shifts the centre of mass.

This experiment can be done using different liquids and by filling the plastic box to varying degrees to find out how the motion down the track changes.

BALANCED EQUILIBRIUM

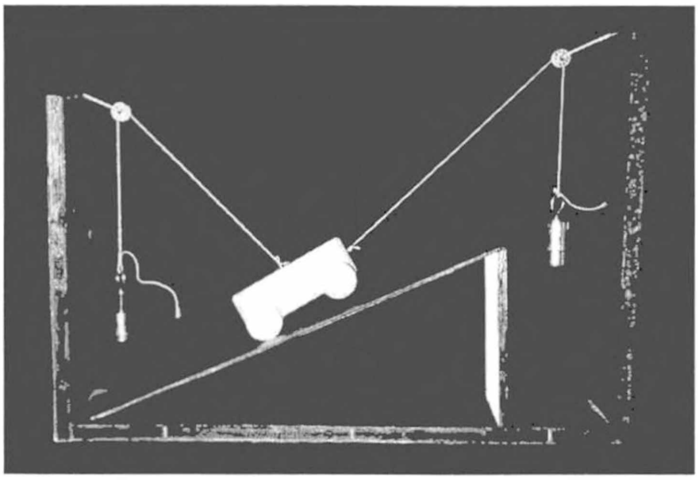
E.S. Sowmya
II Sem B.Ed. 2005

Materials Required

- Plywood sheet
- Pulleys
- Thread
- Cart (wooden)
- Weight hanger with weights
- Threads

Construction

Construct a U-shaped frame as shown in the figure. Fix two pulleys over which threads can be passed. Prepare an inclined ramp out of the plywood sheet. Place the ramp in the frame. Place the cart on the ramp. To the hooks on the cart attach threads. Pass the threads over the pulley and hang the weight hangers.



How to use the device

Adjust the weights in the weight hangers such that the cart remains in equilibrium while on the ramp. Remove the ramp from the stand. The cart will remain suspended in mid air. This is because the forces are balanced and are independent of the ramp.

ONE-DIMENSIONAL DOUBLE-WELL POTENTIAL

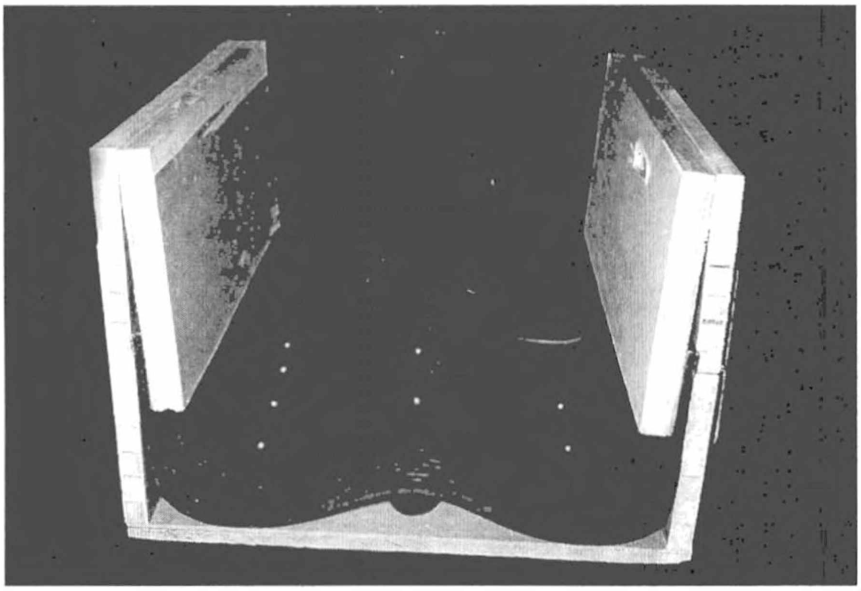
K Agneeswari
II Sem B.Ed. 2005

Materials Required

- Plywood sheet 1 No
- Rubber corrugated mat
- Plastic pipe
- Steel balls 12 Nos

Construction

Construct a U-shaped frame 45cm x 30cm x 40 cm out of plywood. Fix the corrugated rubber mat in the frame as shown in the figure. Insert the plastic pipe in the middle between the rubber mat and the frame to form a double well potential. Place a few steel balls on the corrugated mat on one side of the double-well.



How to use the device

Gently shake the arrangement. Initially all the balls move together in a regular fashion until the amplitude of shaking is sufficient for the balls to overcome the middle hump between the wells. Chaotic motion ensues. This demonstration shows that both regular and chaotic motion can take place in the same system depending on the initial conditions - here, the amplitude of the driving oscillations.

THE GRAVITY WELL

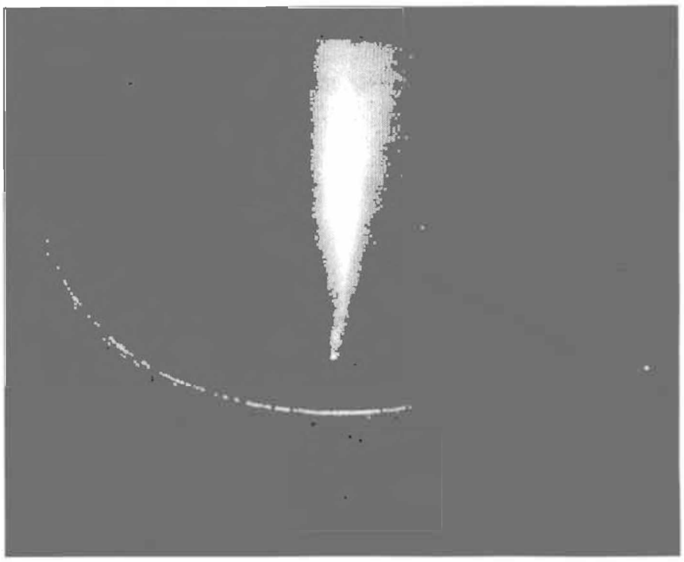
Aravind
II Sem B.Ed. 2005

Materials Required

- Metal Sheet (Aluminium)
- Plywood base
- Steel Balls

Construction

Make a curved funnel and fix it inverted on a plywood base as shown in the figure.



How to use the device

Roll a marble around the rim so that it moves in a circle near the top of the gravity well. The marble keeps rolling in a circle but then slowly drops into the well. As it gets lowered into the well, it goes around the circle in a shorter time. This motion appears blurred as it reaches the bottom of the well. This is because the potential energy of the marble is converted into kinetic energy. The marble therefore drops down with higher velocities, while rolling down thereby completing the orbit much more rapidly near the centre of the well.

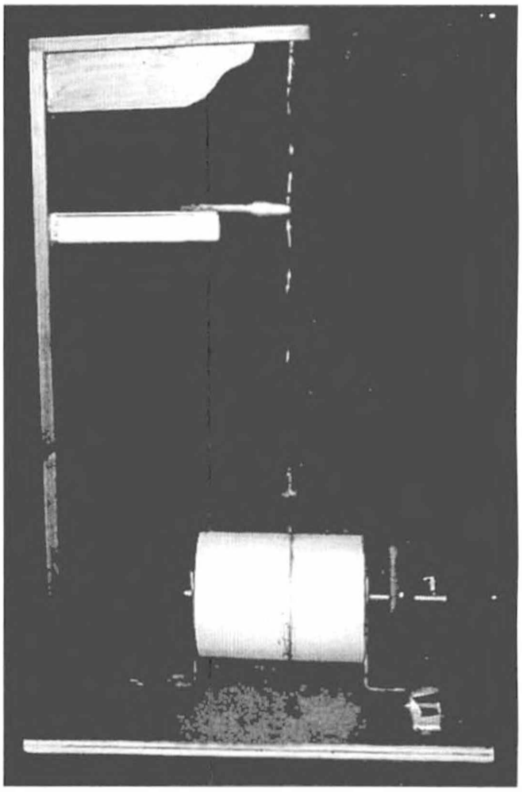
SEISMOGRAPH

A. Aswathy
II Sem B.Ed. 2005

Materials Required

- Tin can
- String
- Plastic bob
- Pen refill
- Plywood sheet
- Horse shoe magnet
- Chart paper
- Electric motor

Construction



Make an upright bent once at right angles 56 cm x 24cm and fix it to the plywood base 38 cm x 30 cm. Attach a horse shoe magnet to the upright as shown in the figure using a cross bar. Suspend the plastic bob with the pen refill as stylus from the upright. Below the stylus mount the tin can, such that it acts as a rotating drum. Connect the drum to a motor which sets it rotating. Fix chart paper round the tin can.

How to use the device

Set the pendulum oscillating while the drum is rotated at a constant speed. The shaking of the ground can be simulated by keeping the arrangement on a vibrating surface. The stylus then traces the graph on the paper. The horse shoe magnet provides the required damping. The pendulum mass, string, magnet and support together constitute the sensor. The drum, pen and chart paper constitute the recorder. The motor that rotates the drum at constant speed forms the timer.

REVOLVING STOOL

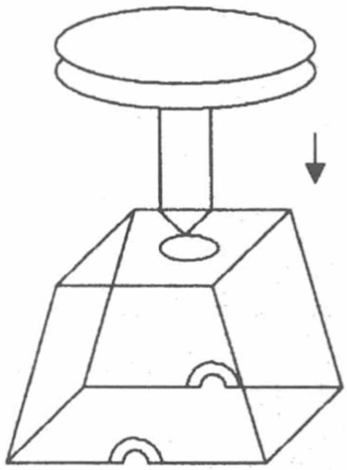
Krishnamurthy S.R.
II Sem B.Ed. 2005

Materials Required

- Plywood
- Iron axle
- Ball bearing
- Top of a broken stool of 30 cm diameter
- Cycle wheel
- Black paint

Construction

Make a stool of height 55 cm out of the plywood as shown in the figure. To the stool top fix the axle which can in turn be fixed into the centre of the stool. Use ball bearings to make its rotation smooth. To the cycle wheel attach an axle to enable one to hold it. Paint the stool black.



How to use the device

Turn the cycle wheel holding its axle. Sit on the stool while holding the wheel and tilting it. The chair gains a comfortable rotation. Now hold the wheel above your head, reverse the direction of the wheel. Notice the change in the direction of rotation of the stool. This works on the principle of angular momentum.

CONSERVATION OF ANGULAR MOMENTUM

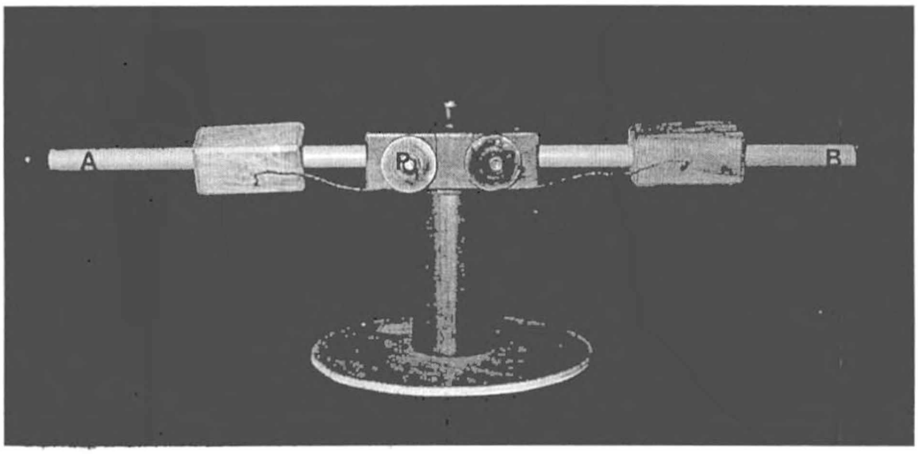
Chandra Mohan
II Sem B.Ed. 2005

Materials Required

- Wooden base
- Pulleys 2 Nos
- String
- Ring
- Moveable masses 2 Nos
- Wooden rods 2 Nos

Construction

Fix the horizontal wooden rod AB above the rod fixed on a base such that it is capable of rotation about a vertical axis as shown in the figure. Fix the pulleys in the position P_1 and P_2 as shown. Slip the two masses on the opposite ends of the rod AB which can be set into rotation. Pass the string attached to the masses over the pulleys P_1 and P_2 and connect them to a ring R. By pulling the string the position of the masses can be altered.



How to use the device

Set the rod AB into rotation with the masses placed at its ends. Now pull the ring R such that the masses are brought towards the centre. Note the speed with which the rod AB rotates. As the moment of inertia changes, the rod rotates with greater angular velocity so that angular momentum is conserved.

LONGITUDINAL WAVE MACHINE

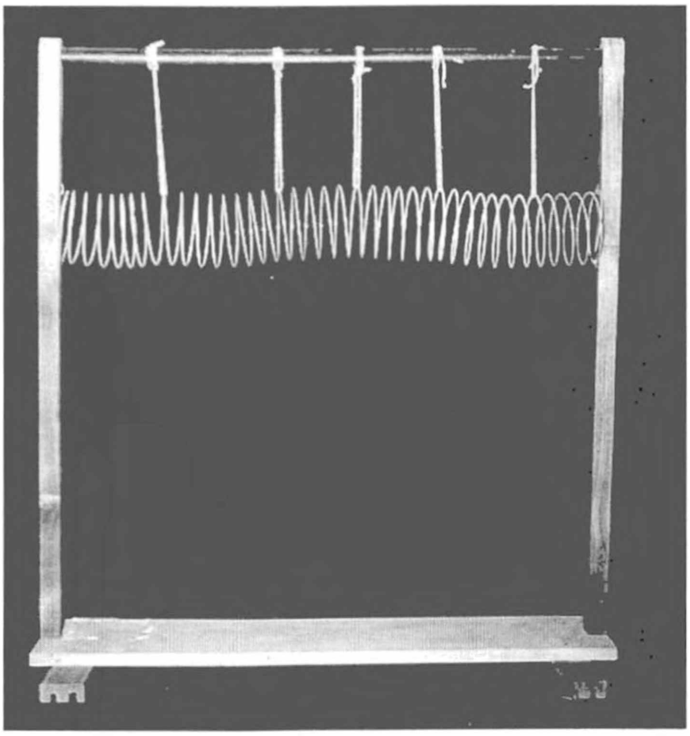
K Kavitha
II Sem B.Ed. 2005

Materials Required

- Slinky
- Plywood
- Curtain rods 2 Nos
- Thread

Construction

Make a frame of plywood as shown in the figure. Fix the 2 curtain rods across the frame. Suspend the slinky from these 2 curtain rods using the threads in the shape of a V. See that the slinky is horizontal.



How to use the device

Hold a few coils of the slinky together and let go in the horizontal direction. A series of compressions and rarefactions move down the coils indicating the generation of a longitudinal wave.

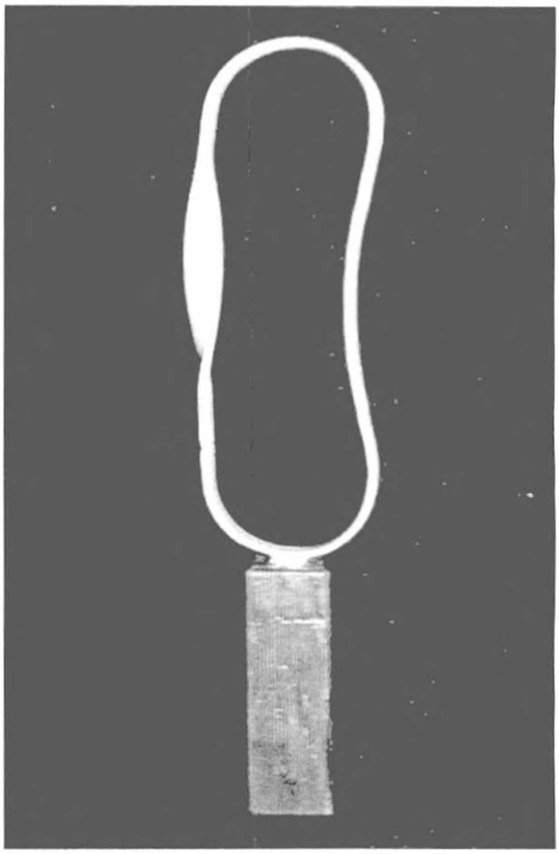
MOBIUS BAND

M. Padmavathy
II Sem B.Ed.

Materials Required

- A rectangular block of wood
- A metallic strip

Construction



Twist the metallic strip, turn it over one end and connect the two ends as shown in the figure. Mount this on the wooden block.

How to use the device.

Run your finger keeping it on one side of the strip till you reach the starting point. You will notice that only one side of the strip is presented to your finger. This was invented by a famous German mathematician August Ferdinand Mobius while he was developing a study in geometry which came to be known as topology.

PARABOLIC REFLECTOR

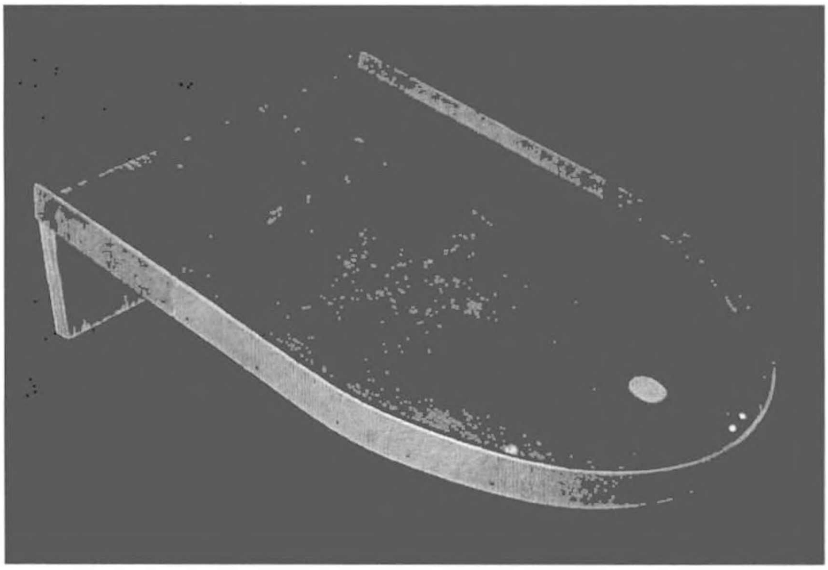
P N Radhika
II Sem B.Ed. 2005

Materials Required

- Plywood sheet
- Wooden beading
- Steel balls
- Small wooden pieces
- Fevicol

Construction

Cut a parabola in the plywood sheet and stick the beading all round. Stick five wooden pieces of equal length, equidistant from each other so as to form channels as shown in the figure.



How to use the device

Roll the steel balls down the channels, either one after the other or together by slightly tilting the board. Observe the motion of the balls. You will observe that all the balls pass through the same point after reflection from the opposite end. This point represents the focus and the board is a simulation of a parabolic reflector.

LISSAJOUS FIGURES

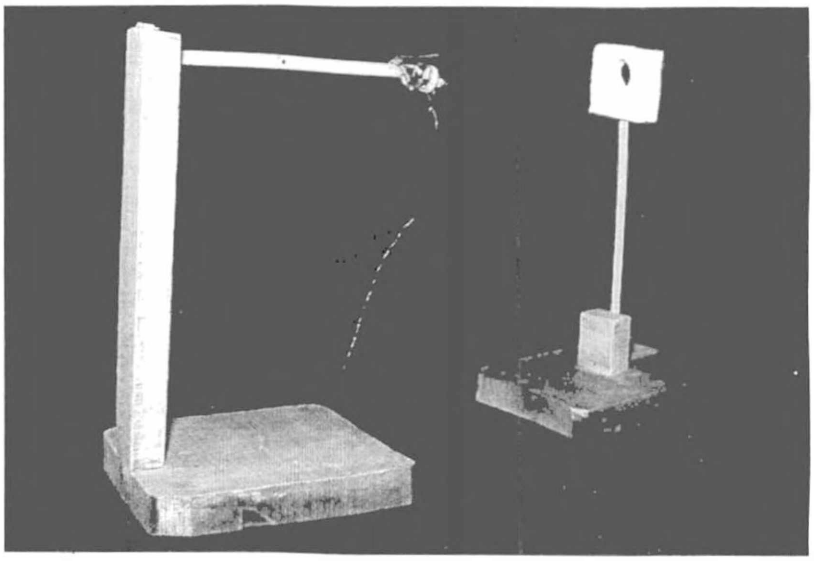
V. C. Shilpa
II Sem B.Ed.

Materials Required

- Plywood
- Bulb with holder (torch bulb)
- Battery
- Wires
- Convex lens
- Hacksaw Blades 2 Nos
- Screws 4 Nos
- Brackets 2 Nos
- Blocks of wood

Construction

Construct two bases out of plywood. On one of them fix an upright as in the figure. Fix a hacksaw blade 1 perpendicular to its edge using a bracket and screws. To the end of the hacksaw, fix the bulb with its holder and connect wires to it. On the second base fix a block of wood to which is fixed a hacksaw blade 2 vertically. To the end of this hacksaw fix a lens as in the figure.



How to use the device

Keep the two bases in front of a wall such that the bulb and lens are perpendicular to each other. Light the bulb. Set the bulb in motion from its mean position, while the lens is stationary. Observe the motion of the light spot. While bulb is stationary, displace the lens from its mean position. Observe the motion of the light spot.

Now displace both the bulb and the light spot from their mean position and release them simultaneously. Observe the path traced by the light spot. The path traced depends on the frequency of the vibrating blades, their relative phases and amplitude of the motion. This arrangement demostrates the superposition of two simple harmonic motions perpendicular to each other. The frequency can be changed by changing the length of blade 1 and the amplitude by adjusting the displacement of the free end.

BIGGER - SLOWER

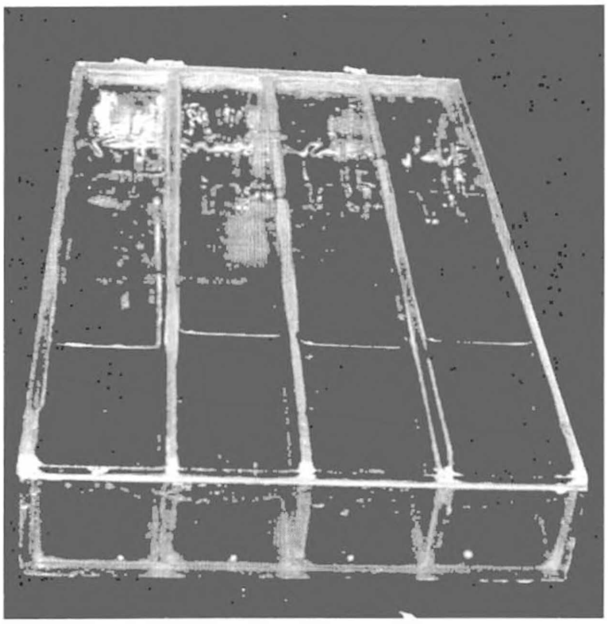
A Radha
II Sem B.Ed. 2005

Materials Required

- Araldite
- Glass/plastic tray (transparent)
- Glass/plastic partitions 3 Nos
- Steel balls of different sizes
- Castor oil 3 litres
- Glass plate / Plastic plate

Construction

Fit the 3 partitions in the glass/plastic tray. Fill the tray with oil upto $^{3}/_{4}{}^{th}$ the volume. Place the steel balls of different sizes, one each in each compartment. Seal the tray with glass - plastic cover to form a box.



How to use the device

Tilt the tray and observe the motion of the balls. The difference in the speed with which the balls move depends on their size. This is due to the resistance offered by the liquids that is its viscosity.

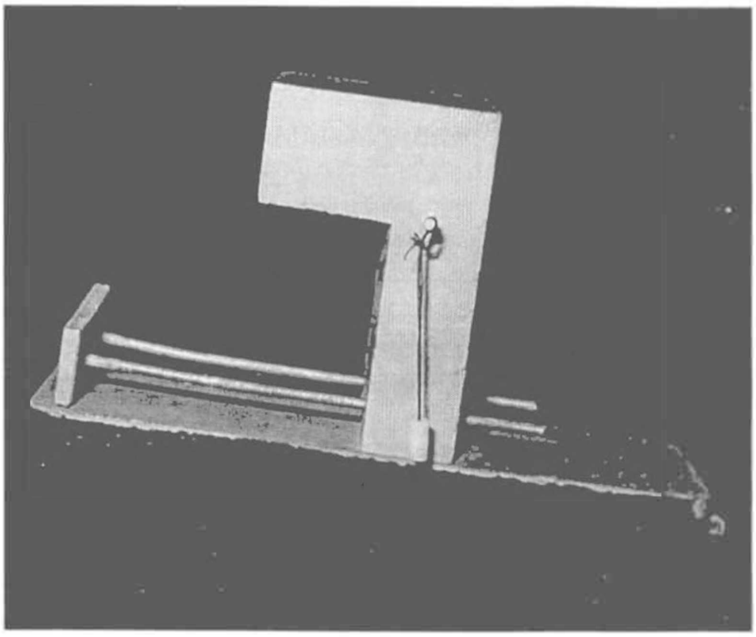
CENTRE OF GRAVITY AND STABILITY

K.P. Bindu
II Sem B.Ed. 2005

Materials Required

- 3" x 4" piece of wood
- 2 dowel rods/cycle spokes/thin rods
- Small block of light wood
- Wood to make an inclined plane
- Plumb line

Construction



Cut the block into an L shape as shown in the figure. Suspend a plumb line from a nail driven into the side of the block at the centre of gravity. To change the size of the base of the block, fix a small block of light wood attached to the dowel rods / spokes / thin rods, which pass through the main block at its bottom, so that it can be moved easily. Take care to see that the bottoms of the large and small blocks are at the same level. Make a small inclined plane whose angle of inclination can be changed and has a width equal to that of the main block.

How to use the device

Place the block on the inclined plane. As the incline is increased, the line from the centre of gravity falls outside the base and the block trips over. Now enlarge the base by pulling the small wooden block outward. Again place the block on the incline, change its angle and note the angle of inclination required for the block to trip over. Compare the angles. In which case is it more ?

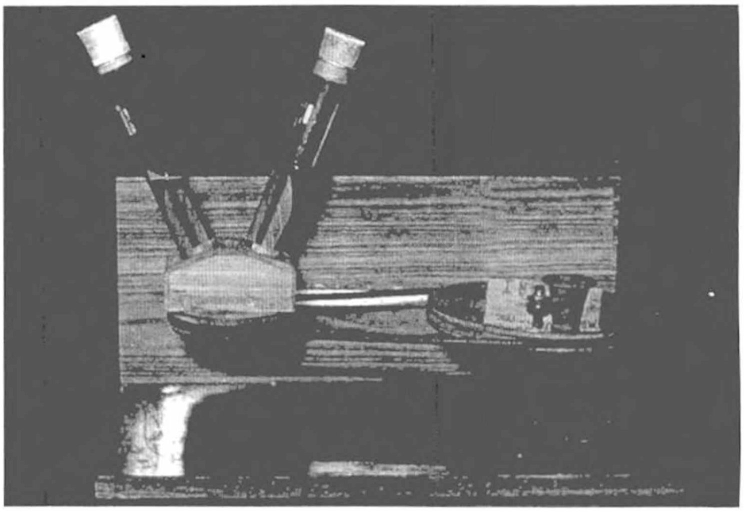
CENTRIPETAL AND CENTRIFUGAL FORCE DEMONSTRATION

I. Chandana
II Sem B.Ed. 2005

Materials Required

- Boiling test tubes 2 Nos
- Rubber corks
- Cork piece
- A wooden base 30 cm x 25½ cm
- Rubber piece
- Pulleys (one big and one small) 2 Nos
- Belt
- Handle
- Bracket 23½ cm x 14 cm and screws
- Back piece 26 cm x 18cm

Construction



Make an L shaped base by fixing the back piece on the wooden base. Mount the U shaped bracket about 8 cm above the base on the back piece. Fix the two test tubes inclined to each other as shown in the figure on the smaller pulley. Mount this on the bracket as shown. Fix the big pulley with handle opposite to it as shown. Connect them by a belt. Fill one test tube with soap water and a piece of cork and seal it with the rubber cork. In the other, fill water and a piece of rubber and seal it with the rubber cork.

How to use the device

Rotate the test tube by means of the handle. Observe the direction in which the cork piece and the rubber piece move. The cork piece moves towards the centre due to centripetal force and the rubber piece moves outward due to centrifugal force.

FRICTIONAL FORCE EXERTED BY DIFFERENT SURFACES

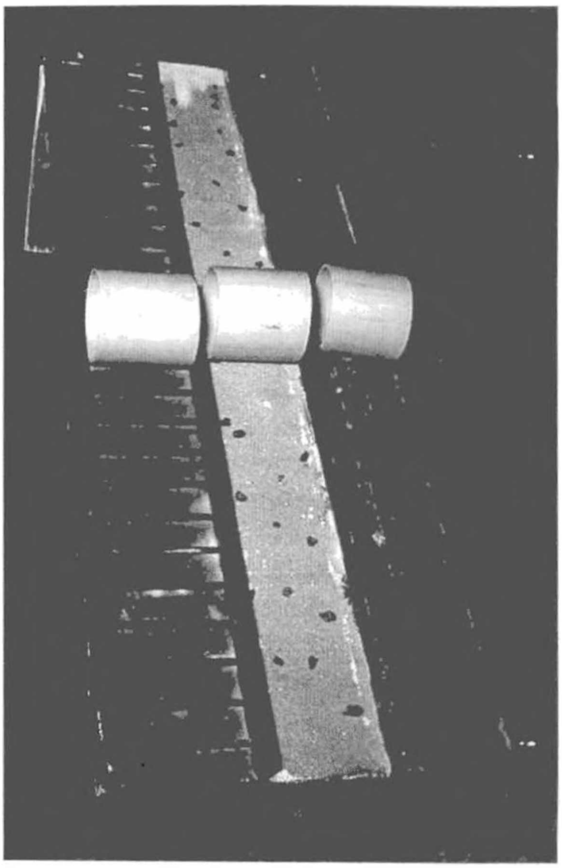
Pratibha
II Sem B.Ed. 2005

Materials Required

- Plywood sheet
- Iron rods
- 3 identical plastic cylinder
- Sun - mica sheet
- Gravel
- Fevicol

Construction

Make an inclined plane of length 75cm and width 48 cm with three tracks as shown in the figure. On one track, stick some gravel using fevicol. On the second track, fix pieces of iron rod at equal distances. In the third track, fix the sun-mica sheet. These three tracks constitute the different surfaces.



How to use the device

Roll the three identical plastic cylinders simultaneously on the three tracks. Observe which of them reaches the bottom faster. Compare the time taken by each of the cylinders to reach the bottom. What is the reason for the difference observed ?

MOVING ELECTRONS

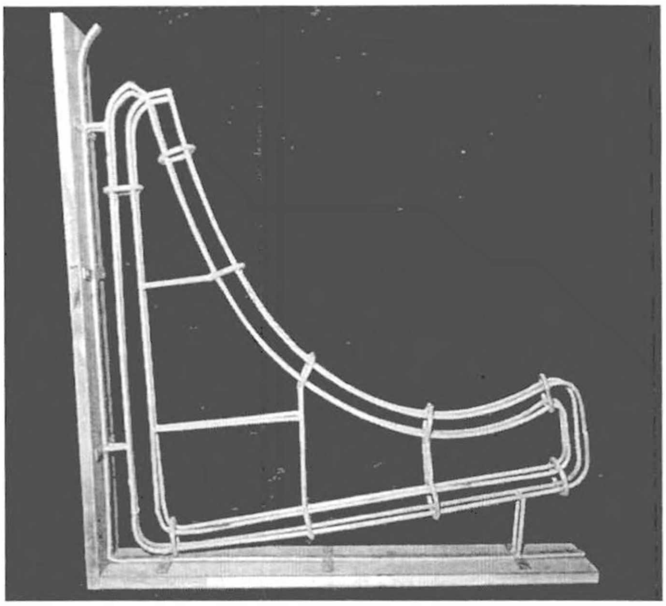
K. Bhaskar
II Sem B.Ed. 2005

Materials Required

- M.S. rods
- L-shaped plywood frame
- Steel balls

Construction

Make a bent cylindrical channel with a vertical section as shown in the figure. Fix it to the L-shaped ply wood frame. Have an opening at the top of the cylindrical path to insert the balls.



How to use the device

The channel in this model represents a wire and the steel balls represent electrons. Lift one ball up through the slit and release it at one end of the channel. Observe that another ball immediately pops out at the other end of the channel. The effect of one ball popping out at the end of the channel though very fast, it moves only a short distance. Current in a conductor travels at nearly the speed of light though the individual electrons do not move so fast. The steel balls in the model move by a transfer of momentum between them. The movement of the balls can be compared to the manner in which electrons move through a conductor when a current is flowing through it.

AN INVERTED PIVOTED PENDULUM

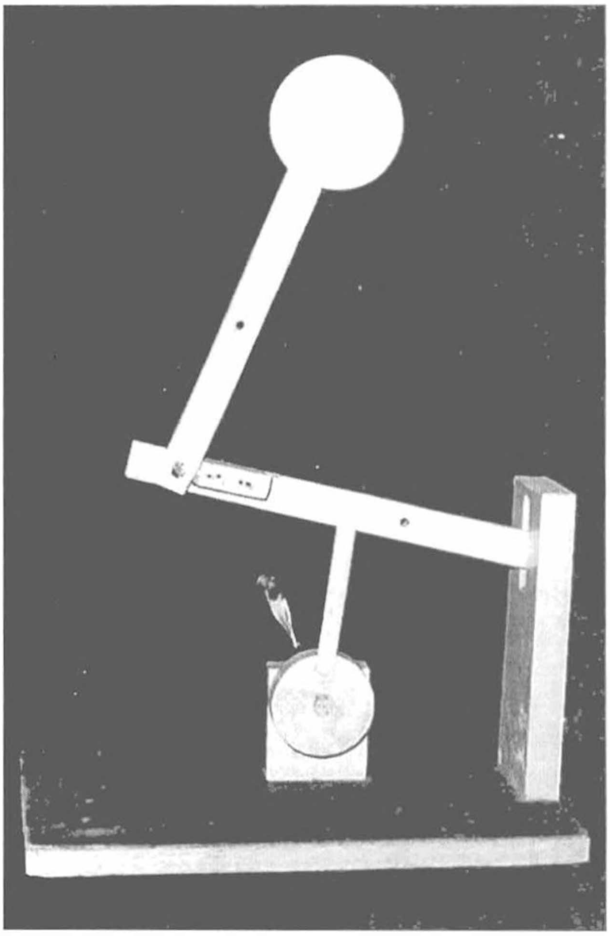
M Omkumari
II Sem. B.Ed 2005

Materials required

- Wood for pendulum
- Plywood 35cm x 20 cm
- Pulley with cranking device

Construction

Construct a pendulum and pivot it inverted as shown in the figure. Connect it to a cranking device as shown.



How to use the device

Move the pendulum up and down by rapidly rotating the device. When the pivot is accelerated downward the bob tends to move inwards. When the pivot is accelerated upward the effect is reversed. The force that restores the 'bob' towards the axis alternates with the average effect being a force toward the axis. Hence the pendulum will swing back and forth about a mean position but in a direction opposite to that of a normal pendulum.

CRANE BOOM AS AN ELBOW

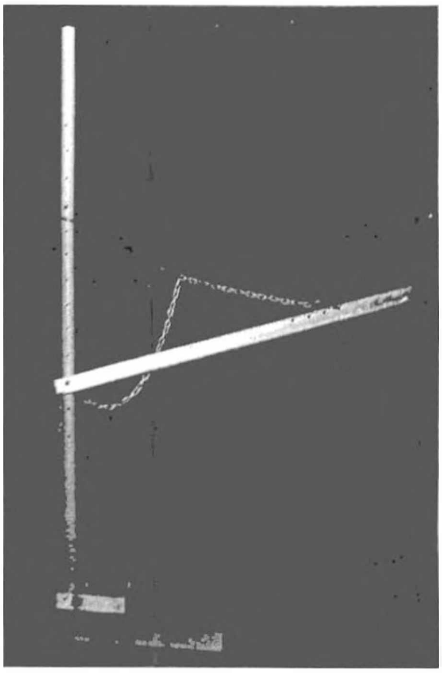
O. C. Raashida
II Sem B.Ed. 2005

Materials Required

- 13cm diameter aluminium rod of 60 cm length
- Vertical rod
- Wooden base
- Chain with hooks
- Spring balance
- Weight hangers

Construction

Drill holes equidistant from one another in the aluminium rod. Attach one end of the rod to the vertical rod fixed on a base by means of a pivot. This allows the boom to rotate in a vertical plane about the pivot. A weight hanger is hung at the other end. A chain is attached by means of a hook about 9 cm from the point at which the boom is pivoted. This chain is in turn attached to the spring balance on the upright rod as shown in the figure. The weight hanger represents the weight in the palm. The weight of the boom acting through its centre of gravity represents the forearm and the chain represents the biceps muscle.



How to use the device

Adjust the hanging weights and the length of the chain until the boom is horizontal. The reading in the spring balance represents the force exerted by the biceps. Notice that the reading in the spring balance which represents the tension in the biceps is considerably larger than the weight in the palm or weight of the arm.

CRANE BOOM AS A BENT BACK

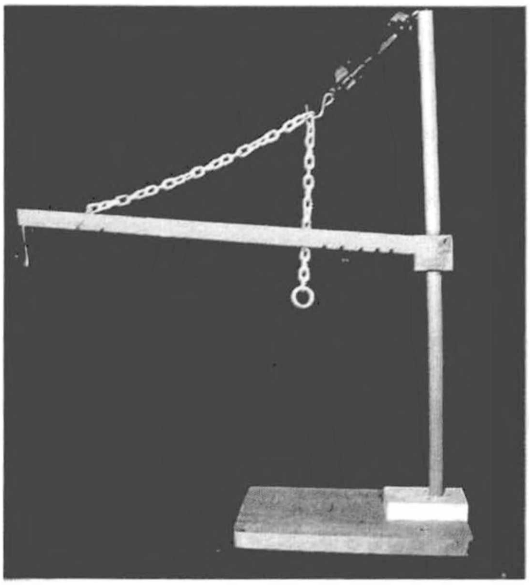
R Kalpana
II Sem B. Ed. 2005

Materials Required

- 13mm aluminium rod, 60 mm length
- Vertical rod
- Wooden base
- Chain with hooks
- Weight hanger.

Construction

Attach the rod to the vertical upright fixed on a wooden base by means of a pivot. Weight on the hanger at the end of the boom represents the weight of the head and arms. Weight of the trunk is represented by the weight of the boom acting at its centre of gravity. Attach a chain to the upper portion of the boom which is in turn attached to a spring balance.



How to use the device

See the lever representation of crane boom as a bent back in the adjoining diagram. With the weight hanger in position adjust the orientation of the boom until it makes an angle of 30^0 with the horizontal which represents the angle made by the trunk of a person bent over. Adjust the chain such that it makes an approximate angle of 12^0 with the boom. Read off the reading on the spring balance. This gives a feel of the tension in the erector spirals muscle of a bent person.

BALL BEARING IN THE CONE OF A FUNNEL

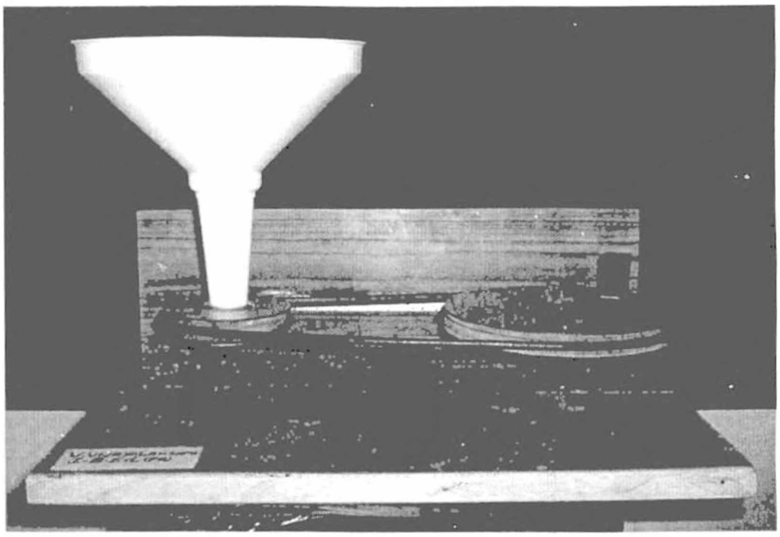
V. Vijayalakshmi
II Sem. B.Ed. 2005

Materials Required

- Filter funnel of diameter 15 cm
- 2 pulleys 8cm diameter and 15 cm diameter
- Belt
- Handle
- Wooden base 44cm x 20 cm
- U shaped metal frame 23½ cm x 14 cm
- Back piece 26 cm x 18cm

Construction

Attach the back piece to the wooden base to form an L shaped frame. Fix the U shaped frame on the back piece. Use one of the pulleys to act as a turn table. Fix this pulley with a handle on the wooden base using ball bearings. Fix the funnel vertically on top of the pulley. The second pulley is fixed at the other end of the U shaped frame with a handle fixed on it. Mesh the two pulleys by means of a belt.



How to use the device

Place the steel ball in the funnel. Rotate the pulley with the handle and observe how the ball rises to the top. The ball bearing instead of gradually rising up the slope moves very rapidly upto the rim at a particular angular velocity and falls down only after the angular velocity drops below this value. This range represents the range in which horizontal circular motion is possible within the confines of the system.

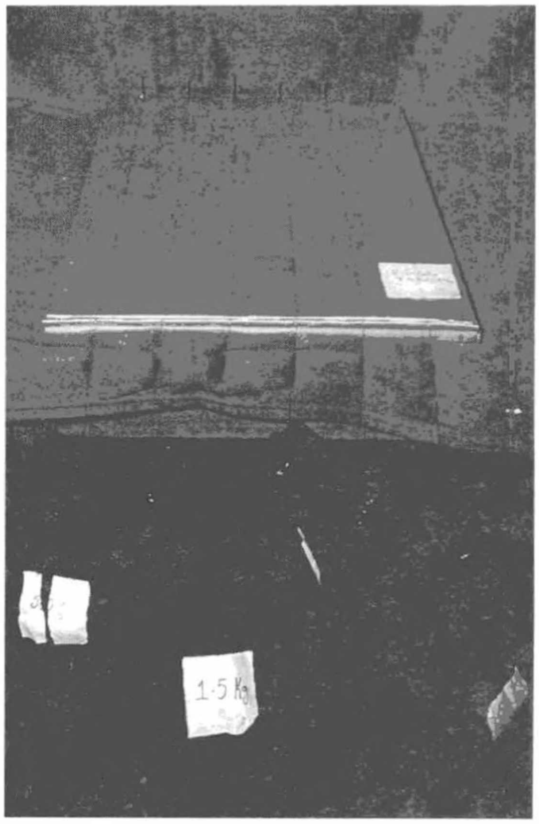
STRETCHED STRING

S. Srilatha
II Sem B.Ed. 2005

Materials Required

- Long wooden board
- Metal strip
- 8 equal lengths of string
- Hammer and nails
- 8 bottles of same size or 8 sand bags

Construction



Hammer the eight nails in the middle of the board. Fix the metal strip with eight equally spaced grooves on the other end of the board as shown in the figure. Fasten the string to the eight nails and run it across the metal strip and over the end of the board. To the loose end of the string, tie either the bottles or the sand bags. Fill in water into the bottles or sand into the bags to keep the string under tension.

How to use the device

Pluck the string strings and adjust the amount of water in the bottles or sand in the bags such that the notes make an octave scale.

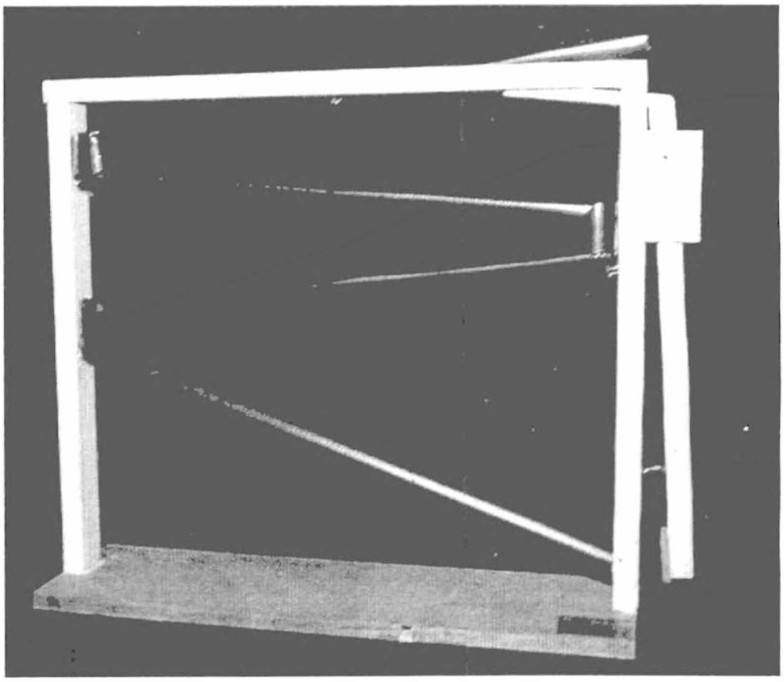
MARBLE CLOCK

Ritika Katoch
II Sem B.Ed. 2005

Materials Required

- Plywood sheet/string wood
- 4 conduits / 8 wooden dowels
- 5 steel marbles
- Spring
- Glue/fevicol

Construction



Cut pieces of wood needed to make the clock frame. Make a slot at the top and bottom in one of the side frames. Firmly glue together the base, the side pieces and the two cross bars at the top. Cut the conduit into half along the vertical and make four pieces to make slopes for the marble to run down, such that their lengths are slightly longer than the cross bars. Fix the slopes in place with glue. Adjust the distance between the slopes such that the marble falls vertically down into the next before rolling. If necessary, cut a vertical groove in the side frames between the slopes to enable it to fall down vertically onto the slope below.

Make the lever arm as shown in the figure by cutting two lengths of wood and gluing the two pieces. Add a small wooden stop to the end of the shorter piece. Attach the lever supports to the frame and fix the lever using a small peg while making sure the arm can swing freely. Fix a small disc at the bottom of the lever arm. Connect the lever arm to the frame by means of a spring to provide it enough elasticity to return to the original position after the wooden stop is released allowing the next ball to roll down. The slopes should be so adjusted that the balls are released at equal time intervals. The time required for the ball to roll down from top to bottom can be measured using a watch.

How to use the device

Place two to three marbles at the topmost cross bar. Release it. The ball rolls down and on reaching the bottom releases the next ball. This continues until all the balls are released. The lever needs to be adjusted so that it works properly. Depending on the time you want to measure, the number of balls can be fixed.

EDDY BREAKER

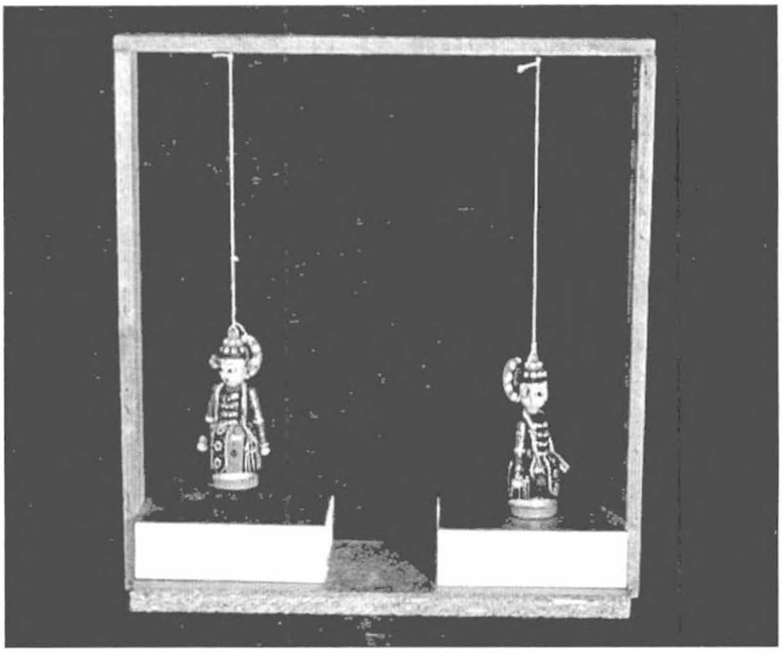
Bhasker
II Sem B.Ed., 2005

Materials Required

- Wooden Base 40cm x 14cm x 1cm
- Wooden pieces 46cm x 4cm x 1cm — 2 Nos.
- Wooden cross bar 42cm x 4 cm 1cm
- Hollow metal boxes 15cm x 10cm x 5cm — 2 Nos.
- Hooks — 2 Nos
- Dolls — 2 Nos
- Disc magnet — 1 No
- Thread

Construction

Make a U frame using the wooden piece of dimension 46cm x 4cm x 1cm and the cross bar. Fix the disc magnet to the base of one of the dolls. Suspend the dolls above the hollow metal boxes.



How to use the device

Set the two dolls into oscillation and observe what happens. This model can be used to explain eddy currents.

MUSICAL PIPES

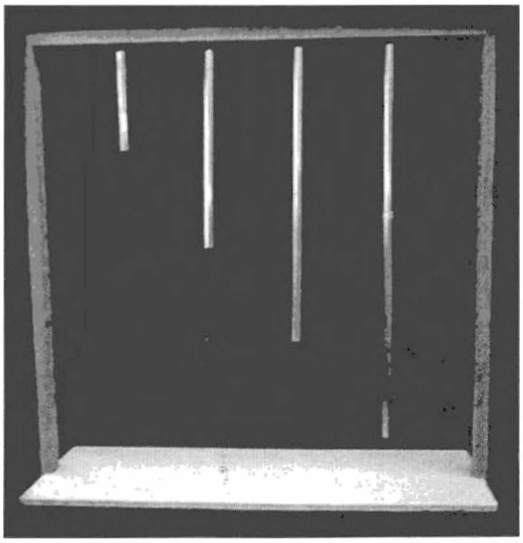
Basavannegowda
II Sem. B.Ed., 2005

Materials Required

♦ Wooden base 106cm x 46cm	
♦ Wood pieces 112cm x 7cm x 2½ cm	2 Nos.
106 cm x 7 cm x 2 ½ cm	1 No.
♦ Steel hollow pipes 23 cm length	1 No
54 cm length	1 No
68 cm length	1 No
92 cm length	1 No
♦ Wire pieces	
♦ Wooden hammer	1 No

Construction

Fix two wooden pieces of dimensions 112cm x 7cm x 2½ cm at the centre of ends of the base as shown in the figure. Fix the cross bar by using the wooden piece of dimensions 106 cm x 7 cm X 2½ cm. To the cross-bar fix the hollow pipes of different lengths at equal distances from each other.



How to use the device

Strike the pipes using a wooden hammer and observe the sound produced. Why is it different? What does the hollow tube have in it ?

CHAOTIC PENDULUM

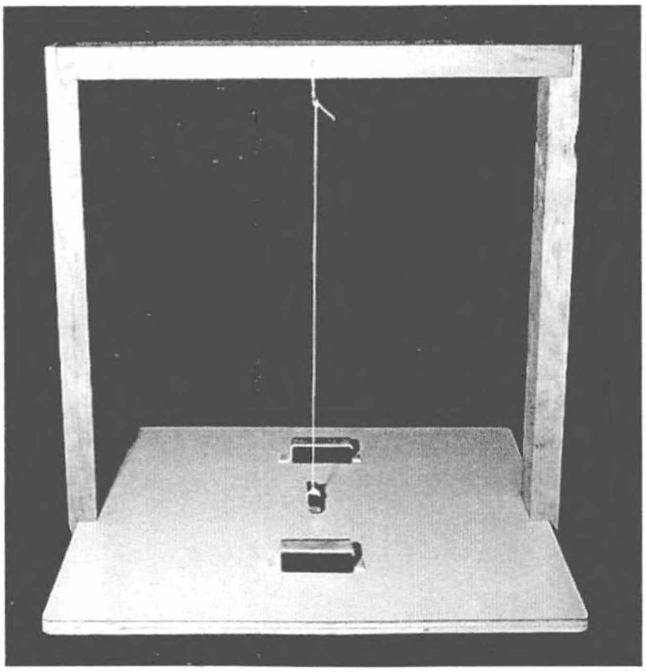
Risika Katochi
II Sem. B.Ed., 2005

Materials Required

♦ Wooden base 48cm x 48 cm x 1cm	1 No.
♦ Wooden pieces 48cm x 7 cm x 3cm	3 Nos.
♦ Hook	1 No
♦ Bar magnets	3 Nos

Construction

Make a U frame with the 3 wooden pieces of dimension 48 cm x 7cm x 3 cm. Fix it on top of the wooden base as shown in the figure. Fix the metallic hook at the centre of the frame and suspend a bar magnet. Fix the two other bar magnets on opposite sides of this magnet as the base and conceal it. (See figure).



How to use the device

Draw the magnet at the centre by pulling it to a side and release it. Observe the motion of the pendulum. Does it resemble the motion of the simple pendulum ? If not why ?

SURFACE TENSION

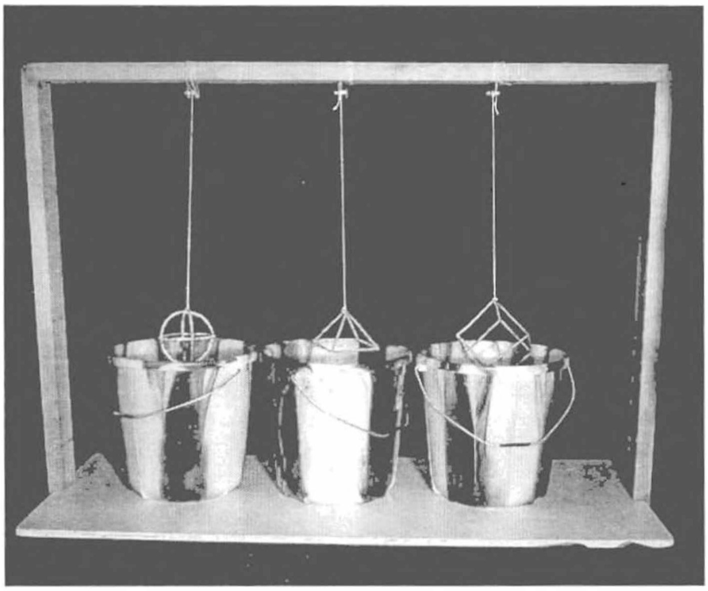
Dipti Pondey
II Sem B.Ed 2005

Materials Required

♦ Wooden base 106cm x 46 cm	1 Nos.
♦ Wooden pieces 76cm x 7 cm x 1 ½ cm	2 Nos
112 x 7 cm x 1 ½ cm	1 No
♦ Hook	4 Nos
♦ Objects of different shapes	3 Nos.
♦ Bucketsb	3 Nos.
♦ Soap powder	

Construction

Make a U frame using the wooden pieces and fix it at the centre of the wooden base as shown in the figure. Fix the three hooks at equal distances on the cross bar. Suspend the objects of different shapes from the hooks. Place the buckets below the objects.



How to use the device

Make soap solution and pour it into the bucket. Dip the objects one by one into the solution and raise it. Observe the shape of the soap film formed.

IMAGE FORMATION IN LENSES

Rajesh
II Sem B.Ed 2005

Materials Required

♦ Wooden planks 46cm x 31cm x 1cm	2 Nos
♦ Wooden pieces 31cm x 31 cm x 1 cm	2 Nos
♦ Glass sheets 31cm x 31cm x 1cm	2 Nos
♦ Concavae lens	1 No.
♦ Convex lens	1 No.
♦ Dolls	2 Nos
♦ Lens stands	2 Nos

Construction

Make a box using the wooden planks with the top and front side of glass. Fix the two dolls behind the lenses.

How to use the device

Look through the lens and observe the image formed by the two lenses. Explain why they are different.

BARTON'S PENDULUM

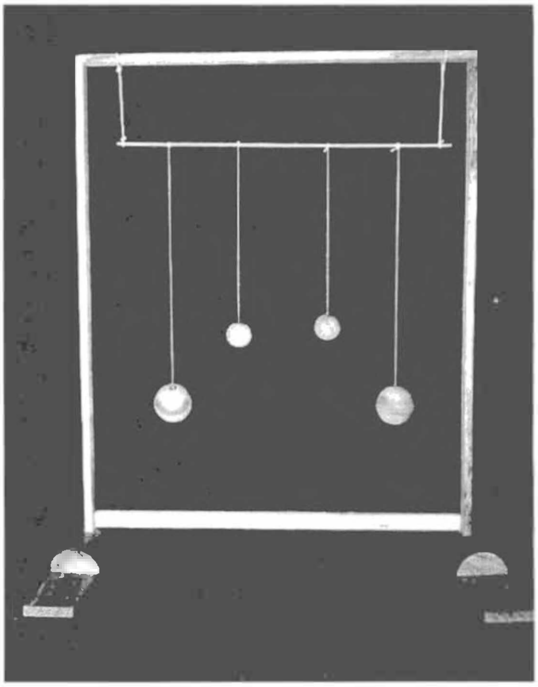
Venkateswara Rao
II Sem. B.Ed. 2005

Materials Required

- wooden base
- Balls (plastic or rubber) 4 Nos
- wooden pieces
- aluminium rod
- thread/chain

Construction

Make a U shaped frame using the three wooden pieces and fix it on the wooden base as shown in the figure. Suspend the aluminium rod using the thread / chain from the cross bar. Suspend the four balls as pendula taking care to see that you have two pairs of pendula of different lengths.



How to use the device

Oscillate the pendulum which is long and observe what happens. Next set the shorter pendulum into oscillation and observe. Which of the pendula start oscillating and why ?

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