(B) By using universal indicator

ocedure :

(1) Take eight clean and dry test tubes. Label the test tubes serially as 1 to 8 and place them in the same order in a test tube stand. Take 10 ml of each given sample in the test tubes.

(2) Add two drops of (BDH) universal indicator with the help of a dropper to each test tube. [BDH – British Drug House]

(3) Observe carefully the colour of the solution in each test tube and match it with different colour shades given on the universal indicator bottle (or refer cover 3 of this book).

(4) Note the pH given against the colour which tallies with developed colour in the solution of each sample.

ervation table :

Use of universal indicator

Sr. No.	Sample	Colour produced	Approximate pH
1	Dilute HCl	Red	1
2	Dilute NaOH solution	dark blue	14
3	Lemon juice	orange	2
4	Distilled water	green	7
5	Acetic (ethanoic) acid solution	orange	3
6	Sodium sulphate solution	green	7
7	Ammonium chloride solution	light blue	8
8	Sodium bicarbonate solution	light blue	9

sion :

idic solutions (with pH less than 7) : _____

sic solutions (with pH more than 7) : _____

ral solutions (with pH=7) : _____

_____

Teacher's Signature : _____

* * *

Observations : The approximate focal length of the given concave mirror = ... cm.

u (cm)	v (cm)	$f = \frac{uv}{u+v}$	Average $f = \frac{f_1 + f_2 + f_3}{3}$
		f_1 = ... cm	
		f_2 = ... cm	
		f_3 = ... cm	

Result : .....

[**Sign convention :** According to the Cartesian sign convention, the distances u and v are negative case. Also, the focal length of a concave mirror is negative.]

Method 2 : To find the focal length of a concave mirror by using a distant object

Aim : To find the focal length of the given concave mirror by using a distant object (approximate met

Requirements : A concave mirror, a mirror stand, a screen with a stand, a metre scale.

Procedure :

(1) Mount a concave mirror in the holder.

(2) Select a distant object like an electric pole. Turn the reflecting surface of the mirror towards it

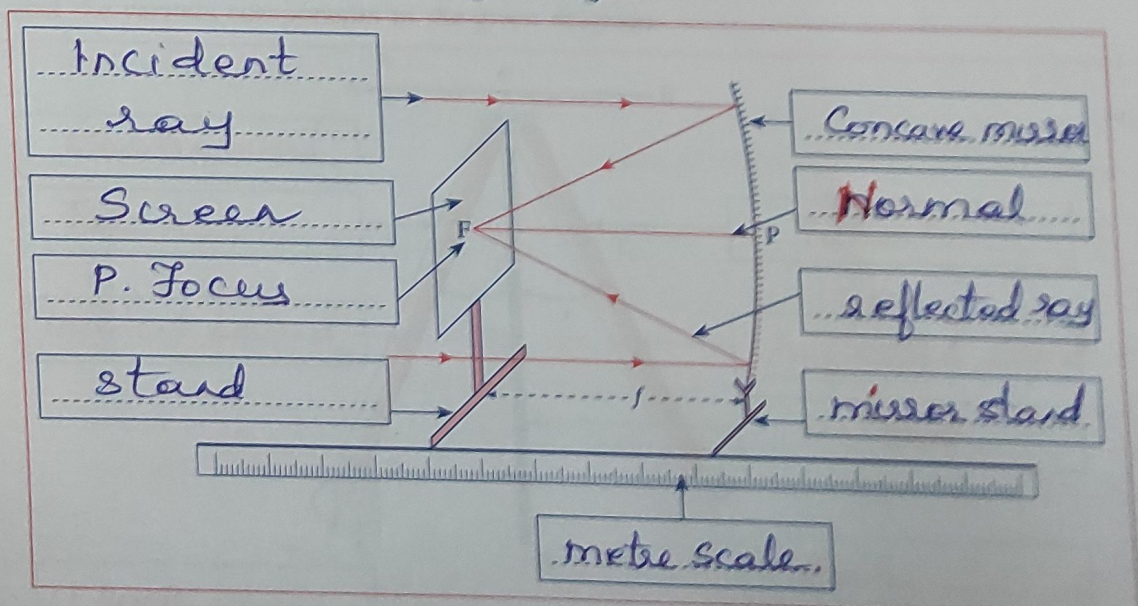
(3) Mount a white screen in the screen holder and place it in front of the mirror.

(4) Move the screen towards or away from the mirror and obtain a sharp image of the object.

(5) Measure the distance between the pole (P) of the mirror and the screen (image).

(6) Repeat the procedure by selecting two more distant objects like a tree, a house, a telephone p

Diagram : Label the various components in the given diagram.



Focal length of a concave mirror

Observation table : Least count of the metre scale : ..... mm.

Distant object	Distance between the pole of the mirror and the image
Window	d_1 = ...6... cm
"	d_2 = ...5... cm
"	d_3 = ...6... cm
	Mean distance = $f = \frac{d_1 + d_2 + d_3}{3}$ = ... cm

Result : ...i. The focal length of the given concave mirror is .....

Sign convention : According to the Cartesian sign convention, the focal length of a concave mirror is ne

Date : _____

Teacher's Signature : _____

* * *

Experiment 10

Study of reflection of sound

Aim : To study the reflection of sound (by clock and ear method).

Requirements : A wooden drawing board, drawing paper, drawing pins, two wooden planks with smoo surfaces, two long and hollow tubes (of metal, plastic or cardboard), a clock or watch (the ticking of whic can be heard clearly), a protractor.

Procedure :

(1) Fix a drawing paper on the wooden board using drawing pins. Draw a line AB on the drawing pap and the normal CD at a point C on line AB as shown in the figure. Place one of the wooden planks a line AB (this plank is the reflector) and the other on the line CD (this plank is the screen) such th they are separated by a small distance and their planes are vertical.

(2) Place one of the tubes (T_1) on the paper, inclined to the normal at a suitable angle and directed toward point C.

(3) Place the clock or watch near the mouth of tube T_1.

(4) Place the second tube (T_2) on the other side of the wooden plank used as a screen and direct it toward point C.

(5) Hold your ear close to the mouth of tube T_2 and adjust the inclination of T_2 to normal CD in such way that the ticking sound of the clock (reflected by the reflector) is heard loudly and clearly.

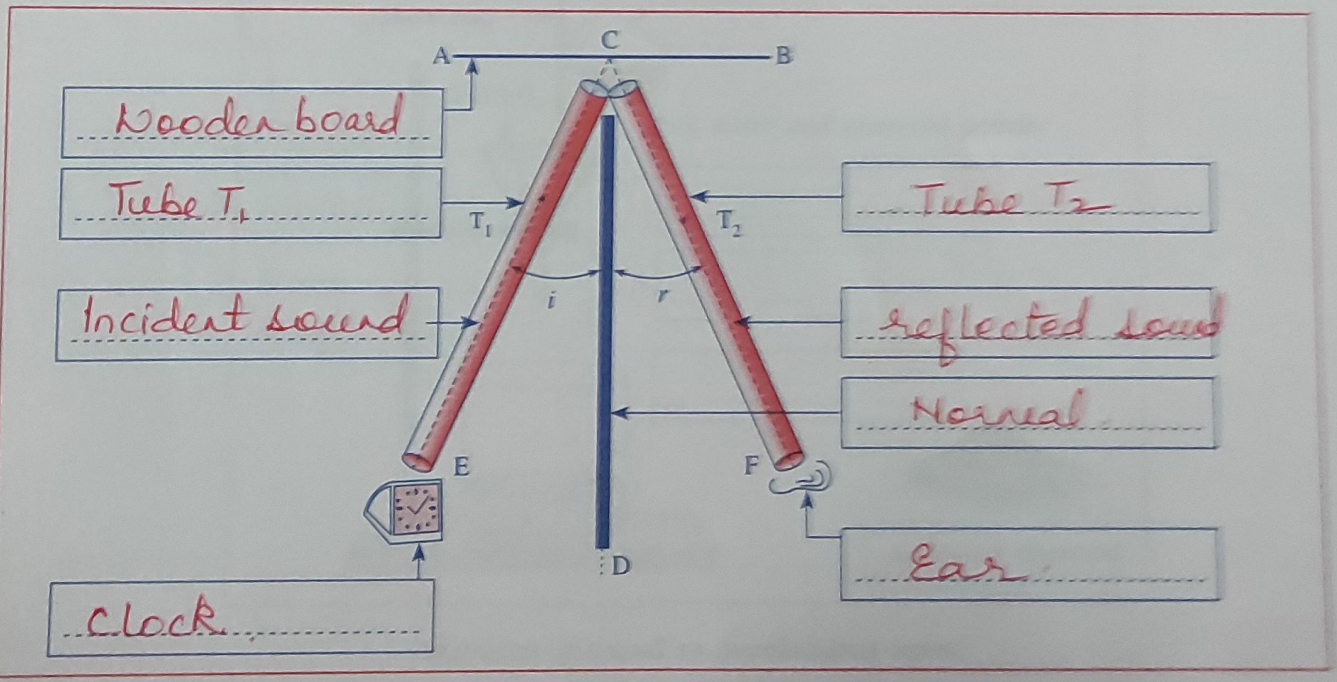
(6) Mark the points E and F along the axes of the tubes. Remove the tubes and the screen. Draw the lin EC and FC.

(7) Measure the angle of incidence (i), i.e., $\angle$ ECD, and the angle of reflection (r), i.e., $\angle$ FCD, of the soun

(8) Repeat the experiment twice for different inclinations of tube T_1. Tabulate your observations of i and

(9) Find the relation between the angle of incidence and the angle of reflection.

Diagram : Label the various components in the given diagram.



Reflection of sound

Observation table :

Angle of incidence (*i*)	Angle of reflection (*r*)
30°	30°
40°	40°
50°	50°
60°	60°
70°	70°

Conclusion : The direction of incident sound wave & reflected sound wave ~~are~~ make equal angles with the ⊥ to the surface & all these three lie in the same plane.

Date : _____

Teacher's Signature : _____

* * *

Experiment 13 — To prepare and study the properties of carbon dioxide gas

Aim : To prepare and study the physical and chemical properties of carbon dioxide gas.

Apparatus : Round bottom flask (250 ml), two-holed rubber cork, thistle funnel, four gas jars with lids, delivery tube, stand, clamp, pair of tongs, deflagrating spoon, candle.

Chemicals : Calcium carbonate (Shahabad stone pieces/marble pieces/lime stone), dilute hydrochloric acid (HCl), blue and red litmus papers, freshly prepared limewater, magnesium wire.

Procedure :

(1) Take a few pieces of Shahabad stone ($CaCO_3$) (about 10 g) in a round bottom flask.

(2) Fix a rubber cork bearing a thistle funnel and a delivery tube to the flask. Arrange the apparatus as shown in the figure. (Show it to the teacher/examiner.)

(3) Insert the open end of the delivery tube in a gas jar and cover the jar with the lid.

(4) Add some dilute HCl through the thistle funnel in such a way that CO_2 is formed gradually and the lower end of the thistle funnel is fully immersed in the acid.

(5) Allow the gas to escape for a while with the air in the flask. Then collect the gas in four jars by the upward displacement of air.

(6) Introduce the moist blue and red litmus papers in the first gas jar.

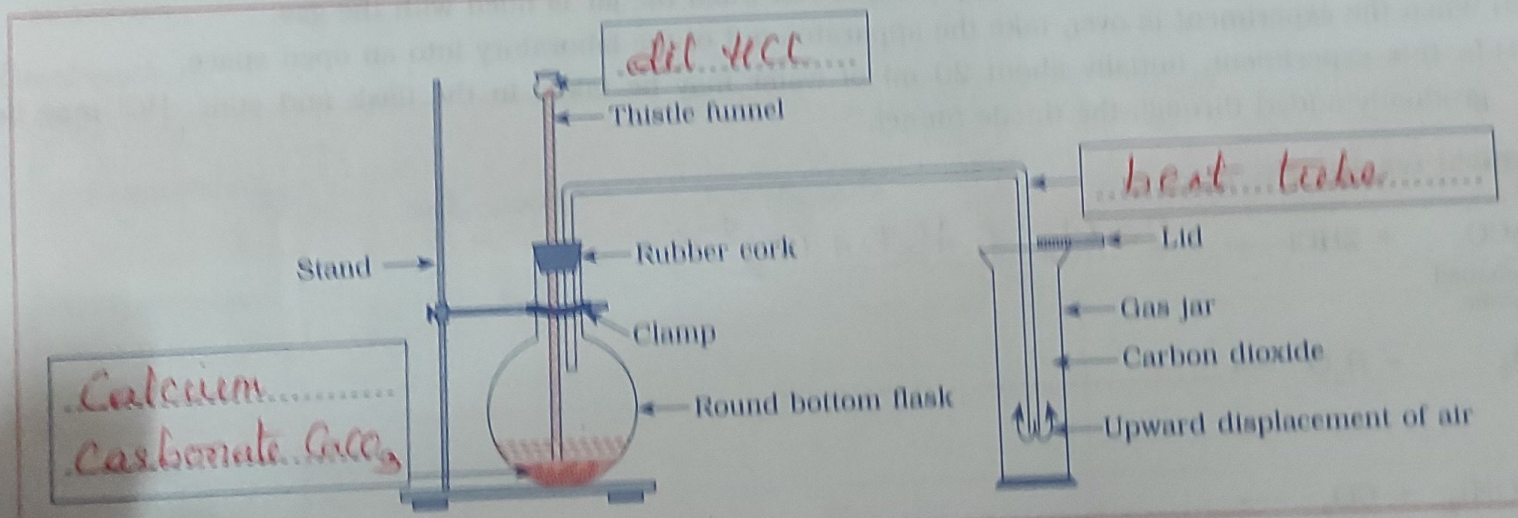
(7) Drop a small amount of solution of a universal indicator in another gas jar and shake it.

(8) Insert an ignited candle in the third gas jar.

(9) Pour some freshly prepared limewater in the fourth jar and shake it well.

(10) Record your all observations in the table.

Diagram : Label the various components in the given diagram.



Preparation of carbon dioxide

Study of the properties of carbon dioxide

Test No.	Test	Observation	Conclusion
1	(i) Colour of the gas. (ii) Smell (smell the gas from a distance.) (Caution!)	colourless odourless	acidic in nature
2	Effect of the gas on moist red litmus paper followed by a moist blue litmus paper.	red remains red blue turns red	
3	Effect of gas on universal indicator.	turns orange	
4	Effect of the gas on a burning candle.	extinguishes	
5	Effect of the gas on fresh lime water (for a short time).	turns milky	

Notes :

(1) Fit the thistle funnel to the flask in such a way that its lower end is slightly above the bottom of the flask.

(2) In order to make out whether the gas jar is filled with the gas, place a moist blue litmus paper at the mouth of the gas jar. The litmus paper turns red when the jar is filled with the gas.

(3) When the experiment is over, take the apparatus out of the laboratory into an open space.

(4) In this experiment, initially about 20 ml of water may be taken in the flask and conc. HCl may be gradually added through the thistle funnel.

Chemical reactions :

$CaCO_3$ (Shahabad stone) $+ 2HCl \longrightarrow CaCl_2 + H_2O + CO_2 \uparrow$.

$CO_2 + H_2O \longrightarrow$ .....

$Ca(OH)_2$ (Lime water) $+ CO_2 \longrightarrow$ .....

Date : _____

Teacher's Signature : _____

* * *

Experiment 13 : Using Litmus paper/pH paper, study the properties of salt (NaCl), baking soda ($NaHCO_3$) and washing soda ($Na_2CO_3.10H_2O$)

sing Litmus paper/pH paper, study the properties of salt (NaCl), baking soda ($NaHCO_3$) and washing ($Na_2CO_3.10H_2O$).

aterials : Salt (Sodium chloride – NaCl), Baking soda (Sodium-hicarbonate – $NaHCO_3$), Washing soda ium carbonate – $Na_2CO_3.10H_2O$) Litmus paper, pH paper, watchglass, etc.

ure :

three separate watchglasses, take approx. 1 gram each of salt, baking soda and washing soda espectively.

Keep these watchglasses on table and observe these compounds carefully after 30 minutes.

low prepare aqueous solutions of these compounds. Use litmus paper to test these solutions.

Add one or two drops of aqueous solutions of these compounds on pH paper.

Keep pH paper strip on white tile. Compare the colour shades and check the pH of these compounds salt, baking soda and washing soda.)

vation :

No.	Compound	Initial observations	Litmus test	pH of solution
1	Salt (NaCl)	Nature : crystalline	Blue litmus – No change Red litmus – No change	7
2	Baking soda ($NaHCO_3$)	Nature :	Blue litmus – No change Red litmus – turns blue	8
3	Washing soda ($Na_2CO_3.10H_2O$)	Nature :	Blue litmus – No change Red litmus – turns blue	11

the basis of observations and other tests, the properties of salt, baking soda and washing soda are follows :

clusion :

Properties	Compounds		
	Salt (NaCl)	Baking soda ($NaHCO_3$)	Washing soda ($Na_2CO_3.10H_2O$)
(1) Hygroscopic			✓
(2) Acidic			
(3) Basic		✓	✓
	7	8	11

Teacher's Signature : _____

* * *