MARATHI VIDNYAN PARISHAD

SET OF
EXPERIMENTS
FOR CHILDREN

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SET OF EXPERIMENTS FOR CHILDREN

MARATHI VIDNYAN PARISHAD

FOREWARD

The first edition of set of experiments for children in Marathi was published in 1994. There was a huge demand for it. The edition of 5000 prints was completely sold out in 2001. There was a persistent demand for the book. But it could not be satisfied due to monetary constrains. Subsequently as money was available the second edition was published in 2003. This was a revised edition. A team consisting of Rajiv Vartak, Ms. Charusheela Jaikar, Ms. Sucheta Bhide, Shri. Abhay Yawalkar and Ms. Shubhada Vakte was assignned the job of updating the book, The new book contains experiments on Heat, Light, Magnetism, Air pressure, Centre of Gravity, Density, Sound etc. The work was done by the above mentioned group under the inspired direction of Dr. Manasi Rajadhyaksha.

We are now bringing this book in English as there is a demand for it. I hope students and teacher will like it. Let us know any of the suggestions you have.

Mumbai
1 June, 2005

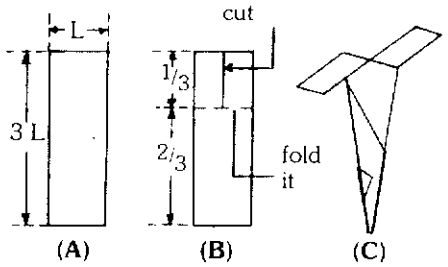
A. P. Deshpande
Hon. Secretary

Experiment no. 1

FLYING PAPER ARROW

Apparatus : A paper from the note book.

Procedure : Make a strip from the paper. The strip should be three times in length than its width i.e. as per sketch A – If the breadth is 'L' the length should be '3L'. As shown in fig B cut the strip in the middle widthwise upto 1/3 of its length. Then fold the two rectangular parts of the strip in opposite direction of each other. The flying arrow will be ready as shown in fig C. The remaining 2/3 length of the paper should be wound to form an equilateral triangle. In a room where there is not much wind or running fan, release the arrow from a height. You will see it flying and revolving round itself while coming down to floor of the room.



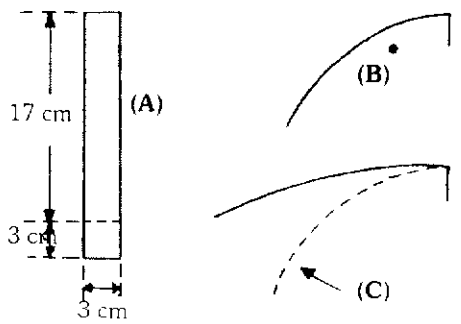
Question :
- ✱ Why does the arrow spins round itself?
- ✱ What will you do to fly the arrow in opposite direction?
- ✱ Can you increase or decrease the speed of the flying arrow?

Experiment no. 2

THE STRIP THAT LIFTS UP

Apparatus : A paper from the note book

Procedure : Take paper slip of about 20 cm. in length and 3 cm in width. Then as shown in fig. A, fold it from one side at a distance of 3 cm. Then hold the square part of paper 3 cm x 2 cm by the thumbe



and first finger so that it will book like the one shown in fig. B. Then as shown in figure C, blow a gentle puff of air by mouth in the direction of the arrow shown. The paper strip will be lifted up.

Questions : * Why was the strip lifted up?

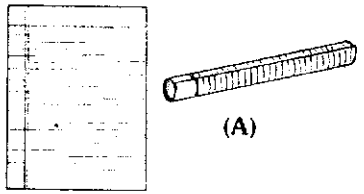
* It you hold the strip breadthwise and then flow a gentle puff of air by mouth from right to left will the strip be lifted in any direction?

Experiment no. 3

A HOLE IN YOUR PALM

Apparatus : A fullscape paper

Procedure :



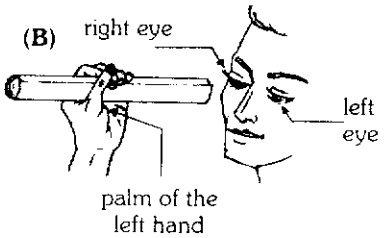
(A)

1) Take a half fullscape paper. Roll a cylinder of it in lengthwise direction. The diameter of the cylinder should be 3 to 4 cm (fig. A)

2) Hold the cylinder at its middle in your right hand

3) Keeping the neck straight put your right eye from one end of the cylinder and see through it.

4) Hold the palm of your left hand in front of your left eye. The palm should hold the cylinder at about its 3/4 of length.



5) Then see by both the eyes. The right eye should see through the cylinder while the left eye should see the palm. You will see a hole in the palm of your hand.

Questions : * Why do you see the hole in the palm?

* What will you do to see a hole in right hand palm?
* Can you see the hole in any other non-transparent object instead of your palm?

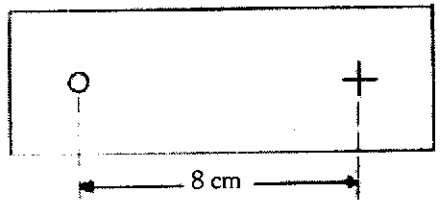
Experiment no. 4

TO FIND OUT THE BLIND SPOT IN YOUR EYE

Apparatus : A piece of paper, pen or pencil and meter rule.

Procedure :

1) As shown in the accompanying figure mark O and + signs on a paper. The signs should be 8 cm away from each other. Draw a Rectangle ground it.



2) Take the figure drawn in your hands and hold it a little away from your eyes. O sign should be in front of left eye while + sign should be in front of right eye.

3) Close the left eye and concentrate on sign O by your right eye. Still you can see the + sign.

4) Keeping the neck motionless, while concentrating on sign 'O' by right eye, move the paper slowly towards you.

At a specific distance + sign vanishes

Questions : * Why did the + sign vanish?

* If the paper is brought still nearey cam you see the + sign?

Experiment no. 5

CARD PAPER AND PIN

Apparatus : Card paper and a pin

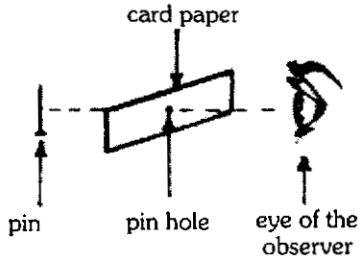
Procedure :

1) Take a piece of card paper measuring 5 x 8 cm. Pierce the pin to make a small hole somewhere in the middle of the card paper (The hole should not be big)

2) Hold the card in one hand and hold it in front of your eyes. See through the hole. Pickup the pin by the other hand and hold it opposite to the hole at a distance.

3) Bring the pin slowly towards the hole and see that it becomes thicker. If you hold the pin against the iron bar of the window you will

find that the pin appears thicker that the iron bar of the window.



Questions : * Why did you see the pin very thick?
* If you see the pin separately, why does it not appear thick?

Experiment no. 6

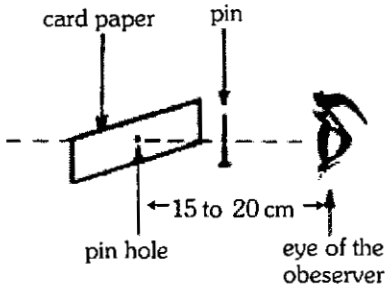
THE PIN THAT REVERSES

Apparatus : Card paper and a pin

Procedure :

1) This experiment is to be done as in the last experiment. In this experiment the pin should be in between the eye and the hole in the card. The distance between the eye and the card should be 15 to 20 cm.

2) Now move the pin from left to right and vice versa very slowly. You should look beyond (the pin) through the hole. You will see as if the pin is moving in the apposite direction.



Question : * Why does the pin appear to move in reverse or opposite direction?

Experiment no. 7

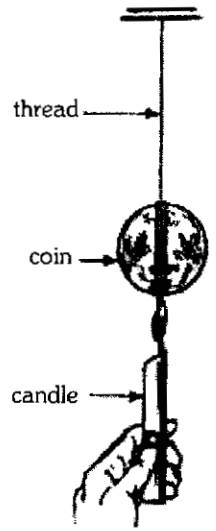
THE FIBRE THAT DOES NOT BURN

Apparatus : a bundle of thread, coin, candle and matchbox.

Procedure :

1) Hold a piece of thread over a lighted candle. See how it burns.

2) As shown in the figure, hang a coin tied by the thread. Now hold the lighted candle and try to burn the thread going round the coin. The fibre does not burn.



Questions :

* Why the figure tied round the coin does not burn?

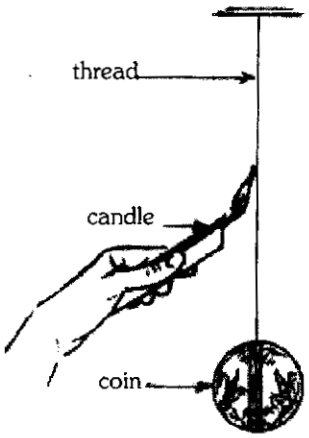
Experiment no. 8

THE FIBRE THAT DOES NOT GET CUT EVEN WHEN BURNT

Apparatus : A reel of thread, common salt

Procedure : Take a few pieces of the thread which are 30 cm in length. Keep these fibres in the concentrated solution of common slat for a day. Keep them in the sun to dry.

Tie up a coin with one of these threads and hang it. Try to burn the fibre with the lighted candle. Even when the fibre is burnt the coin does not fall down.



Question : * Why does coin not fall down even after it is burnt?

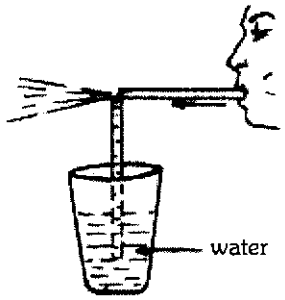
Experiment no. 9

SPRAY OF WATER DROP

Apparatus : Pair of scissors, Glass, a few straws

Procedure :

1) Cut one straw into two pieces. Take water in the glass. Dip one of the pieces of straw in water taking care that the straw does not touch the bottom of the glass.



2) As shown in the figure put the other piece of the straw at the open end of the first straw in the glass. Now blow hard through the second piece of straw.

You will see a spray of water drops

Questions : * Why did you see the spray?

* Which is principle that is common to this and the previous experiment.
* Which apparatus works on this principle

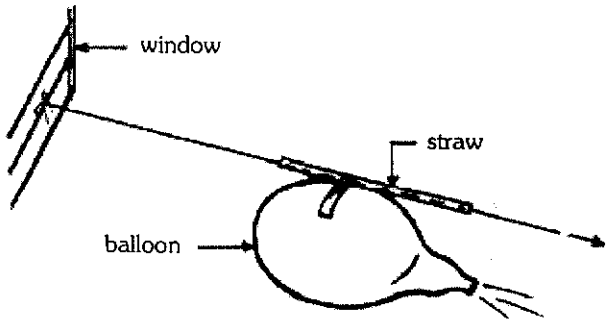
Experiment no. 10

BALLOON ROCKET

Apparatus : A medium size rubber balloon, straw, cell-o-tape, thread and scissors

Procedure : 1) As shown in the figure, tie a thread to the iron bar of the window or a strong thick nail. Keep the other end of the thread free.

2) Put the loose end of the thread through the straw and blow the balloon. As shown in the figure, stick the straw to the balloon by a piece of cell-o-tape.



3) Pull the thread tight and open the balloon the balloon will glide along the thread upwards.

Questions : * Why did the balloon glide upwards?

Experiment no. 11

THE EGG THAT FLOATS ON WATER

Apparatus : A glass, common salt, spoon and an egg.

Procedure :

1) Take some water in the glass and release gently an egg into it. The egg sinks to the bottom of the glass.

2) Now mix a spoon full of common salt in to the water in the glass. Stir it so that the salt dissolves in water. Add more salt to the water till no more salt can be dissolved. This is now a concentrated solution of common salt, or a saturated solution.

Now release the egg in the glass and you will see the same egg now floating on the surface of water.

Questions : * The egg sinks in ordinary water but why does it not sink in the concentrated solution of salt?

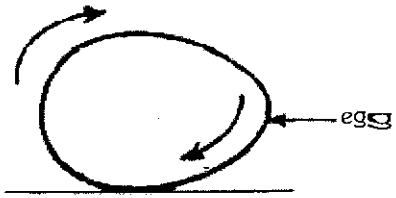
Experiment no. 12

WHICH IS THE BOILED EGG?

Apparatus : Two eggs

Procedure :

1) Get one egg boiled in the kitchen. Keep both the eggs (boiled and unboiled) on a plane surface. Then spin them. While they are spinning, stop them by hand and release them immediately. One of the eggs will stop spinning when stopped, but the other one will start spinning again.



Questions : * Which one of the two eggs is boiled?

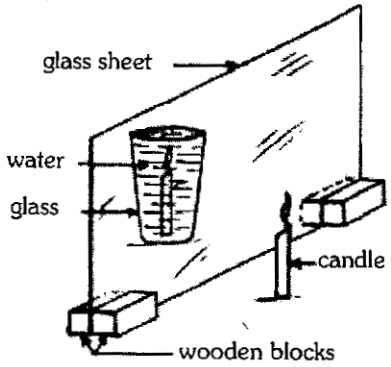
* What principle will be used to findout answer?

Experiment no. 13

THE CANDLE THAT BURNS IN WATER

Apparatus : A plane glass sheet of 20 cm x 15 cm, candle, water, glass, wooden blocks

Procedure : 1) Hold the glass sheet vertical by supporting with wooden blocks (see the figure)



2) Keep a burning candle in front of the glass sheet. On the other side of the glass sheet, keep a glass with water at the same distance as that of the candle. The glass sheet should be perpendicular to the line joining the glass with water and candle.

It the observe sees the candle from its side you will find that the candle is burning in water.

Question : ✶ Why do you see the candle burning in water? If the location of the glass with water is shifted, still can you see candle burning in water? In what location?

Experiment no. 14

THE STRAW THAT BREAKS AT THE SURFACE OF WATER

Apparatus : Fish tank, straw, water glass

Procedure :

1) Hold a straw in the water in the fish tank. See the level of the water in the tank from front. How the straw looks like?

2) See the same straw angularly from surface of water. How it appears?

3) Take the glass of water. Now see how the straw looks on the surface of water when hold at the center of glass. Take the straw to one side of glass and see how the straw appears.

Questions : ✶ What is the reason and principle involved in answers to these questions?

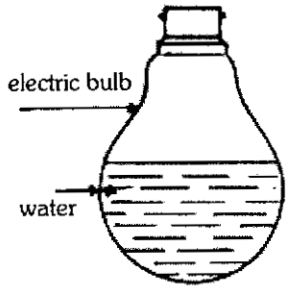
Experiment no. 15

AQUATIC LENS

Apparatus : Burnt out electric bulb, water, fish tank

Procedure : 1) Remove the wire from inside the bulb. Take care while doing it.

2) Fill the bulb completely with water and read the printed letters kept on the other side through the bulb.



Questions : ✶ If the printed letters are kept at distance of 20 cm from the bulb, how will the letters appear?

✶ How will the letters be seen from a distance of 2-3 cm?

✶ What is the reason for the change?

Experiment no. 16

AIR LENS

Apparatus : Empty electric bulb, fish tank, water

Procedure : Submerge the bulb in the water of the fish tank but don't fill it with water. See your friend through it.

Question : ✶ How does your friend appear? Why?

Experiment no. 17

PUPIL OF THE EYE

Apparatus : Pen torch (its focal length should be less than 10 cm) concave lens.

Procedure : Ask your friend to open his eyes in dim light room. Observe his eyes. You will see the pupils of eyes expanding. Then

direct the light from the torch on his eyes. You will see the pupils contacting.

This experiment can be done on your own eyes in front of a mirror is dim lighted room.

Question : * Is there any relation between the contracting pupil and your entry into a dark room from lighted outer atmosphere?

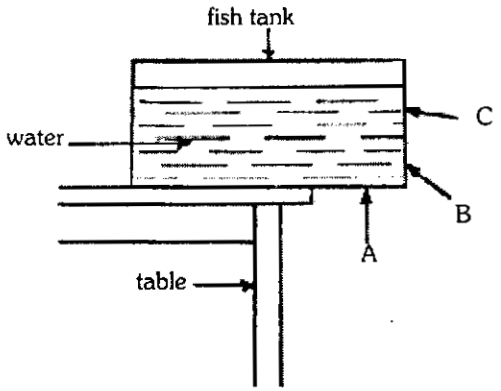
Experiment no. 18

TOTAL INTERNAL REFLECTION

Apparatus : Fish tank, water, pen torch.

Procedure :

1) As shown in the figure keep the fish tank on the table.
2) The room should be dim lighted.
3) Throw the light from the torch in 'A' drection in the tank and observe the path of light passing through water.
4) Now do the same thing from directions 'B' and 'C'

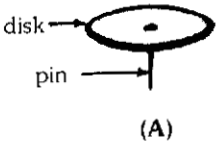


Question : * The ray of light from 'C' never went out of water? Why?

Experiment no. 19

THE INVISIBLE PIN

Apparatus : A thick non-transparent disc of plastic (Lid of Fevical tin will do), Pin, Tray and water.

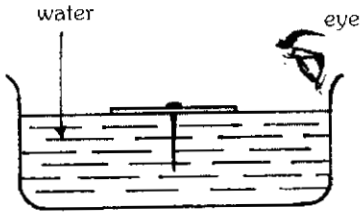


(A)

Procedure :

1) Take a disc of 4 to 8 cm diameter. Then pierce it in the center and insert the pin in it. (See fig A)
2) Hold the disc on the lower side of your eye (fig. B), we can see the tip of the pin. Now put the disc in water placed in the tray. The disc floats on water but the pin does not touch the bottom of water. If you see the surface of water, the pin is not seen.

(B)



(C)

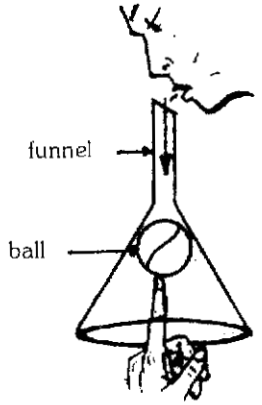
Question : * Where has the pin vanished? Why?

Experiment no. 20

SUSPENDED BALL

Apparatus : Funnel made of glass or plastic, a table tennis ball.

Procedure : Take a small size funnel. Hold the ball in the funnel as shown in figure. Place a finger at the bottom of the ball. Then blow through the upper end of the funnel. The ball remains suspended or does not fall down.



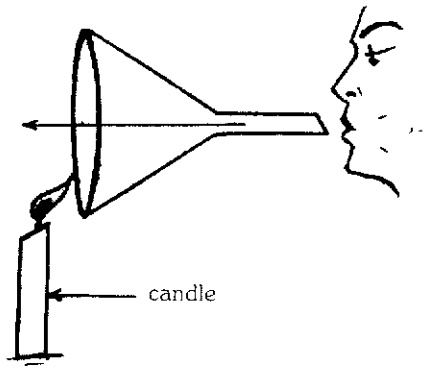
Question : * Which force opposes the force of gravity so that the ball remains suspended?

Experiment no. 21

THE FLAME THAT BENDS TOWARDS THE FUNNEL

Apparatus : Glass funnel, candle, match box

Procedure : As shown in the figure hold the flame of the candle near the mouth of the funnel. Then blow air through the other end of the funnel. You will see the flame bending towards mouth of the funnel. Take care to blow on the flame. Do not suck the air. The hot air will burn your mouth.



The principle behind experiments 20 and 21 is the same.

Experiment no. 22

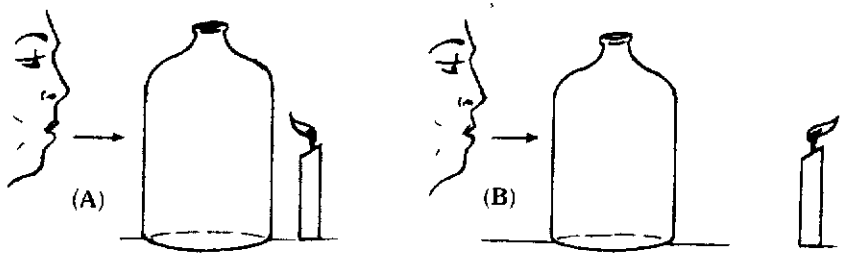
THE FLAME THAT BENDS TO AND FRO

Apparatus : Cylindrical bottle, Candle match box

A cylindrical bottle is necessary for this experiment. If you take a plastic bottle make it heavy by putting sand or water in it.

Procedure :

1) Fix a burning candle at a place.
2) As shown in figure 'A' keep the heavy cylindrical bottle near the candle. Then blow. The flame of the candles bends towards the bottle.
3) Now while you are blowing increase the distance between the bottle and the candle. At a particular distance you will see the flame is bending in opposite direction of the bottle.



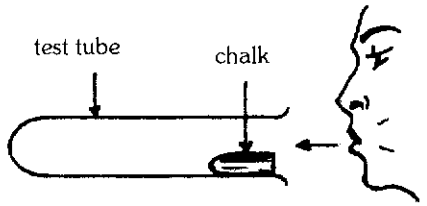
Question : Why is it that the flame bends in both directions?

Experiment no. 23

A PIECE OF CHALK THAT MOVES AGAINST THE DIRECTION OF THE BLOW

Apparatus : A test tube (a small bottle will also do) a piece of chalk

Procedure : Keep the piece of chalk at the open end of the test tube. Try to push it in side by blowing air. The piece comes out with a force.



Question : ✶ Why does the piece of chalk come out?

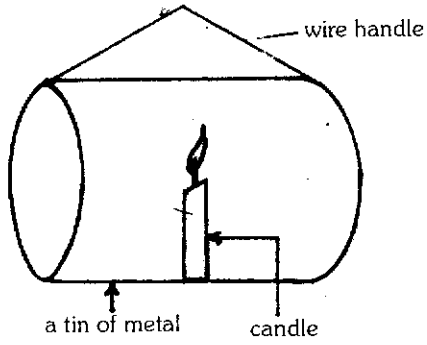
Experiment no. 24

CANDLE THAT DOES NOT EXTINGUISH EVEN IN A STROM

Apparatus : A narrow metal tin, wire, candle, match box

Procedure :

1) Fix a handle of wire to the tin. Put a candle in the tin as shown in the figure. Keep the end of the tin open.
2) Now light the candle. Move vigoursly the tin in both ways by holding the handle. (To much speed will dislodge the candle.) You can hold the tin in front of a fan. The candle does not extinguish.



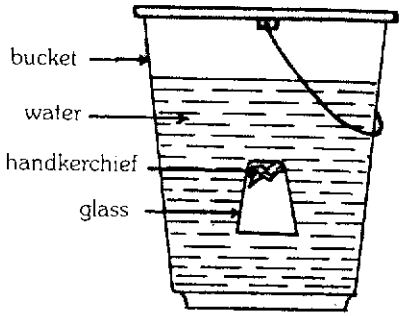
Question : ✶ Why does the candle not extinguish?

Experiment no. 25

HANDKERCHIEF REMAINS DRY UNDER WATER

Apparatus : A bucket, water, glass, handkerchief

Procedure : Take water in the bucket. Fix the handkerchief tight at the bottom of the glass. Now dip the glass in water with bottom up, Take out the glass. The handkerchief remains dry.



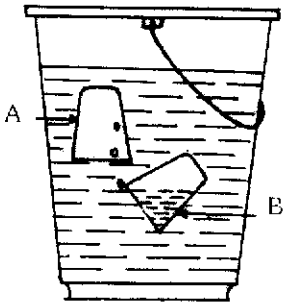
Question : ✶ Why does the handkerchief remain dry?

Experiment no. 26

POURING AIR

Apparatus : Bucket, 2 glasses, water

Procedure : Put water in the bucket. Fill the glass 'A' full with water. Put the glass 'B' with bottom up in water under the glass 'A'. Then fill the glass 'B' which has air in it. The air bubbles will flow to glass 'A' and glass 'B' will be full of water.

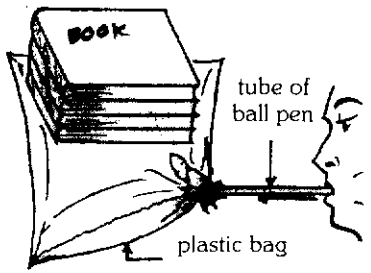


Experiment no. 27

AIR JACK

Apparatus : A bag of plastic. twine, tube of ball pen.

Procedure : Take a bag of plastic (one litre milk bag will do). Put the tube of ball pen which is open at both ends through the open end of the bag. Then tie the mouth of the bag tightly to the tube. Keep 4-5 heavy books on the bag. Blow the air in the bag through the tube. The books are easily lifted up.



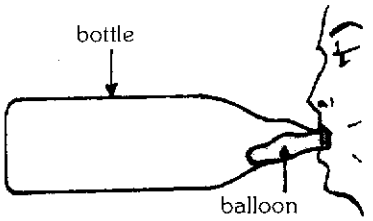
Question : ✶ A simple blow of air on the books with not lift them. But they are lifted when the air is filled is the bag. Why?

Experiment no. 28

BALLOON THAT DOES NOT BLOW UP

Apparatus : Bottle (Plastic or glass), Balloon

Procedure : Fix a balloon in the mouth of a narrow bottle. Try to blow the balloon in side the bottle. It hardly blows. It is difficult to blow fully a balloon in the bottle.



Question : ✶ Why does the balloon not blowup?

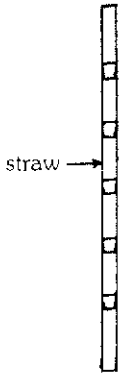
Experiment no. 29

RACE FOR DRINKING WATER

Apparatus : Straw, sticker tape, water and glass.

Procedure : Go on fixing one straw in to another as shown in the figure. Fix about six straws into one another. Fix the sticker tape at each joint and make it air tight.

Now try to suck (drink) water through the straw. It is difficult to drink water.



Question : ✶ Why is it difficult to drink water through a lengthey straw?

Experiment no. 30

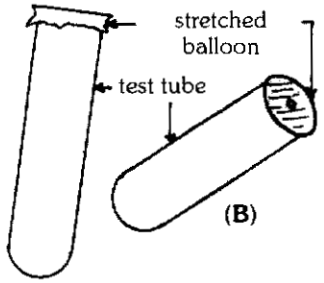
THE WATER THAT DOES NOT FALL DOWN

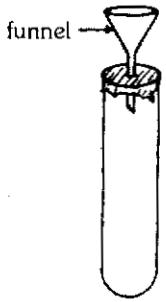
Apparatus : Test tube, balloon, funnel and water.

Procedure :

1) Fix a piece of balloon at the mouth of the test tube. (Figure A). Do not stretch it too far.

2) As shown in figure 'B' pierce a hole in the stretched balloon part. Do it with a pin.





3) Now push the tube of the funnel through to hole. Pour water in the funnel. Water does not fall in the test tube. When the funnel is taken out of the test tube the water begins to fall down.?

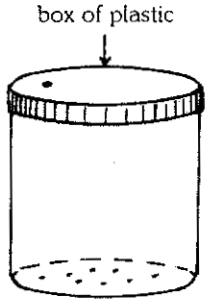
Question : ✶ Why did the water not fall in the test tube through the funnel?

Experiment no. 31

RAIN BY ORDER

Apparatus : A box of plastic, pin and water.

Procedure : Pierce 7 to 8 holes by the pin at the bottom of the box. Pierce one hole to the lid of the box also. Fill the box with water. Fix the lid tightly on the box. Keep your finger on the hole of the lid of the box. The water does not come out of the holes at the bottom. Lift the finger kept on the hole, water starts dropping from the bottom. Place the finger again on the lid hole, the drops of water stop falling.



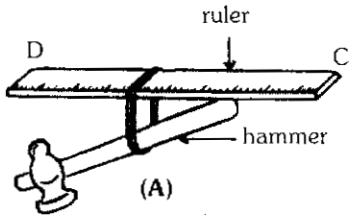
Experiment no. 32

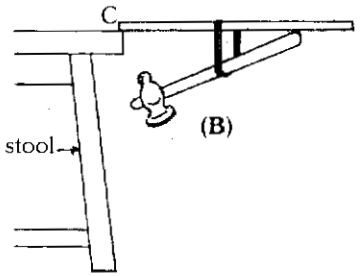
IMPOSSIBLE BALANCE

Apparatus : Meter ruler, Hammer, String, Wooden stool / table.

Procedure :

1) As shown in figure 'A', tie the hammer by the string to the ruler / and hang it. See that it does not move. If necessary fix the hammer to the ruler by making serration on the wooden handle of the hammer





2) Now place the 'C' end of the ruler on the table for a distance of one millimeter. See how the ruler with the hammer gets balanced even at a distance of one mm.

Question : ✶ Why does the ruler not fall down from the table?

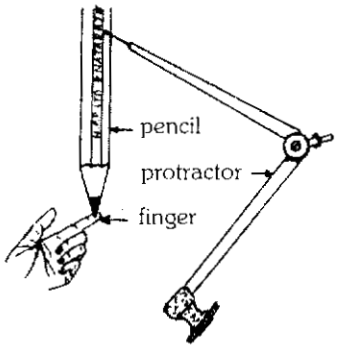
Experiment no. 33

BALANCED PENCIL

Apparatus : Pencil

Procedure :

1) Fix the sharp end of the compass in the pencil as shown in the figure. While doing it keep the pencil on the table for support. Do not press two hard. That is dangerous.



2) Then try to balance the pencil on the finger by pencil's sharp end. If necessary tie a small stone where the pencil is kept. Try to change the angle of the compass and see still it gets balanced.

Questions : ✶ Why was the pencil got balanced so easily?

Experiment no. 34

CENTRIFUGAL SPRAY

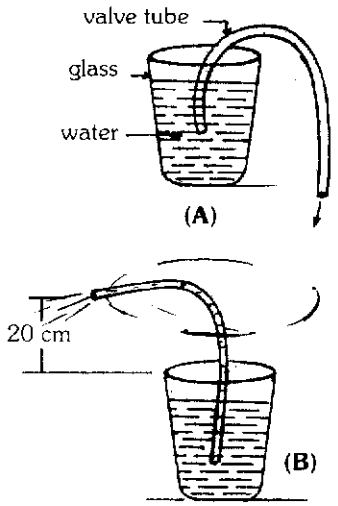
Apparatus : Glass pot, water, cycle valve tube (40 cm in length)

Procedure :

1) Put one end of the valve tube in water and suck from the open end.

2) Once the water starts flowing take that open end and push it upwards. Hold the tube at a distance of 20 cm. while taking it upwards. While doing it see that other end of the tube remains dipped in water.

Questions : * When will water come out with more speed?



Experiment no. 35

LIFTING WEIGHT BY THE CENTRIFUGAL FORCE

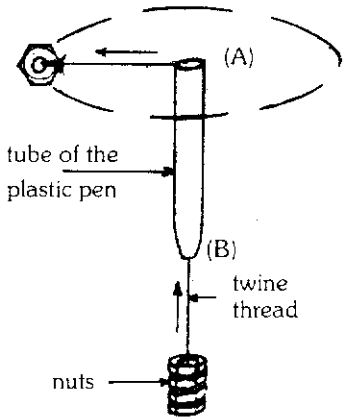
Apparatus : A tube of plastic pen or refill, twine which has been washed in hot water to remove its starch, 4 nuts weighing 50 to 100 gm each.

Procedure :

1) Pass the soft wine thread through the tube of refill. At one end tie one nut and at the other end 3 to 4 nuts are tied lightly.

2) As shown in the figure keeping the end 'A', move the tube in a circular manner. The nut near point 'A' slowly moves away and the weight at the other end is lifted up.

Questions : * Why the heavy weight got lifted?



Experiment no. 36

BRUSH THAT CLIMBS

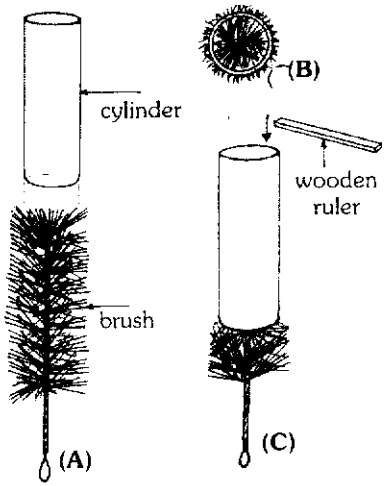
Apparatus : Brush (with which a bottle is cleaned) cardboard, cello tape.

Procedure :

1) As shown in the figure, prepare a cylinder of the card board. The diameter of cylinder should be about 75% of the brush. You can judge its shape from figures 'A' & 'B'

2) As shown figure 'C' push the brush a little bit in the cardboard cylinder. Now hit the cylinder with wooden ruler from the upper side. The brush instead of falling down moves upwards.

Questions : * What is the reason of the upword movement of the brush?



Experiment no. 37

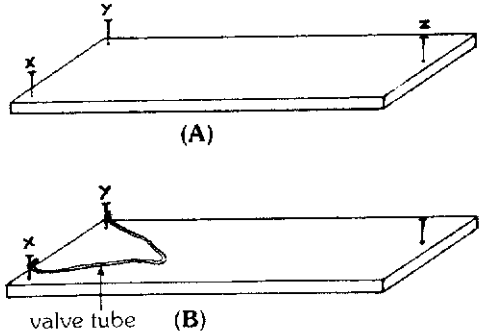
CATAPULT CAR

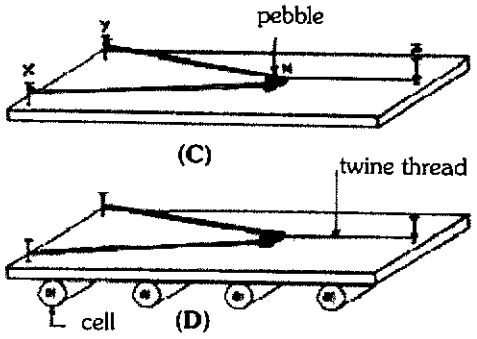
Apparatus : Wooden board, valve tube, nails, large size used battery cells, twine

Procedure :

1) As shown in figure 'A' fix three nails at X, Y and Z points on the wooden board.

2) Tie the valve tube to nails X and Y. The length of the valve tube should not be more that 15 cm





3) Tie the twine to nail at the point Z on the board. Then stretch the valve tube by the twine and tie it to 'M' point. Place a small pebble in the fork at M

4) Now keep the catapult and the board on the cells arranged parallel to each other.

5) When the twine is stretched, the pebble is thrown away while board moves along with the cells in the opposite direction.

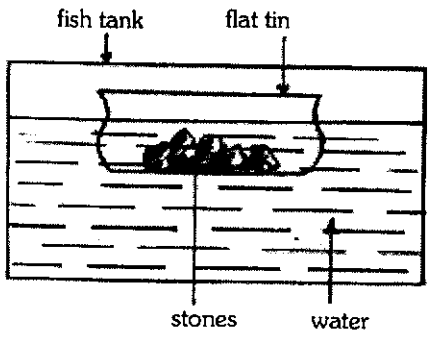
Questions : ✶ What will happen if the pebble is heavy?

Experiment no. 38

DOES THE STONE RAISE THE LEVEL OF WATER?

Apparatus : Fish tank, a flat tin that can float on the water, stone.

Procedure : Pour some water in the fish tank. Now put some pebbles (stone) in the flat tin and put it in the fish tank but see to it that the tin does not sink down. Note the level of the water. Now release stones one by one in fish tank. Note again the level of water, after all the stones are put back in the tin.



Question : ✶ The level of water should increase or raise, but why did it decrease or go down?

Experiment no. 39

DE'CARTE'S DIVER

Apparatus : Test tube, water, balloon, injection ampoule.

Procedure : Get some used injection ampoules from your doctor and clean them.

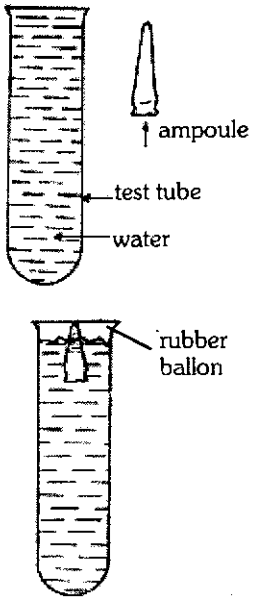
1) Fill the test tube with water

2) Fill water in ampoule in such way that the ampoule floats on water.

3) Then gently immerse the ampoule with its open end in the test tube. Now tie a piece of rubber balloon on the mouth of the test tube.

If you press the rubber piece the ampoule sinks in the water. When pressure is relcased, ampoule comes up.

Question : ✶ How does the ampoule sink by more pressure?

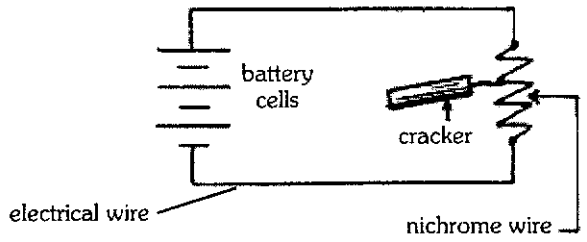


Experiment no. 40

ELECTRIC CRACKER

Apparatus : 3 meter long two pieces of electric wire, electrical element of the iron (i.e. a wire covered by mica); 2-3 battery cells, a small cracker

Procedure : Take out 8 cm long nichrome wire from the element of iron. You have to cut the mica cover of element and then cut a piece of wire that is 8 cm in length. Join the wick of the cracker to nichrome



wire. Then with a 3 meter long wire join the nichrome wire in the electric circuit of the three battery cells. (It the cells are new 2 cells will suffice) The cracker bursts.

Questions :
- How was heat produced in the wire?
- Whether other wires can also create heat?
- What will happen if only nichrome wire is used instead of 3 m long electrical wire?

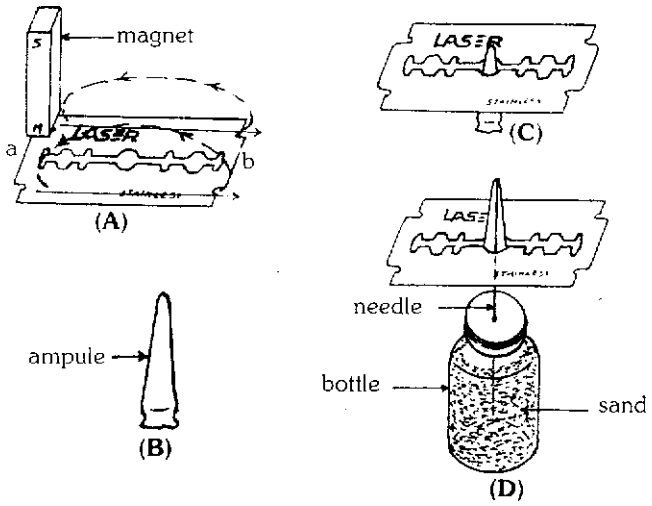
Experiment no. 41

SIMPLE MAGNETIC NEEDLE

Apparatus : Cut end of the injection ampoule, a big needle, blade, small injection bottle, soil / sand, straight magnet

Procedure : As shown in figure 'A' make the blade magnetic by single touch method. Fix the cut end of the injection ampoule in the middle hole of blade as in figure 'C'.

Fill a used injection bottle with sand. Pierce the big needle through its rubber lid. Fix the ampule on the tip of the needle as shown in 'D'.



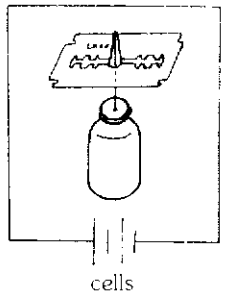
Question :
- Even if you tip the blade lightly to other position it remains in the same direction. Why?

Experiment no. 42

EFFECT OF ELECTRIC CURRENT ON A MAGNET

Apparatus : Magnetic needle used in experiment 41, copper wire, two cells.

Procedure : Join the copper wire to cells above the magnetic needle. Switch on the current. The blade revolves round itself and assumes a new direction.



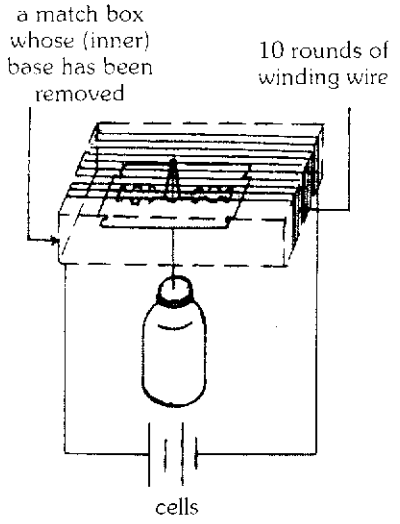
Question :
- What will be the difference if the copper wire is held at the bottom of the magnetic needle?
- Is there any change if the direction of the cells is changed?

Experiment no. 43

GALVANOSCOPE

Apparatus : Magnetic needle, 22 gauge winding wire, (used in electric motor and covered by enamel insulation), cells, empty match box or cardboard box.

Procedure : Remove the bottom of the inner box in the match box, Put the 10 rounds of winding wire as shown in the figure. Then pierce the needle from the magnetic needle in the center of the box; keep a magnetized blade with ampoule on the needle. The frame of the wire should be in the same direction as the steady blade. Now swith on the current. Even a weak current will show the galvanoscope.



Experiment no. 44

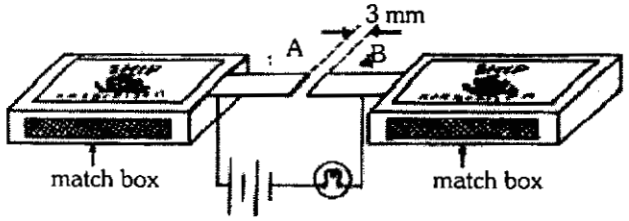
ELECTRIC CURRENT THROUGH A SOLUTION

Apparatus : Two metal strips (they should be 3 cm long and 1 cm. broad (even tin strips will do), Bulb of 2.2 volt and its holder, two cells, wires, solution of common salt, dilute H_2So_4, two empty matchboxes, sand.

Procedure : Fix the two metal strips A & B in the match box as shown in the figure. Then join A strip to two cells, bulb and B strip in an electrical circuit. Strips A and B should be at 3 mm away from each other. Now with the help of dropper put a drop of salt solution on the slit very gently.

The bulb gets lighted.

Try dilute H_2SO_4 in place of salt solution. The bulb will be more bright.



Question : ✶ Why there was increase in the light of the bulb when H_2SO_4 was used?

Experiment no. 45

DANCING DOLL

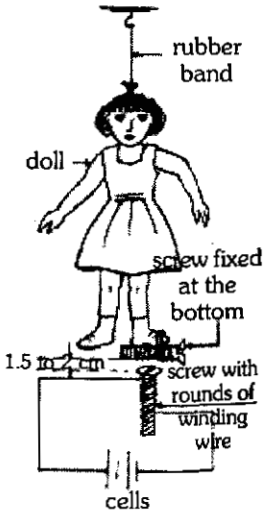
Apparatus : A doll of about 15 cm. length. 2 thick screws or nails of 2-3 cm length, electrical winding wire no 20 or 22 gauge 2-3 cells, long thin rubber band.

Procedure :

1) Put 25 rounds of winding wire on one of the screws or nails and connect to the cells.

2) Tie the screw to the bottom (legs) of the doll. Fix a rubber band on top head of the doll and hang it to a nail.

3) Bring the screw with rounds of wire below the screw fixed to doll at a distance of 1.5 to 2.0 cm.



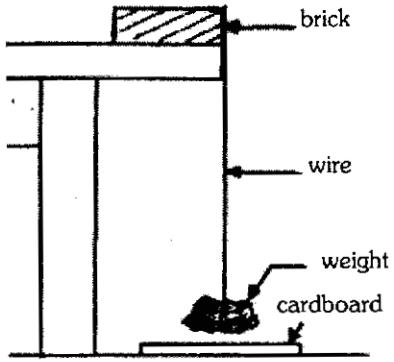
4) Switch on the current. Doll is pulled down. Swith off the current, doll goes up again

Experiment no. 46

LINEAR EXPANSION

Apparatus : Metal wire, candles, matchbox, table, weight, paper, cardboard, brick.

Procedure : Wind the wire around the brick ask shown in figure. Tie a weight (stone) at the other end of the wire. (Do not take a heavy stone or weight)



Keep the paper / cardboard under the weight. You should be able to move the paper / cardboard whenever necessary. Then light 2-3 candles. Apply heat by the flames of the candles at 2-3 places on the wire. See if you can remove the paper or cardboard under the weights easily.

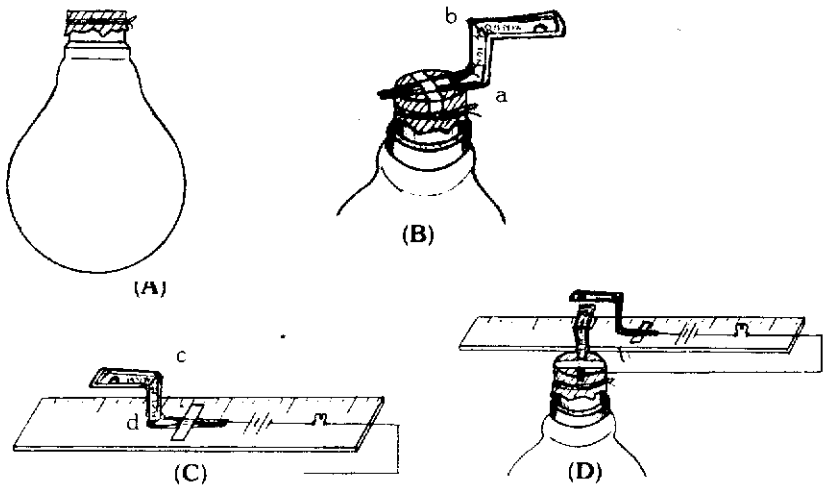
Question : ✶ Why the paper is not easily removed?

Experiment no. 47

LIGHTING THE BULB BY EXPANDING AIR

Apparatus : A used electric bulb, a bulb of 2.2 volt with holder, 2 cells, wires, ruler, balloon, stove pin, candle, matchbox, cello tape.

Procedure : Take out the inner wires from the fused electric bulb as shown in figure 'A'. Tie a balloon at the upper end of bulb tightly. Stick the stove pin bent at a a and b on the tight balloon by cello tape. Stick the second stove pin bent at point c and d on a wooden ruler by cello tape, attach a bulb by wire. Leave open wire after this.



Keep the end of the metal strip under the other metal strip. (see fig D). Tie the bulb by a thread to strip. The front end of the wire after the bulb (2.2 volt) should be tied on the balloon of the empty bulb. Now heat the empty bulb by the flame of the candle. 2.2 volt bulb gets lighted.

Question : * Why the bulb gets lighted when heat is applied?

Experiment no. 48

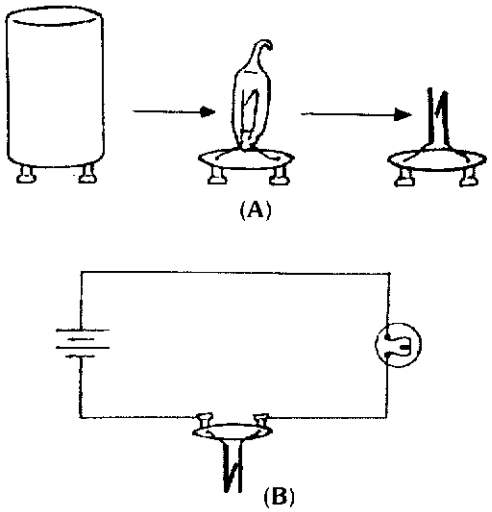
LIGHTING A BULB HEATING A STARTER

Apparatus : 2.2 volt bulb, holder, 2 cells, wire, tube light starter, candle, match box.

Procedure :

Open the aluminum or plastic box on the starter of a fluorescent tube. Break the part looking like a glass lamp from the starter. You will see two strips as shown in figure.

Then as shown in fig. B, prepare an electric circuit by joining 2.2 volt bulb and broken starter. Heat the strip of the starter by the flame of the candle. Bulb lights. It you blow over the strips the bulb extinguishes.



Question : * How was circuit broken when heat was applied?

Experiment no. 49

BURNING SUGAR

Apparatus : Spoon, candle, match-box, sugar, tobacco.

Procedure : Heat the sugar in the spoon by the flame of the candle. The sugar gets burut without a flame. Wash the spoon clean and dry it.

Now add tobacco or snuff with sugar. Heat by a candle. Now the sugar will burn with a flame.

Question : * Why the sugar burns with a flame when substances like tobacco are added?

Experiment no. 50

HEAT LIGHTS UP THE WORDS

Apparatus : A sheet of paper from the note book, Lemon juice, milk, painter's small brush, two saucers

Procedure : Squeez the lemon in one saucer. Put some milk in the other saucer. Now dip the brush in lemon juice and write something

on the paper. Wash the brush. Dip it in milk and write with it. The written matter will vanish when juice and milk get dried. Apply heat by a candle flame to paper. The written words will reapper.

Question : * Why did words appear again?
* Can we see the words if a hot iron is pressed over the paper?

Experiment no. 51

AMMONIA

Apparatus : Salammonic (Ammonium Chloride) and lime.

Procedure : Take some salammonic and lime on the palm of the hand. Smell it. Now rub your palms against each other. Smell it. You will smell ammonia.

Question : * Why the smell of ammonia is experienced when hands are rubbed?

Experiment no. 52

COPPER PLATING

Apparatus : Nail, $CuSO_4$, water and vessle.

Procedure : Prepare a concentrated solution of copper sulphate in a vessel. Keep a nail submered in the solution for 2-3 minutes. Take out the nail. It will be plated with copper.

Question : * Why did the nail get copper colour?

Experiment no. 53

DANCING BALLS

Apparatus : Naphthalene balls, washing soda, Hydrochloric acid, large glass, water.

Procedure : Get some water in the glass. Dissolve washing soda in it. Release small pieces of naphthalene ball. The pieces sink.

Now drop 20 drops of HCl in solution of washing soda. The pieces start dancing up and down.

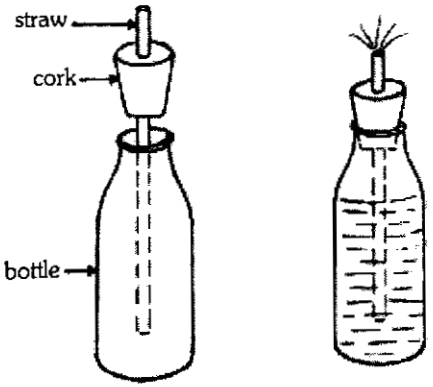
Question : * Did the balls settle down at the bottom?
* Why did they dance?

Experiment no. 54

CHEMICAL FOUNTAIN

Apparatus : Bottle, tight fix cork, dilute HCl, dropper

Procedure : Pass a straw through the hole of the cork and fix it tight. Fill the bottle to about 80% with water. Add 3 spoons of washing soda powder. Then put 20 drops of dilute Hcl by a dropper. Fix the cork tightly on the bottle quickly as shown is the figure. A fountain will come out of bottle.



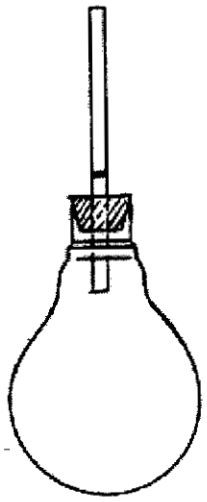
Questions : * Did the fountain start due to any pressure applied on a cork?
* What will happen if the bottle is half filled?

Experiment no. 55

WATER COLUMN THAT GOES UP AND DOWN

Apparatus : Used empty electric bulb, a cork with a hole in the middle, the cork must be tightly fixed in the mouth of the bulb, straw, water.

Procedure : Pass a plastic straw through the hole in the cork. As small part of the straw should come out of the cork. Dip this part of straw in water and wet it. A small column of water will be automatically formed in the straw. Now fix the cork in the bulb as shown in fig. While fixing the cork the column of water in the straw will be pushed up. Dry your hands and hold the bulb in your hands. The water column will automatically go further up.



Remove the hands, the column comes down.

Question : * Why does the column of water rise up while fixing the cork?

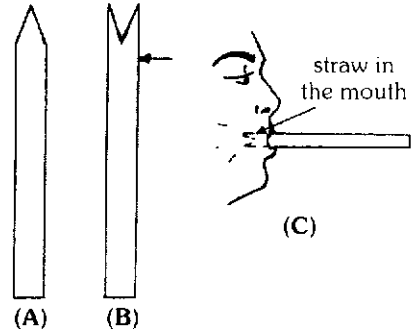
* Why does the column of water comes down after removing the hands around the bulb?

Experiment no. 56

BLOW PIPE OF STRAW

Apparatus : Straw, sharp pointed pair of small scissors.

Procedure : Cut a triangular piece from one end of the straw as shown in figure 'A'. There will be two parts as shown in figure 'B'. Now hold the part of the straw in your mouth up to the arrow shown in fig. 'B'. Do not press the straw by lips but see that air does not escape from the sides of straw (fig 'C'). Now blow through the straw. It will produce sound like an musical instrument. After the same practice go on cutting the straw by 2 cms. each time and blow. Your will hear the change in the sound distinctly.



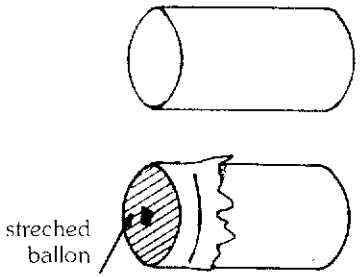
Question : * Why there was change in the pitch of sound when the straw was cut?

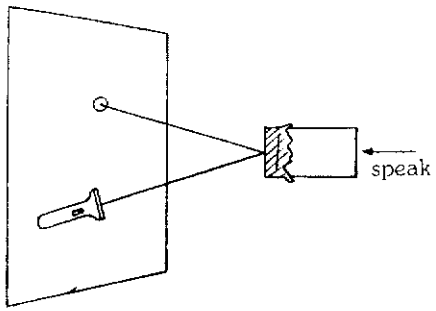
Experiment no. 57

DANCING BEAM OF LIGHT

Apparatus : An empty tin of metal, pencil torch (Laser is preferred), big balloon, a piece of mirror, fevicol, rubber band.

Procedure : Cut the bottom and top of the tin, you get cylinder. Fix a piece of balloon tightly at one end of the cylinder. Stick the small piece of mirror on the piece of balloon by fevicol. Start the experiment after fevicol dries.





Aim a beam of light from the torch / laser on the mirror. Now speak a few words from the other end of the cylinder. See how the ray of light dances after reflecting from the mirror.

Question : * Why did the ray of light dance?

Experiment no. 58

WATER THAT DOES NOT LEAK

Apparatus : Bottle, water, a piece of net cloth, rubber band

Procedure : Fill completely the bottle with water. Then tie two pieces of net cloth tightly with rubber bands on the mouth of the bottle. Now turn the bottle upside down. The water does not leak.

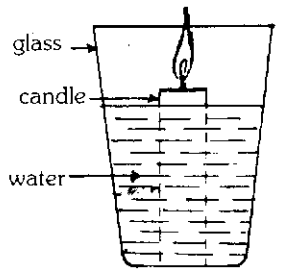
Question : * Why does the water not leak even when the bottle is turned upside down?

Experiment no. 59

CANDLE NEVER SHORTENS

Apparatus : Glass, thick candle, water, match box

Procedure : Take a piece of candle which is little shorter than the length of the glass. Fix the candle at the glass. Now fill water in the glass less by 5 mm in height than candle. Now burn the candle, when the candle burns upto the level of water it goes on burning without reducing in length.

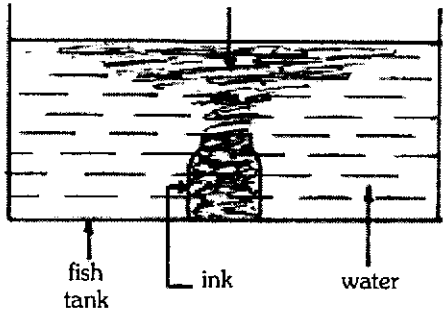


Experiment no. 60

VOLCANO OF COLOURED WATER

Apparatus : Fish tank, water, ink colour, a small bottle, boiling water

Procedure : Pour cold water in the fish tank. Take some hot water mixed with coloured ink in the small bottle. Put the small bottle at the bottom of water very delicately with the help of twine. The coloured water will start coming out over the cold water. It froms a thik layer on the surface of cold water.



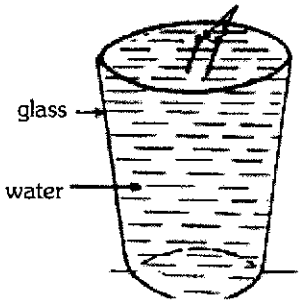
Question : ✶ Why only the upper layer of water is coloured?

Experiment no. 61

MOVING MATCH STICK

Apparatus : Water, glass, sugar candy, match sticks

Procedure : Fill one glass with water. Put two match sticks parallel to each other. Now put a crystal of sugar candy in between the match sticks. The sticks go apart.



Question : ✶ Why did the sticks get apart?

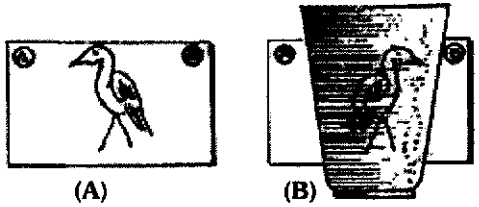
✶ Can you use any other substance instead of sugar candy?

Experiment no. 62

BIRD THAT TURNS ITS HEAD

Apparatus : Glass, water, paper, pencil, pen etc.

Procedure : Take a piece of paper measuring 5 x 5 cms. Sketch a picture of a bird on it as shown in fig 'A'. See the picture through the water in the glass. When the picture is at a particular distance from the glass, the bird in the picture moves its beak. (fig. 'B')



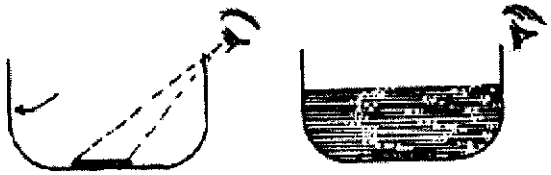
Question : ✶ Why does the bird move its beak?

Experiment no. 63

VANISHING COIN

Apparatus : Small metal bowl, water, coin.

Procedure : Keep the coin at the bottom of the bowl. One can see the coin if seen at an angle as shown in the figure.



Keep the eye in the same position and pour water in the bowl. The coin vanishes.

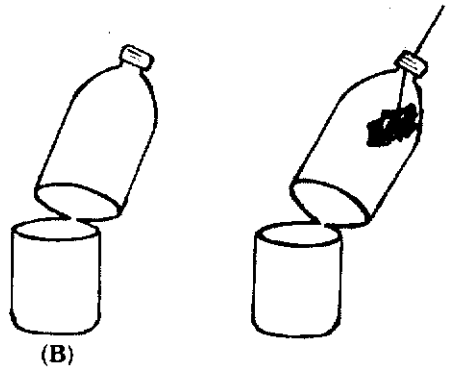
Question : ✶ Why the coin vanishes?

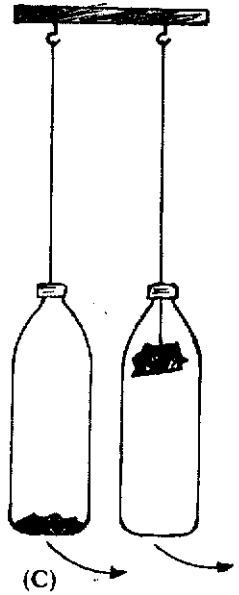
Experiment no. 64

DIFFERENT SWINGS BUT SAME LENGTHS

Apparatus : Twine, two botties of one litre capacity each, stones, a door hook

Procedure : Keep the stones at the bottom of one of the bottles. Fix it with wax. Tie a twine to the cork of the bottle (figure 'A'). Keep the stone in the other bottle in such a way that it remains suspended. (If necessary you can cut the bottle but not completely (fig. 'B') Now pull out the twine





with stone through the cork – stick the cut bottle. Now hang both the bottles on the book of the door, see to it that the length of twine in both bottle is same. (fig. 'C'). Now move the bottles away from each other at the same time.

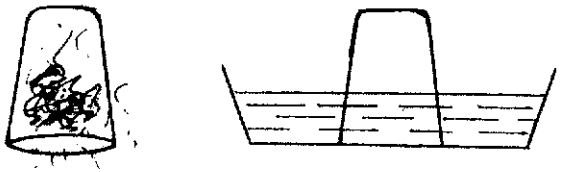
Question : ✱ Why is time of the pendulums not same?

Experiment no. 65

WATER RISES IN THE GLASS

Apparatus : Flat shallow vessel, water, matchbox, paper etc.

Procedure : Burn a few paper in a glass.



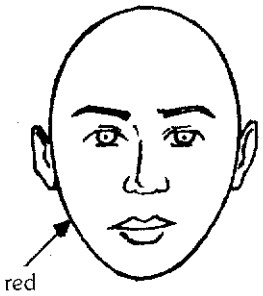
Throw away the burnt paper and put the glass with bottom up in water placed in the flat vessel. The water rises in the glass. Keep some ice on the glass or pour cold water on the glass. The water will rise to greater height again.

Question : ✱ Why does water rise?

Experiment no. 66

INVISIBLE FACE

Apparatus : Paper, red and blue pencil, red and blue coloured gelatin paper.



Procedure : Draw the out line of a human face in light colour on the paper. Draw eyes, nose and lips in side out line of the face by a light blue pencil.

Put red gelatin paper and see. Eyes, nose, lips disappear or vanish.

(The colours used should be very light. Still if you do not see the effect referred above then fold the gelatin paper twice, thrice or even four times and then see through.)

Experiment no. 67

PENCILS THAT DO NOT MEET

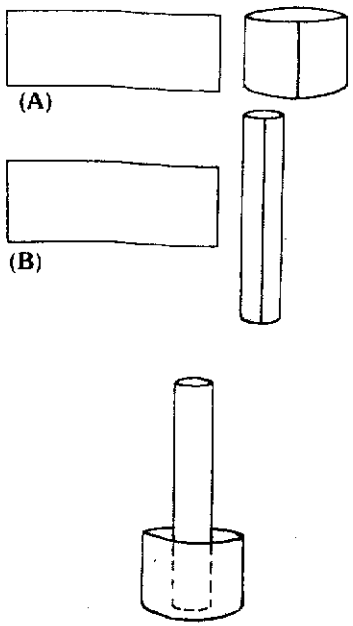
Apparatus : Two sharpened pencils

Procedure : Take a pencil in each hand. Bring the sharp ends of the pencils near each other by keeping your hands straight or

without bending at the elbow. The two ends of the pencil meet each other, when moved near each other. Do the same thing by closing one eye. It will be difficult to meet the ends of the pencils with one eye only.

Experiment no. 68

SAME AREA BUT DIFFERENT VOLUMES



Apparatus : Paper (if possible two old post card, cello tape and sand / mustard seeds.

Procedure : Prepare a cylinder of the one of the post cards from its breadth as shown in the figure (figure 'A'). The second card should also be formed into a cylinder by using is length (figure 'B'). While doing this bring only the edges of the cards near each other and stick by cello tape. Do not overlap the edges.

Then keep the narrow cylinder in the broad cylinder. Fill the narrow cylinder with sand upto the full. Now lift the narrow cylinder so that the sand will fall into the broad cylinder. The broad cylinder will not be filled upto to its capacity. There will be empty spaces.

Question : ✶ The area and size of the cards are same. Still the volumes of the cylinders are different. Why?

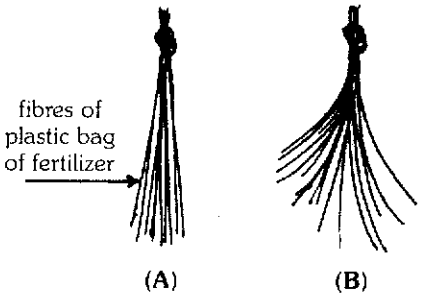
Experiment no. 69

THE CHOWN THAT BLOOMS

Apparatus : Fibres of the plastic bag used for fertilizers

Procedure : Tie the fibres together at one end. It possible take long strips and tie them at one end by making a knot of the fibres (figure 'A')

Now hold the rope by its knot in your fist. Rub the other end on the ground. The fibres fall a part as shown in fig 'B'.

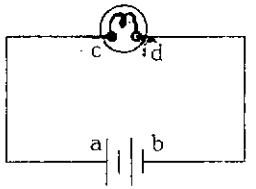


The hands must be clean and dry while doing the experiment (the period from December to February gives you better results due to dry season.)

Experiment no. 70

WHEN A BULB LIGHTS?

Apparatus : 2.2 volt bulb with its holder, copper wire, 2 dry cells, screw driver



Procedure : Arrange the bulb, copper wire and dry cells as shown in the figure. Join one end of wire to the positive end at a and join the other end of the wire to the screw of the holder at 'c'.

Take another wire and join it at the negative end of the dry cell (b) and the other end of the wire to the other screw of the bulb holder at 'd'.

This connection is known as "Electrical circuit"

When the circuit is completed the bulb gets lighted. We have joined the wire in the circuit at four (a, b, c, d) points. Remove one wire from one of the points. Does the bulb light? Try all the points like this one after the other and see whether the bulb gets lighted. Note it.

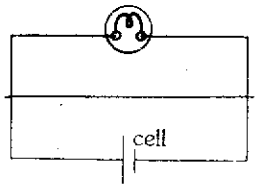
Question : ✶ Why the bulb lights only when the circuit is completed?

Experiment no. 71

SHORT CIRCUIT

Apparatus : 2.2 volt bulb with holder, copper wire, Dry cells, screw driver

Procedure : Prepare an electrical circuit as shown in expt. 70. The bulb gets lighted. Now take another wire and join to the two wires as shown in the figure. Does the bulb get lighted? Repeat the process and note your reading.



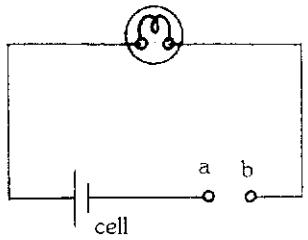
In this experiment a third wire is connected to the two wires and therefore there was the 'Short circuit'. The filament in the bulb has more resistance than the thick wires and the current therefore passes through the thick wires.

Experiment no. 72

CONDUCTOR AND RESISTER OF ELECTRICITY

Apparatus : Bulb with holder, dry cell, copper wire, screw driver, pin, paper, plastic, nail, wood, metal piece.

Procedure : Arrange wires, bulb and cells as shown in the figure (prepare a circuit) Join a and b in the connection. The bulb lights. If a and b are separated, the connection is cut and bulb does not light. Join the a and b ends of the wire to a nail. Note whether the bulb lights or not. Try metal spoons, metal pieces, plastic pieces, wooden piece etc. to end a and b. Does the bulb lights each time? Note it.



Observation :

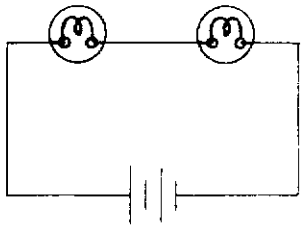
The bulb gets lighted different things	The bulb is not lightsed different things

Question :
- ✶ What is the speciality of the things?
- ✶ Which things lighted the bulb? Are they metal or non metals.
- ✶ What will you call the things that did not light the bulb? Metals or non metals?
- ✶ The bulb gets lighted with only certain things? Why?

Experiment no. 73

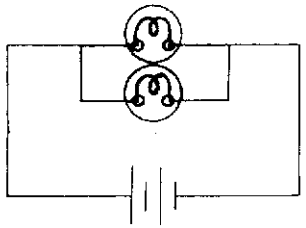
CIRCUIT IN SERIES AND PARALLEL

Apparatus : Two bulbs with holder, wire, dry cell circuit in series.



Procedure : Connect bulbs, dry cells and wire as shown in the figure. Both the bulb get lighted. Are they shining with the same intensity? Remove one bulb from the circuit. Does the second bulb get lighted?

Circuit in parallel



Procedure : Connect the bulbs, cells and wire as shown in the figure. When the circuit is complete do both the bulbs get lighted. Do they have same intensity? Remove one bulb from the circuit. Does the second lamp get lighted?

Question : ✶ Note down the differences between the circuits in series and in parallel.

Circuit in series	*Circuit in parallel*

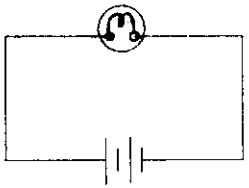
What kind of circuit is used in house?

Experiment no. 74

INTENSITY OF THE BULB LIGHT

Apparatus : A bulb of 2.2 volt, wire, 4 cells.

Procedure : Connect bulb, wire and one cell as shown in the figure. Observe the intensity of the bulb carefully. Now connect the other cell. Observe if there is any difference in the intensities of the two bulbs. It the number of cells is increased does the intensity change?



Observation : As the number of cells goes on increasing the intensity of the light increase / decreases.

(*Note* : It more than three cells are used it is likely that the bulb will fuse out)

Answers

EXPERIMENT BASED ON BERNALI'S PRINCIPLE

(Experiment nos. 2, 9, 20, 21, 22)

In experiment no. 9 : the figure 1 (A)

When the straw is in water the pressure on the surface of water and even on the straw is the same.

When we drink a cold drink (fig. 1 B) the air pressure in the mouth is reduced, that reduces the pressure in the straw. (the pressure on water or liquid or drink surface is more.) then water or cold drink is sucked up.

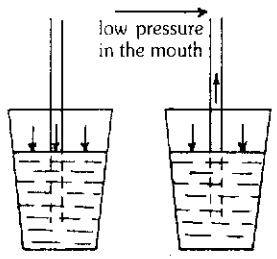


fig. 1 (A) **fig. 1 (B)**

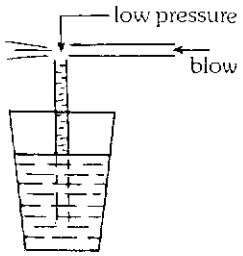


fig. 1 (C)

In experiment No. 9 : The water comes up through the straight vertical straw. This means that the air pressure at open end of the straw is reduced. When you blow air the air molecules are driven away with the blow and water comes up.

The pumps used in homes to spray insecticides works on the same principle. Observe it carefully.

Experiment No. 2 : The paper strip is lifted up in the same way.. The air pressure on the upper surface of the strip is reduced. The air pressure on the wings of an aeroplane is reduced in the same way and aeroplane gets lifted.

In experiment 20 : Due to blowing of air in the funnel, the air escapes from sides of the ball. When the air is escaping, the ball sucks the air up. So a low pressure area is created and to fill it, draft of air comes as shown in figure 1 (D). This draft of air balances the ball.

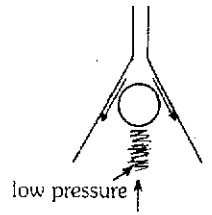


fig. 1 (D)

Experiment No. 21 : The fact that the flame bends towards funnel is the proof of the principle stated above.

Experiment No. 22 : The bending of the flame towards bottle in the first part is the same as above. Due to the round shape of the bottle, the draft of air blows away as shown in figure 1 E. An area of low pressure is created. To compensate this low pressure, air draft comes from the opposite side and the flame turns towards the bottle.

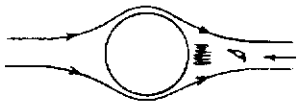


fig. 1 (E)

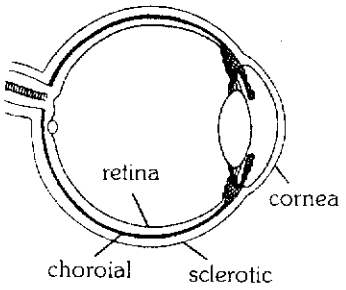
EXPERIMENTS BASED ON EYE AND LIGHT

(Experiment nos. 3, 4, 5, 6, 17, 67)

In experiment No. 3 : If you see by the right eye only through the cylinder, you only see the hole. While you see the palm of the hand when seen by left eye only. When seen by both the eyes, a hole is seen in the palm of the hand.

Eye receives light from outside. The meaning of images is derived at in the brain. In this experiment the two images from the two eyes are synchronized.

Experiment No. 4 : There are light sensitive cells in the retina. The image is sent by the optic nerves to the sight area of the brain. The light entering the eye is focused on the retina. But when the nerves starting from sensitive cells get together on the opposite side of lens of the eye there are no sensitive cells at that point.



In experiment no. 4 – the image falls exactly at this point. As there are no nerves of the sensitive cells, the message does not reach the brain. This is known as 'Blind spot'.

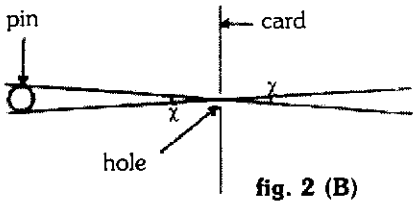


fig. 2 (B)

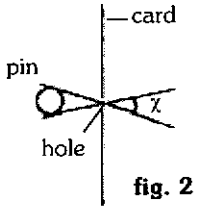


fig. 2 (C)

In experiment no. 5 : When the pin is away from the hole in the card, the rays coming from both ends of the pin form an acute angle. See fig. 2 B. It the pin is nearer the pore. The same rays form a wide angle. That is why the pin appear thick (fig. 2 C).

In experiment no. 6 : Fig. 2 (D), (E), (F) two rays are shown coming to the eye. There are a number of rays in between these two rays. See

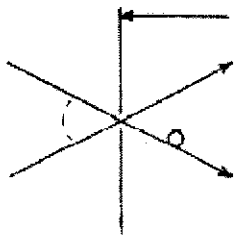


fig. 2 (D)

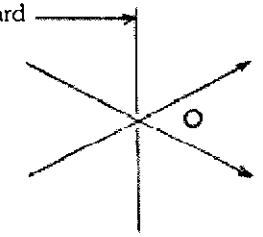


fig. 2 (E)

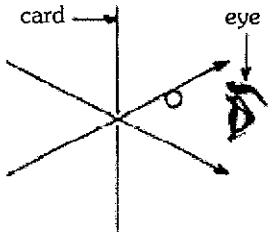


fig. 2 (F)

the position of pin in fig. 2 D. The rays coming from the left are obstructed by the pin. In fig 2 E. the rays coming from front, and in fig 2 F the rays coming from right side are obstructed by the pin. This results in obstructing the rays. As in fig 2 D if the pin is shifted to A, B, C, rays A, B, C get obstructed and still we feel that pin is at those points.

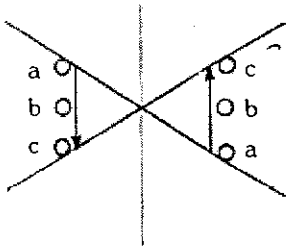


fig. 2 (G)

In experiment no. 17 :
If too much light enters the eye, the retina gets damaged. Our eye has received special sets of muscles through evolution. The muscles contract the pupil when there is more light. When little light enters the eye, the muscles of the pupil relax making hole bigger.

fig. 2 (H)

When you enter from bright lighted place in your house or class, they appear dark because the pupils have contracted in the bright Sun. When you enter the house, the pupils have not yet dialated, that is why you do not see very clearly in the room.

During total eclipse of the Sun, the pupil dialates. So when the totality moves and starts exposing the Sun, a number of Sun rays enter in our eyes, because the pupil does not get time to contract. That is why you must put dark coloured goggles before the first rays of the Sun are radiated.

Why did Bharat Ratna Dr. C. V. Raman used to enter in the dark room before starting his experiments in the room?

In experiment no. 67 : The two eyes give you the depth of the object. The object is seen by the two eyes from the light rays coming from different angles. That is why you feel the depth.

The ends of the pencils meet when both the eyes are open.

Can you pass a thread through the eye of the needle by using only one eye?

EXPERIMENTS BASED ON REFLECTION & REFRACTION

(Experiment nos. 13, 14, 15, 16, 18, 19, 63, 66)

Experiment no. 13 : In plane mirror the image at the back is at the distance of the object in front. As shown in fig. 3 A the rays from the glass come to us. While rays from the flame of the candle are reflected from every part of the surface of the glass. But when the distances

between the flame and the glass and from the glass to water glass are same then the reflected rays from the flame and glass come from the same direction. In such condition Incident ray A and reflected ray B are of the same angle.

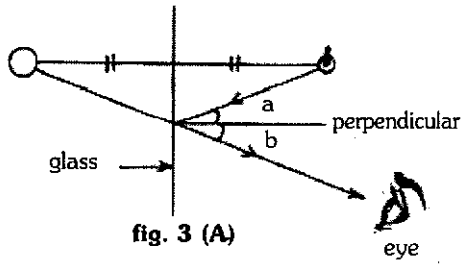


fig. 3 (A)

Experiment no. 14 : Some part of the straw is in air. From this part the rays come straight to the eye. But rays coming out the fish tank into the air (from dense to rare atmosphere) as shown in fig. 3 B. deviate from the perpendicular and then came to the eye. Thus rays coming from two directions give us the feeling that the part of the straw in the air is broken at the surface.

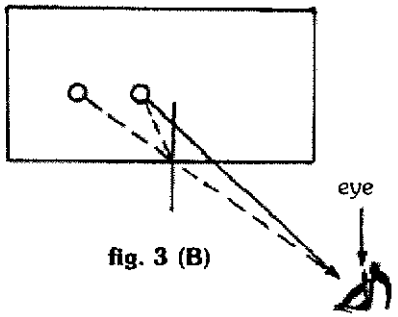


fig. 3 (B)

Experiment no. 15 : There is rare medium outside the bulb and dense (water) medium in side the bulb. Due to circular surface, the perpendiculars coming from this medium are like radii.

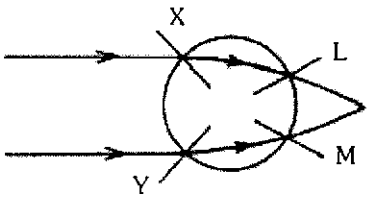


fig. 3 (C)

The rays bend at 'X' and 'Y' from the perpendicular. When they come out of water, go away from the perpendicular at 'L' and 'M' (i.e. from dense to rare medium) Due to circular surface and refraction a convex lens is formed.

Experiment no. 16 : There is dense medium (water) out side the

bulb and rare medium (air) in side. This forms a concave lens.

Experiment no. 18 : Fig. 3 D shows that the acute incident ray becomes obtuse incident ray in its passage. The angle goes on increasing in the beginning. When it is right angle the incident ray is called 'critical ray'. Then the ray travels without refraction back to the water. This is called total internal reflection. It is because of this that we do not see the pin in experiment 19.

Experiment no. 63 : The disappearance of the coin in this experiment is due to the above reason.

In experiment no. 66 : Red gelating paper absorbs red letters and blue gelating paper absorbs blue letters.

In Experiment no. 7 : The letters having symmetrical axis are really inverted but still they appear like the original ones.

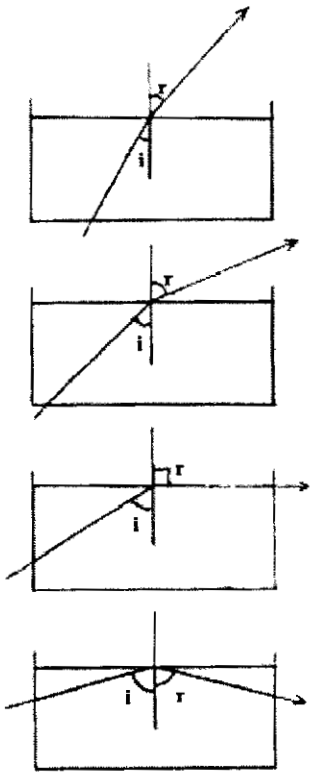


fig. 3 (D)

EXPERIMENT BASED ON AIR PRESSURE

(Experiment nos. 23, 24, 25, 26, 27, 28, 29, 30, 31, 34)

Experiment no. 23 : When you blow in the test tube there is no space for the air to comeout. So the force in air reflects back in the same force and thus brings out the chalk.

Experiment no. 24 : By the same reason the flame of candle does not extinguish. There is air already inside and therefore the outside air cannot enter. In Konkan area people used to carry lighted candle in the kernel (shell) of the coconut. It could be used as a torch. Even in a storm the candle does not extinguish.

In experiment no. 25 : As there in air in the glass, the water cannot enter inside.

In experiment no. 26 : We catch the air bubbles from glass 'B' in the glass 'A' and fill it with air.

Experiment no. 27 : A mere gentle blow of air, the pressure in not felt. But when we lock the air, molecules come together. Therefore one can lift a few books or even a small child can be lifted up. Such type of air jacks were used in the past for small cars.

In experiment no. 28 : The air that is already in the bottle does not allow the balloon to blow up.

In experiment no. 29 : The force of gravity acts on the column of the water. To balance this force the air pressure in the mouth has to be reduced. We do not take care while inhaling the air during breathing to keep this pressure low.

Experiment no. 30 : There is air already in the test tube and therefore water cannot enter. If the water is to be put inside then one has to see that air has a passage to go outside. Same principle is used in.

In Experiment no. 31 : When the finger is removed from the upper hole, the air can enter in and the water drops from the lower parts or holes.

In Experiment no. 34 : In the first part there is a pressure of air on the water (fig. 4). But when air is sucked through the tube, the water enters in stages. When the level of this water goes down level of water in the glass, it comes down due to gravity and starts pulling water.

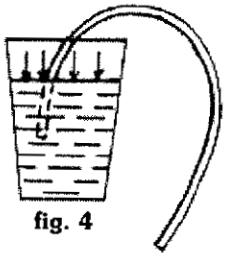


fig. 4

EXPERIMENTS BASED ON CENTRE OF GRAVITY

(Experiment nos. 32, 33, 64)

In Experiment no. 32 : In absence of the hammer the meter ruler would drop down in the direction of the arrow (fig. 5 (A); and the hammer would have come down in reverse (fig. 5 B). The movement of hammer

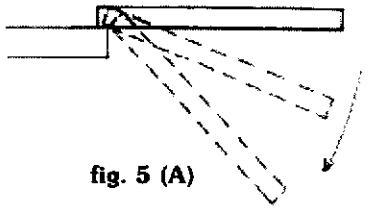


fig. 5 (A)

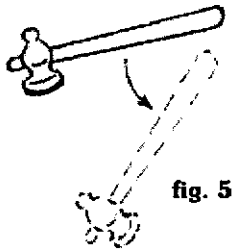


fig. 5 (B)

in reverse direction resists the movement of the meter ruler. The center of gravity of meter ruler and the hammer remain inside the table.

In Experiment no. 33 : In this, the center of gravity of the pencil and compass comes down. This also goes below the tip of the finger. That is why the pencil remains straight. Even if you move it, the center of gravity goes up and pulls the pencil down. Figure 5 C.

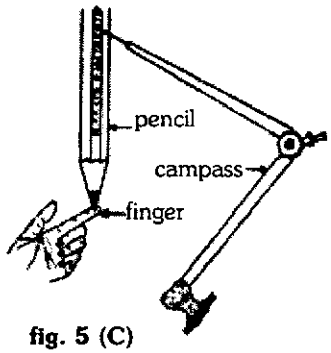


fig. 5 (C)

In experiment no. 64 : The weight (stone) in the pendulum formed by bottle goes to different places and therefore the portion of its center of gravity changes. The length of the pendulum in measured from its center of gravity.

EXPERIMENT BASED ON HEAT

(Experiment nos. 7, 8, 46, 47, 48, 49, 50, 51, 55, 60, 65)

Experiment no. 7 : The coin absorbs heat. That is why the ignition point temperature of the twine is not reached. The twine is thus not burnt. Experiment no. 8. Even it the thread is burnt still the crystals of torsion keeps the thread together.

In Experiment no. 46 : The metal wire expands due to heat and the weight touches to the paper.

Experiment no. 47 : Air in the bulb expands and the circuit is completed which lights the bulb.

Experiment no. 48 : The bimetallic strip is the starter expands due

to heat. The two different metals in the strip expand differently and the strip therefore bends and touches the side tape and thus the circuit is completed.

Experiment no. 49 : Lithium metal in tobacco works as a catalyst and increases the heat. Heat goes up to the ignition point temperature of the sugar and thus the sugar burns with a flame.

Experiment no. 51 : When both the hands are rubbed, the heat produced is sufficient to start the reaction between salammonia and lime.

Experiment no. 50 : Due to heat, the carbon in the milk or lime juice burns thus the written letters become visible.

Experiment no. 55 : The air in bulb is expanded due to heat and the column of water rises up.

Experiment no. 60 : When water is heated it expands and its density is reduced. It starts moving up looking like a volcano.

Experiment no. 65 : When a lot many papers are burnt, the glass becomes hot. The air also becomes hot. Air expands (A puree when released) in hot oil it blow. A chapati also blows when it is baked. The milk when heated overflow.) When the glass is kept in water the heat reduces. The heated air contracts and the water rises considerably. When a candle is burnt in a up turned glass, the water rises due to heat. This experiment has nothing to do with the proportion of oxygen in the air.

EXPERIMENT BASED ON DENSITY

(Experiment nos. 11, 38, 39, 60)

Experiment no. 11 : The density of egg is more than that of the water and thus it sinks. The density of salt or sugar solution is more than water. It the density is higher than that of the egg then the egg does not sink because its upwards force is higher.

Experiment no. 38 : The density of the boat with stones is less than the water density. But the density of the stone alone is more than that of water. When the stones are in the boat, a large part of the boat is under water. Its size is quite big. When the stones are removed from the boat the most of it or the vessel comes above the surface of water.