Formative Assessment - I

(2023-2024)

PHYSICAL SCIENCE

VIII, IX, X Classes

Experiments/Lab activities & Projects

Special Edition

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8th CLASS

Experiments -1:

Aim: Electrostatic force comes into play even when the bodies are not in contact.

Materials required: Two plastic straws, Thread, A sheet of paper,

Procedure: 1) Take equal lengths of two plastic straws.

2) Suspend one of the plastic straw from the edge of a table with the help of a piece of thread.

3) Now hold the other plastic straw in your hand and rub its free end with a sheet of paper.

4) Bring the rubbed end of the straw near the suspended straw.

5) Make sure that the two plastic straws do not touch each other.

6) We observed that, two straws are attracting each other.

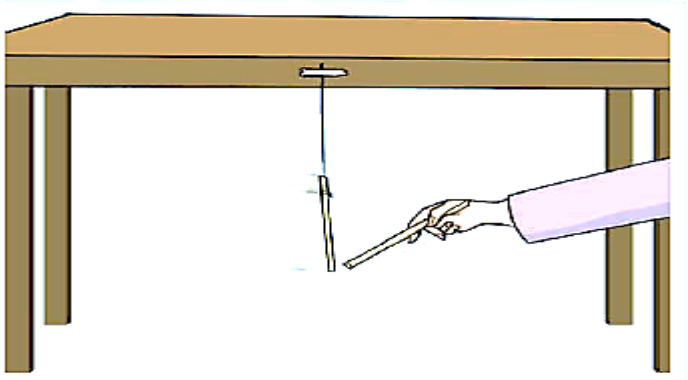
7) A straw is said to have acquired electrostatic charge after it has been rubbed with a sheet of paper. Such a straw is an example of a charged body.

8) Next, rub the free end of the suspended piece of straw with a sheet of paper.

9) Again, bring the piece of straw that was rubbed earlier with paper near the free end of the suspended straw.

10) We observed that, two straws are repelling each other.

11) Two plastic straws acquired same electric charge.



Conclusion: Electrostatic force comes into play even when the bodies are not in contact. The electrostatic force, therefore, is another example of a non-contact force.

Experiments -2:

Aim: Pressure exerted by liquid at the bottom of the container depends on the height of its column.

Materials required: Transparent container, Water Ruler or measuring tape, Spring balance or pressure gauge, Stopwatch or timer

Procedure:

1) Place the transparent container on a flat surface.

2) Fill the container with water, ensuring it is completely filled to the brim.

3) Use a ruler or measuring tape to measure the initial height (h1) of the water column from the base of the container to the surface of the water.

4) Attach the spring balance or pressure gauge to the bottom of the container, ensuring it is securely fastened.

5) Start the stopwatch or timer.

6) Observe and record the reading on the spring balance or pressure gauge, which

indicates the pressure exerted by the liquid at the bottom of the container.

7) Measure the final height (h_2) of the water column after a specific time interval (Ex: 30 seconds).
8) Repeat steps 5-7 for different time intervals (Ex:1 minute, 2 minutes) while keeping the initial height constant.
9) Repeat steps 3-8 for different initial heights (h_1) by adding or removing water from the container.

S.No	h_1	h_2	$\Delta h = h_2 - h_1$

Conclusion: This experiment confirms that the pressure exerted by a liquid at the bottom of a container does depend on the height of its column.
By measuring the pressure at different heights and observing the corresponding changes, we can see a direct relationship between the two variables.

Experiments -3:

Aim: Pressure exerted by liquid at the bottom of the container depends on the height of its column.

Materials required: Transparent glass or a plastic pipe, Water, A piece of thin sheet of rubber

Procedure:

1) Take a transparent glass tube or a plastic pipe.
2) The length of the pipe/tube should be about 25 cm and its diameter should be 5-7.5 cm.
3) Also take a piece of thin sheet of a good quality rubber, say, a rubber balloon.
4) Stretch the rubber sheet tightly over one end of the pipe.

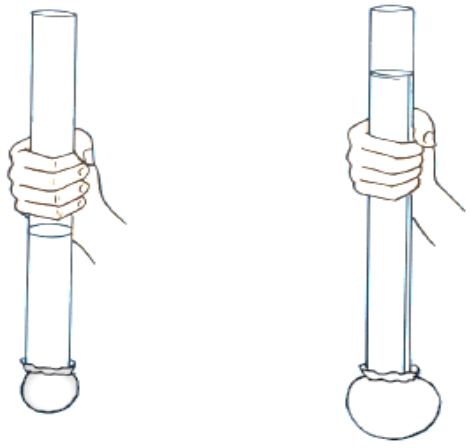


Fig. 1.14 : *Pressure exerted by water at the bottom of the container depends on the height of its column*

5) Hold the pipe at the middle, keeping it in a vertical position.
6) Ask one of your friends to pour some water in the pipe.
7) The rubber sheet bulges out.
8) Note also the height of the water column in the pipe.
9) Pour some more water.
10) Observe again the bulge in the rubber sheet and the height of the water column in the pipe. Repeat this process a few more times.
11) We will observe that the bulging of the rubber balloon increase with the increase in height of the liquid column.

Conclusion: Pressure exerted by liquid at the bottom of the container depends on the height of its column.

Experiments -4:

Aim: Friction depends on the nature of the surface.

Materials required: Table, Wooden board, books or bricks, pencil cell, a piece of cloth, Sand

Procedure:

1) Make an inclined plane on a smooth floor, or on a table.
2) You may use a wooden board supported by bricks, or books.
3) Put a mark with a pen at any point A on the inclined plane.
4) Now let a pencil cell move down from this point.
5) Note down the distance from starting point to the rest position.
6) Now spread a piece of cloth over the table. Make sure that there are no wrinkles in the cloth.

7) Repeat this activity by spreading a thin layer of sand over the table.
8) Maintain the same slope throughout the activity.

S.No	Object	Nature of surface	Distance (cm)
1	Pencil cell	Plane Surface	
2	Pencil cell	Cloth Surface	
3	Pencil cell	Sand Surface	

Conclusion: We observed that, the pencil cell moves a minimum distance on a sand surface and a maximum distance on a plane surface. So, Friction depends on the nature of the surface

Experiments -5:

Aim: Rolling friction is always easier to roll than to slide a body over another.

Materials required: 3 or 4 Pencils, Table, Thick book

Procedure:

1) Take a few pencils which are cylindrical in shape.
2) Place them parallel to each other on a table.

Fig. 2.15 : Motion of the book on rollers

3) Place a thick book over it.
4) Now push the book.
5) You observe the pencils rolling as the book moves.
6) Sliding the book feels more difficult than moving it this way.

7) Because the rolling friction is less than the sliding friction, the resistance to motion has decreased.
8) Rolling friction is the resistance to a body's motion as it rolls over the surface of another body.
9) Friction is reduced when rolling. Rolling is usually simpler than sliding a body over another.

Conclusion: Rolling friction is always easier to roll than to slide a body over another.

Project – 1

Title of the Project: Collect information on methods of increasing and decreasing friction in day-to-day life

Aim of the project: What are methods using increasing and decreasing friction.
Hypothesis: Friction is increased or decreased according to human needs.
Introduction: The force that acts between two bodies which are sliding or trying to slide against each other is known as friction. For example, when we push a box along a rough floor, friction is responsible for making the task difficult.

Friction is also known as an opposing force since it always acts in the opposite direction of a body that is moving or trying to move. A moving body is slowed down due to the virtue of friction. At times, friction is useful since it stops car tires from skidding on the road and also helps us to walk on the pavement without slipping. While walking, the friction caused between the tread on shoes and the ground prevents us from slipping.

Sometimes, too much friction is unnecessary, and we want to reduce friction. For example, friction between machine parts reduces the efficiency of the machine and in order to reduce this friction, we oil the machine parts. Oil helps to separate the surfaces and this helps to reduce the friction between them.

Factors affecting Friction:

There are many factors that affect the frictional conditions at the interface between two surfaces in relative motion. These factors are as follows:

i) Surface Finish- The frictional coefficient is drastically affected by the roughness, number, and even the directional contact points of the asperities on the surfaces.

ii) Temperature- The overall level of cold or heat or cold in an environment can affect friction. For example, temperature determines whether an anti-wear or extreme pressure additive will be effective in certain applications.

iii) Operational Load- Friction varies directly with the load. A load that exceeds the designed capacity will drastically increase the frictional coefficient of friction.

iv) Relative Speed- Increasing the speed beyond the specified safety level will dramatically increase friction.

v) Nature of the Relative Motion between the Surfaces- The frictional coefficient is also affected by the sliding motion versus the rolling motion.

Methods of Increasing Friction

Method 1: Create an uneven or rugged or adhesive point of contact. When two or more bodies either slide or rub against each other, there are three things that may happen: small irregularities, nooks, and crannies on the surfaces can catch on each other; one or both the surfaces can deform due to motion; and lastly, the atoms within each surface can interact with each other. Practically, all three of these effects do the same thing: generate friction. An adhesive interaction with other surfaces (like tacky glue, etc.) is an easy way to increase friction.

Method 2: Press the two surfaces together harder. A fundamental principle of basic physics is that the friction experienced by a body is directly proportional to its normal

force. This implies that we can increase the friction between two surfaces can be increased if we press the surfaces into each other with a greater force.

Method 3: Stopping any relative motion. That is, if one body is in motion with respect to another body, stop it. Until now, we have focused on sliding friction, which is also known as kinetic friction-the friction that occurs between two bodies as they slide against one another. In fact, this friction is different from static friction, which occurs when a body just starts to move against one another. The friction between two bodies is the highest right when they start moving against one another. This friction decreases, once they are gradually in motion. This is one of the most important reasons why it's harder to start pushing a heavy body than it is to keep it moving.

Method 4: Remove lubrication between the two surfaces. Oil, grease, petroleum jelly, etc. are lubricants that can greatly reduce the friction between two objects or surfaces. This is due to the fact that friction between two solids is much higher than the friction between those solids and the liquid between them. To increase friction, we need to remove any lubricants from the scenario, using only dry and un-lubricated parts to generate friction.

Method 5: Increase the fluid viscosity. Besides solid objects, fluids (liquids) and gases (like air) can also generate friction. The amount of friction generated by a fluid as it passes against a solid depends on several factors. One of the easiest of these to control is the fluid viscosity since the greater the viscosity of the liquid, the greater is the friction between the fluid and the solid. The highly viscous fluids (ones that are "thick", "gooey", etc.) generate more friction than fluids that are less viscous (ones that are "smooth" and "liquid").

Method 6: Increase the area exposed to air. As noted in the previous point, fluids like water and air can generate friction as they move against solid objects. The frictional force that an object experiences as it moves through a fluid is called drag. One of the most important properties of drag is that objects with bigger surface area, to the fluid as they move through it — have a greater drag.

Method 7: Use a shape that has a greater drag coefficient. A variety of shapes interact with fluids in a variety of ways as they pass through them — this implies that some shapes can have greater drag than other shapes that are made out of the same amount of material. The drag coefficient is the quantity that measures the relative amount of drag a shape makes hence shapes with high drags are said to have high drag coefficients.

Method 8: Use a less permeable material. Some materials are permeable to fluids. In Layman's terms, they have holes in them that allow the fluid to pass through them. This readily reduces the area of the object that the fluid is able to push against and this lowers the force of drag. This property holds even if they are microscopic holes — as long as the holes are large enough to let some of the fluid pass through the object, the drag will be reduced. This is why parachutes which are designed to produce lots of drag to slow the speed of the user's fall, are made out of strong, light silk or nylon and not cheesecloth or coffee filters.

Method 9: Increase the speed of the object. It does not matter what the shape of an object it is or how less/more permeable the material it's made from is, the drag which it creates will always increase as it goes faster. The faster a body moves, the more fluid it has to move through, and, thus, the greater drag it experiences. Bodies moving at very high speeds will experience very high friction due to drag, so these objects must be streamlined or else they will fall apart under the force of the drag.

Methods of Reducing Friction

Method 1: Objects that move in fluids such as boats, planes, cars, etc, the shape of their body must be streamlined in order to reduce the friction between the bodies of the objects as the fluid.

Method 2: Friction can be reduced by polishing the surface of a body as polishing makes the surface smooth and even.

Method 3: Lubricants such as oil or grease must be applied to machine parts regularly to reduce the friction between them.
Method 4: Suppose an object is rolled over a surface, the friction between the rolled object and surface can be reduced by using ball bearings.
Method 5: Friction between two surfaces can also be reduced by reducing the contact between the surfaces.
Method 6: Ball bearings are used in manufacturing vehicles, bicycles, and vehicles to reduce friction.
Conclusion: This project aims to enhance our understanding of friction and its influence on day-to-day life. By investigating methods to increase and reduce friction, we can propose practical applications and optimize friction in various contexts.

PROJECT REPORT

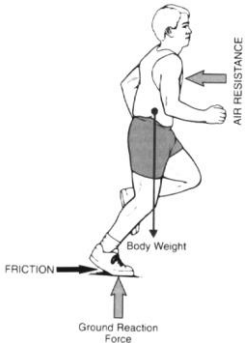
Name of the project:
Class : 8th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 8thclass physical science book.

Project – 2

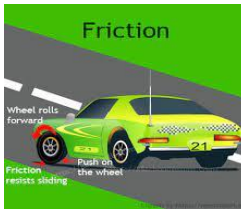
Title of the Project: WHAT HAPPENS IF FRICTION VANISHES?

Aim of the project: To collect the data and pictures about the incidents of if the friction vanishes.
Hypothesis: We cannot do anything if there is no friction.
Introduction: Friction opposes the relative motion between two surfaces in contact. It acts on both the surfaces. Friction is important for many of our activities.

1. Walking and Running: Without friction, it would be extremely difficult to walk or run. We would have no traction to push against the ground, resulting in people sliding and stumbling constantly.



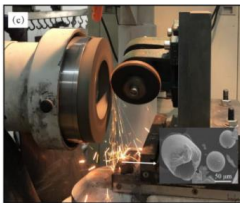
2. **Transportation:** Friction plays a crucial role in the functioning of vehicles. Cars, trains, and airplanes heavily rely on friction to generate traction and control their movements. Without it, driving or flying would become nearly impossible.



3. **Sports:** Friction is vital in numerous sports, such as soccer, basketball, and tennis. Players would have difficulty stopping, changing direction, or maintaining control over the ball or equipment.

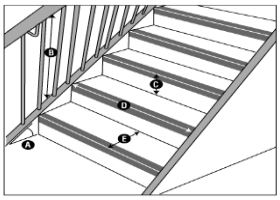
4. **Gravity and Stability:** Friction is essential for maintaining stability and preventing objects from sliding or falling. Without friction, everything from furniture to buildings would be prone to sudden movements or collapse.

5. **Manufacturing:** Friction is utilized in various manufacturing processes, such as grinding, polishing, and cutting. These processes would become significantly challenging, affecting industries that rely on them.



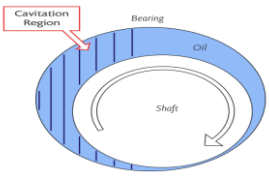
6. **Writing and Drawing:** Friction provides the necessary resistance between the pen/pencil and the paper, enabling us to write and draw. Without friction, it would be extremely difficult to create legible or precise marks on paper.

7. **Personal Safety:** Friction is crucial for our safety in everyday life. We rely on it to grip handrails, hold objects firmly, and prevent accidental slips or falls. Without friction, personal safety would be severely compromised.

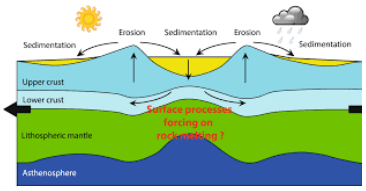


8. **Fire and Heat:** Friction generates heat, and without it, fire-making would be challenging. Rubbing two objects together to create sparks or ignite flammable material would no longer be possible.

9. **Engineering and Design:** Friction is a fundamental consideration in engineering and design. Machines, mechanisms, and structures are designed with friction in mind. Without it, existing designs would fail, and new concepts would have to be developed.



10. **Natural Processes:** Friction plays a significant role in natural processes like erosion, weathering, and tectonic plate movements.The absence of friction would disrupt these processes, leading to unpredictable changes in the Earth's surface and environment.



Conclusion: Friction prevents objects from sliding apart. Everything would slide to the lowest point if there was no friction. It would be impossible to scale anything. We will be unable to write without friction. No riding a bike, cycle, or even a car or bus without friction. There are no machines in businesses, so there are no mechanics without friction. We would not have been able to sit, walk, run, or dance without friction

PROJECT REPORT

Name of the project:
Class : 8th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 8thclass physical science book.

9th CLASS

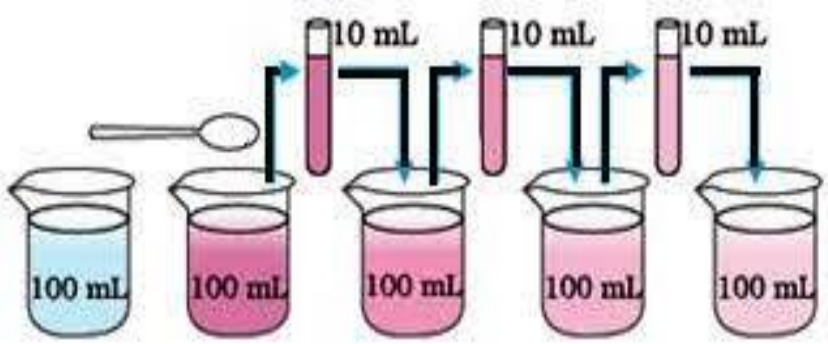
Experiments -1:

Aim: Testing that the particles of matter are very small.

Materials required: Transparent measuring beakers, Potassium permanganate crystals, Water, Spoon, Test tubes

Procedure:

1) Take 2–3 crystals of potassium permanganate and dissolve them in 100 mL of water.
2) Take out approximately 10 mL of this solution and put it into 90 mL of clear water.
3) Take out 10 mL of this solution and put it into another 90 mL of clear water.
4) Keep diluting the solution like this 5 to 8 times.
5) The water remains coloured till the last dilution.
6) This experiment shows that just a few crystals of potassium permanganate can colour a large volume of water (about 1000L).



7) So we conclude that there must be millions of tiny particles in just one crystal of potassium permanganate, which keep on dividing themselves into smaller and smaller particles.
8) The same activity can be done using 2 ml of Dettol instead of potassium permanganate.
9) The smell can be detected even on repeated dilution.

Conclusion: The particles of matter are very small. They are small beyond our imagination.

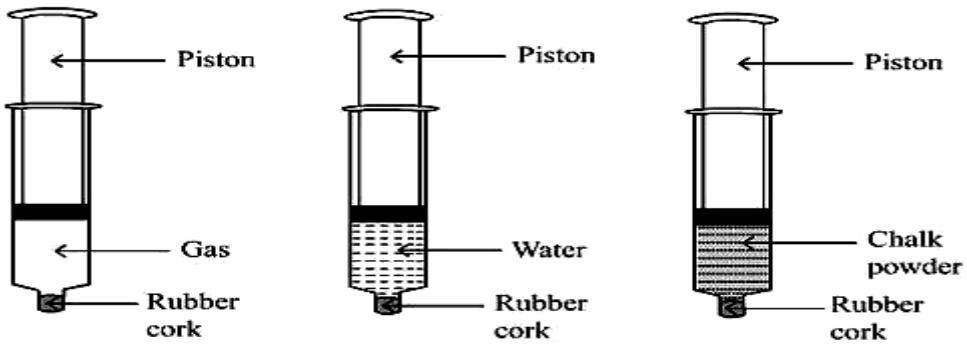
Experiments -2:

Aim: The gases are highly compressible as compared to solids and liquids.

Materials required:

Procedure:

1) Take three 100 mL syringes and close their nozzles by rubber corks, as shown in Figure



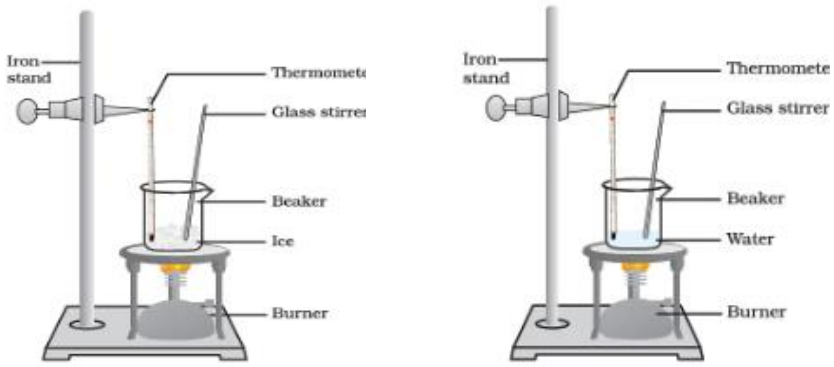
2) Remove the pistons from all the syringes.
3) Leaving one syringe untouched, fill water in the second and pieces of chalk in the third.
4) Insert the pistons back into the syringes. You may apply some vaseline on the pistons before inserting them into the syringes for their smooth movement.
5) Now, try to compress the content by pushing the piston in each syringe.
6) The piston was pushed in easily in the syringe in which nothing except air was filled.
7) Gases can be compressed easily.

Conclusion: We have observed that gases are highly compressible as compared to solids and liquids.

Experiments -3:

Aim: The state of matter is affected by changing temperature.
Materials required: Beaker, Laboratory thermometer, Ice, Burner, Glass rod
Procedure:

1) Take about 150 g of ice in a beaker and suspend a laboratory thermometer so that its bulb is in contact with the ice, as in Figure.



2) Start heating the beaker on a low flame.
3) Note the temperature when the ice starts melting.
4) Note the temperature when all the ice has converted into water.
5) The ice melts at 0^0C. All the ice gets conversion from solid to liquid state.
6) Now, put a glass rod in the beaker and heat while stirring till the water starts boiling.
7) Keep a careful eye on the thermometer reading till most of the water has vaporised.
8) The water starts boiling at 100^0C and gets converted into vapours at the same temperature.

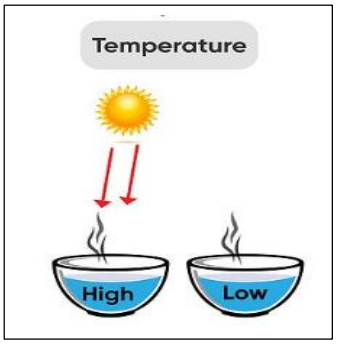
Conclusion: On increasing the temperature of solids, the kinetic energy of the particles increases.Due to the increase in kinetic energy, the particles start vibrating with greater speed. The energy supplied by heat overcomes the forces of attraction between the particles. The particles leave their fixed positions and start moving more freely. The state of matter is affected by changing temperature.

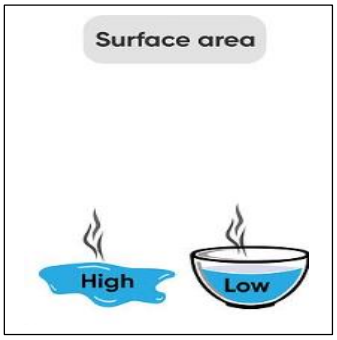
Experiments -4:

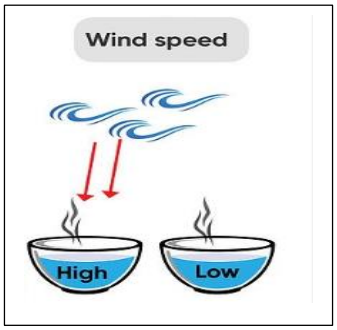
Aim: Evaporation depends on temperature, surface area and speed of wind.
Materials required: Test tube, China dish, Fan, Thermometer
Procedure:

1) Take 5 mL of water in a test tube and keep it near a window or under a fan.

2) Take 5 mL of water in an open china dish and keep it near a window or under a fan.
3) Take 5 mL of water in an open china dish and keep it inside a cupboard or on a shelf in your class.
4) Record the room temperature.







5) Record the time or days taken for the evaporation process in the above cases.
6) Repeat the above three steps of activity on a rainy day and record your observations.
7) Evaporation will be fastest from the china dish kept near window.
8) The evaporation increases with temperature, surface area of the container and speed of wind.

Conclusion: Evaporation depends on temperature, surface area and speed of wind.

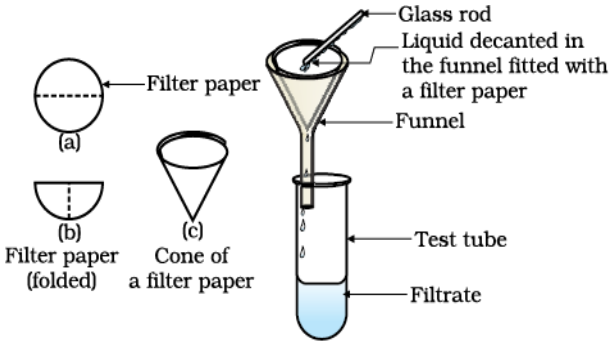
Experiments -5:

Aim: Testing of solution, suspension and colloidal solution.

Materials required: 4 test tubes, copper sulphate crystals, Chalk powder or Wheat flour, Milk or Ink, Water, Torch light,

Procedure:

1) Take four test tubes and divide into four names as— A, B, C and D.
2) Few crystals of copper sulphate to test tube A.
3) One spatula full of copper sulphate to test tube B.
4) Chalk powder or wheat flour to test tube C.
5) Few drops of milk or ink to test tube D.
6) Each test tube should add the given sample in water and stir properly using a glass rod.



7) Particles of mixture are visible only in case of test tube C.
8) Direct a beam of light from a torch through the beaker containing the mixture and observe from the front.
9) The path of the beam of light was visible in case of test tube C and D.
10) Leave the mixtures undisturbed for a few minutes (and set up the filtration apparatus in the meantime).
11) The particles settle down after sometime in case of test tube C.
12) Filter the mixture.
13) Residue will be left in case of group C.
14) We observed that,

Test tubes A and B have got a solution.
Test tube C has got a suspension.
Test tube D has got a colloidal solution.

Conclusion: *Test tubes A and B have got a solution, Test tube C has got a suspension, Test tube D has got a colloidal solution.*

Project – 1:

Title of the Project: Collect information on the effect of evaporation on daily Life situations.

Aim of the Project: To study the effect of evaporation on daily life situations.

Hypothesis: Evaporation is a cooling process and surface phenomena.

Evaporation: Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into the vapour state.

The rate of evaporation depends upon the surface area exposed to the atmosphere, the temperature, the humidity and the wind speed.

The effect of evaporation on daily life situations: -

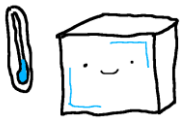
1. Drying Clothes under The Sun:
   One of the most common real-life examples of evaporation is drying of clothes under the sun. When the wet clothes are put under the sun, they get heated up resulting in the evaporation of water particles present in wet clothes; making the clothes dry.

2. Ironing of Clothes:
   The hot iron evaporates the water vapors present in the fabric of clothes, which help to iron the clothes well.

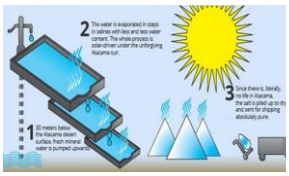
3. Cooling Down of Hot Tea and Other Hot Liquids:
   Isn't it a magic as to how a hot cup of tea or any hot liquid cools down after some time? It's all possible because of the evaporation. Heat loss happens as the water evaporates resulting in the cooling down of the tea and other such beverages.

4. Wet Floors:
   How does the wet floor dries up? Where does the water go away? The simple answer is that the water is evaporated because of the heat and making the floor completely dry.

5. Melting of Ice Cubes:
   When the ice cubes are taken out of the refrigerator for having drinks, we all must have noticed that after some time the ice cubes melt and take the form of the liquid. It changes its shape from solid to liquid. It all happens because of the increased temperature outside the refrigerator that evaporates the water, resulting in the change of shape of the ice cubes.

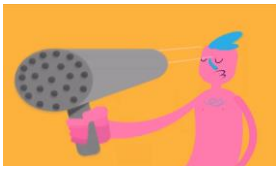


6. Preparation of Common Salt:
   Preparation of common salt is also a widespread example of the evaporation. The seawater goes under the evaporation, which results in the formation of salt crystals.



7. Evaporation of Nail Paint Remover:
   The acetone present in the nail paint remover takes the heat of our bodies and evaporates.

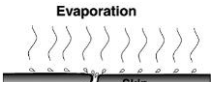
8. Drying of Wet Hair:
   Going for some urgent work? Need to dry your hair immediately? The only possible immediate solution is drying up of hair with



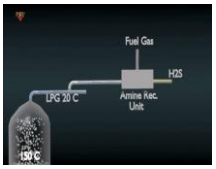
the hairdryer. The water vapor of wet hair evaporates due to the heat of the sun or heat of the hairdryer.

9. Drying up of Different Water Bodies:
   The water from different water bodies mostly get dried up during the hot summers and gets refilled only after rain. So, what do you think? What happened here? Well, here also it's evaporation.

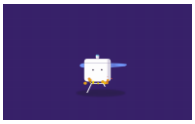
10. Evaporation of Sweat from Body:
    On a hot summer day, the sweat from the skin evaporates due to the high temperature of the environment, taking a little bit of body heat. Thus, it results in the cooling effect.



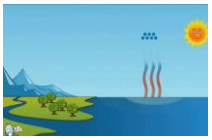
11. Distillation Process:
    Distillation is a process in which the different components of the liquid are separated by the boiling and the condensation. Thus, in this process too, the evaporation performs the main role.



12. Working of a Pressure Cooker:
    During cooking, a lot of heat is produced inside a pressure cooker, and with its whistle, the steam comes out by evaporation; making a perfect dish for us.



13. Brings Rain:
    The initial stage under the water cycle process is evaporation. The other process like condensation, sublimation, precipitation, transpiration, runoff, and infiltration comes after the evaporation process. So, if evaporation is not there then this water cycle would remain incomplete.



Conclusion: Evaporation is a natural phenomenon that occurs in liquids. Evaporation is a part of human life.

PROJECT REPORT

Name of the project :
Class : 9th class
Subject : Physical Science
Name of the School :
Time Duration :
Material Used : Internet, Newspapers and 9th class textbook

Project – 2

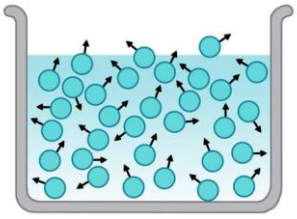
Title of the Project: Evaporation and Factors Affecting Evaporation

Aim of the Project: To study the process of evaporation and factors affecting evaporation.

Hypothesis: Evaporation is a cooling process and surface phenomena.

Evaporation: Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into the vapour state.

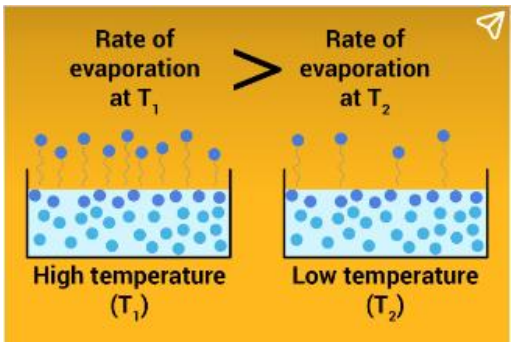
The rate of evaporation depends upon the surface area exposed to the atmosphere, the temperature, the humidity and the wind speed.



Each of these factors affecting evaporation have been explained in detail below.

1) Temperature

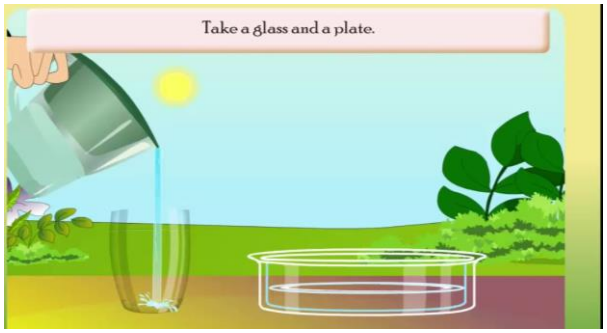
When the temperature of the liquid (water, in this case) is increased, it results in an increase in the kinetic energy of the individual molecules that constitute the liquid. This increase in energy makes it easier for the liquid molecules to overcome the intermolecular forces of attraction (that holds the liquid together) and escape into the atmosphere as a gas. It can be noted that the temperature of the surrounding can also contribute towards faster evaporation since hot environments can transfer their heat to the liquid.



2) Surface Area Occupied by the Liquid

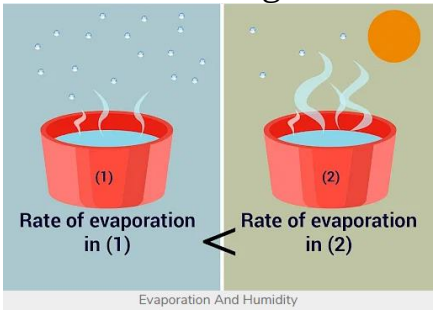
Evaporation is a surface phenomenon, which implies that the process only occurs at the surface of the liquid. During evaporation, the molecules of the liquid that are present at its surface overcome the intermolecular forces of attraction to break away from the liquid and escape into the atmosphere as a gas (or vapour).

Liquids are known to not have any definite shape – they assume the shape of their container. Therefore, the greater the surface area of the container (or the greater the surface occupied by the liquid), the greater the number of liquid molecules present at the surface. The larger the number of liquid molecules are at the surface, the larger the number of molecules that will break away from the liquid and become a gas at a given point of time, which contributes to an increase in the rate of evaporation.



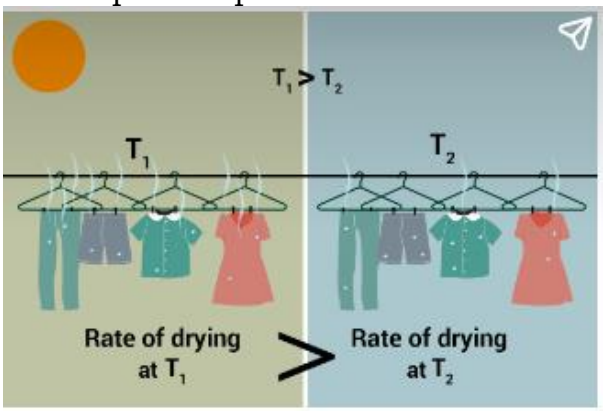
3) Humidity of the Surrounding

There is a limit to how much water vapour the atmosphere can hold. This limit is proportional to the temperature (which implies that hot air can hold more water vapour than cold air). Evaporation can be viewed as an equilibrium process through which the amount of water vapour in the atmosphere reaches an equilibrium with the amount of water in the surface of the liquid. Therefore, the greater the amount of water vapour in the atmosphere over the liquid, the slower the rate of evaporation. Also, it can be noted that an increase in temperature with constant humidity will contribute to an increase in the rate of evaporation since hot air can hold a greater amount of water vapour.



4) Air Circulation or Wind Speed

Evaporation increases the humidity of the atmosphere that immediately surrounds the liquid. This humid air takes some time to dissipate into the rest of the atmosphere. The presence of a breeze, a powerful wind, or some other form of air circulation can speed up this process and make the environment of the liquid less humid. Therefore, by decreasing the humidity of the liquid's surrounding, a powerful breeze or wind can increase the rate at which the liquid evaporates.



Conclusion: we collect the data about the factors which depend on evaporation in our daily life.

PROJECT REPORT

Name of the project :
Class : 9th class
Subject : Physical Science
Name of the School :
Time Duration :
Material Used : Internet, Newspapers and 9th class textbook

10th CLASS

Experiments -1:

Aim: To find the specific heat of a given solid

Materials required: Calorimeter, Thermometer, Stirrer, Water, Steam water, Wooden box and Lead shots (or)Iron bolt

Procedure:

Step-1:

Mass of the calorimeter(m_1)=....

Temperature of the calorimeter(T_1)=..

Let specific heat of calorimeter = S_c

Step-2:

Now fill 1/3rd of the volume of calorimeter with water.

Mass of the calorimeter + water = m_2

Mass of the water= $m_2 - m_1$

Temperature of the water(T_1)=.....

Let specific heat of water= S_w

Step-3:

Take a few lead shots and place them in hot water or steam water.

Temperature of the lead shots(T_2)=..

Let specific heat of lead shots = S_l

Step-4:

Transfer the hot lead shots quickly into the calorimeter.

Mass of the calorimeter + water + lead shots = m_3

Mass of lead shots = m_3-m_2

After some time

Temperature of calorimeter+ water+ lead shots = T_3

According to the principle of the method of mixtures

Heat lost by the solid (lead shots) = Heat gain by the calorimeter + Heat gain by the water

$$(m_3- m_2)\, S_l(T_2-T_3) = m_1\, S_c(T_3-T_1)+(m_2-m_1)\, S_w(T_3-T_1)$$

$$S_l = \frac{[m_1S_c+(m_2-m_1)S_w]\,(T_3-T_1)}{(m_3-m_2)(T_2-T_3)}$$

Conclusion: Knowing the specific heats of calorimeter and water, we can calculate the specific heat of the solid (lead shots).

Experiments -2:

Aim: The rate of evaporation of a liquid depends on its surface area and vapour already present in surrounding air.

Aim (1): The rate of evaporation of liquid depends on its surface area

Materials required: Two dishes of different surface area and water

Procedure (1):

1) Take two dishes of different surface area
2) Pour equal amounts of water in the both dishes
3) Keep aside for 2 to 3 hours
4) Observe them after some time. Dish with more surface area has less quantity of water than the dish having less surface area

Observation (1): This shows evaporation increases with increasing of surface area

Aim (2): The rate of evaporation of liquid depends on The rate of evaporation of liquid depends on

Materials required: Two dishes of equal surface area and water

Procedure (2):

1) Take two dishes of equal surface area containing water
2) This experiment should be conducted on more humidity day and less humidity day
3) We may observe that evaporation is less on more humidity day due to more vapour in the air

Observation (2): Hence the rate of evaporation depends upon vapour already present in surrounding air.

Conclusion: The rate of evaporation of a liquid depends on its surface area and vapour already present in the surrounding air.

Experiments -3:

Aim: To show that acid produce hydrogen gas reacted with metals.

Materials required: Test tube, Delivery tube, Glass trough, Candle, Soap water, dil. HCl, and Zinc granules.

Procedure:

1) Set the apparatus as shown in figure.
2) Take about 10ml of dilute HCl in a test tube and add a few zinc granules to it.
3) We observe a gas is evolved from the zinc granules
4) Pass the gas being evolved through the soap water.
5) We observe some bubbles formed in the soap solution.
6) Bring a burning candle near the gas filled bubble.
7) The candle turn off with a pop sound

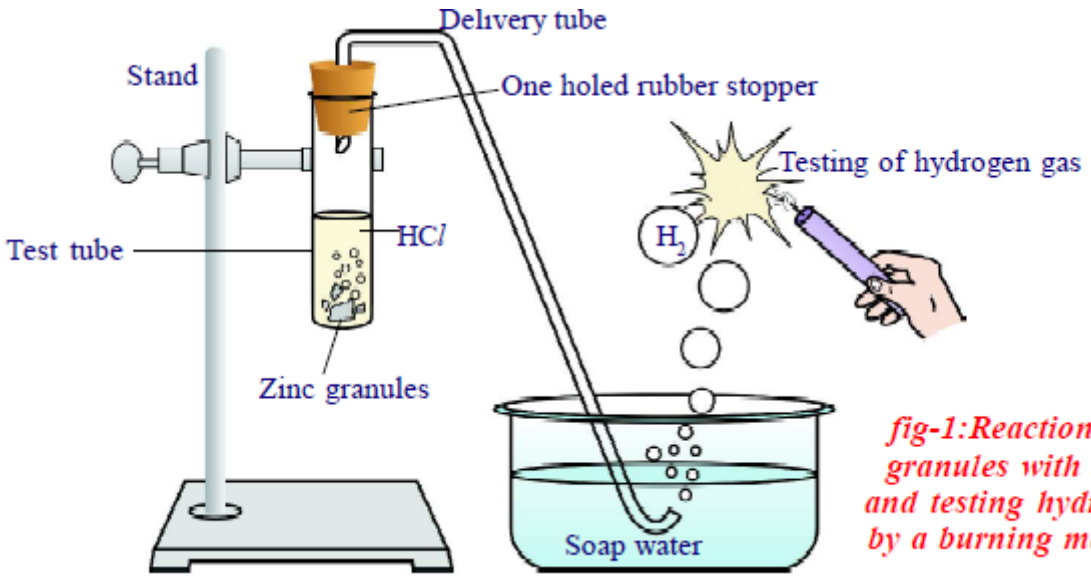


fig-1:Reaction of zinc granules with dil. HCl and testing hydrogen gas by a burning match stick

8) The pop sound indicates that the gas evolved in H_2

Acid + Metal → Salt + Hydrogen

$2\ HCl\ (aq) + Zn(s) \rightarrow Zn\ Cl_2\ (aq) + H_2\ (g)$

9) Repeat this experiment with remaining acids like HNO_3, H_2SO_4 etc.
10) We observe that, HNO_3, H_2SO_4 etc. also produced hydrogen gas when reaction with metals

Conclusion: We conclude that hydrogen gas is produced when acid reacts with metals.

Experiments -4:

Aim: Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids.

Materials required: Beaker, 230v AC plug, Bulb, Graphite rods, Electrical wires, Solutions of HCl, H_2SO_4, Glucose and Alcohol.

Procedure:

1) Prepare solutions of glucose, alcohol, hydrochloric acid and sulphuric acid etc.
2) Connect two different coloured electrical wires to graphite rods separately in a 100 ml beaker as shown in figure.
3) Connect free ends of the wire to 230 volts AC plug and complete the circuit as shown in the fig by connecting a bulb to one of the wires.

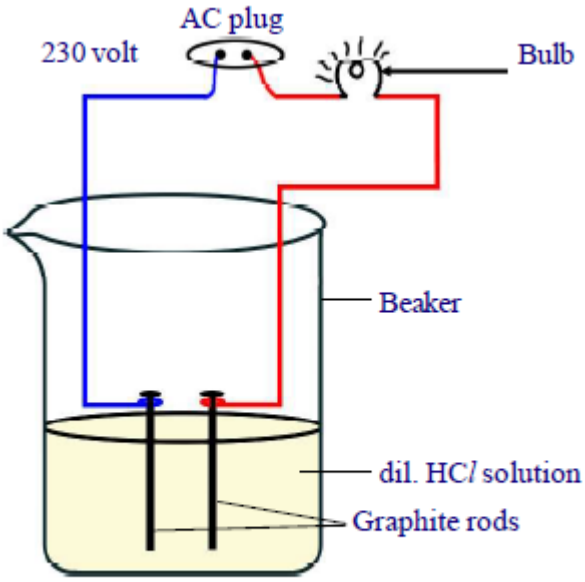


fig-3: Acid solution in water conducts electricity

4) Now pour some dilute HCl in the beaker and switch on the current.
5) We observe that the bulb glows.
6) Repeat activity with dilute sulphuric acid and glucose and alcohol solutions separately.
7) You will notice that the bulb glows only in acid solutions but not in glucose and alcohol solutions.
8) Glowing of bulb indicates that there is flow of electric current through the solution. Acid solutions have ions and the moment of these ions in solution helps for flow of electric current through the solution.
9) The positive ion (cation) present in HCl solution is H+. This suggests that acids produce hydrogen ions H+ in solution, which are responsible for their acidic properties.
10) In glucose and alcohol solution the bulb did not glow indicating the absence of H+ ions in these solutions. The acidity of acids is attributed to the H+ ions produced by them in solutions.

Conclusion: Compounds such as alcohols and glucose contain hydrogen but are not categorized as acids.

Experiments -5:

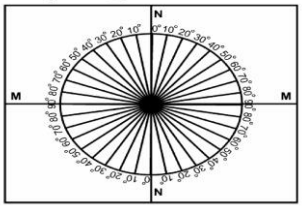
Aim: Obtaining a relation between angle of incidence and angle of refraction (or) Experimentally prove that the angle of incidence is more than angle of refraction when light rays travel from rarer medium to denser medium (or) prove that Sin i/Sin r is constant

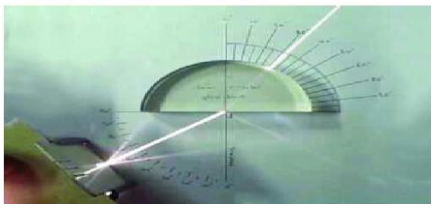
Materials required: Pro circle, scale, small black printed plank, a semi-circular glass disc of Thickness nearly 2 cm, pencil and laser light

Preparation of Pro Circle:

1) Take a wooden plank which is covered with white chart
2) Draw two perpendicular lines, passing through the middle of the paper as shown in the figure

3) Let the intersecting point be O.
4) Mark one line as NN which is normal to the another line marked as MM
5) Here MM represents the line drawn along the interface of two media and NN represents the normal drawn to this line at O
6) Take a protractor and place it along NN in such a way that its centre coincides with as shown in fig.
7) Then mark the angles from 0^0 to 90^0 on both sides of the line NN
8) Repeat the same on the other side of the line NN
9) The angles should be represented on circular line.





Procedure:

10) Now place a semi-circular glass disc so that its diameter coincides with the interface line (MM) and its center coincides with the point O
11) Take the laser light and send it along NN in such a way that the laser propagates from air to glass through the interface at point O and observe the way of laser light coming from other side of disc
12) There is no deviation
13) Send laser light along a line which makes 15 with NN and see that it must pass through point O
14) Measure its corresponding angle of refraction
15) Repeat this experiment with angles of 20^0,30^0,40^0,50^0 and 60^0 note the corresponding angles of refraction

i	r	sin i	sin r	sin i/sin r
20^0				
30^0				
40^0				
50^0				
60^0				

From the above table we observe that sin i/sin r is constant
From the above table, we observe that i > r

Conclusion: The angle of incidence is more than angle of refraction when light rays travel from rarer medium to denser medium. sin i/sin r is constant.

Experiments -6:

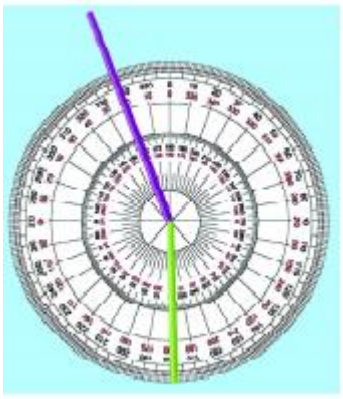
Aim: The angle of refraction is more than angle of incidence when light rays travel from denser to rarer medium

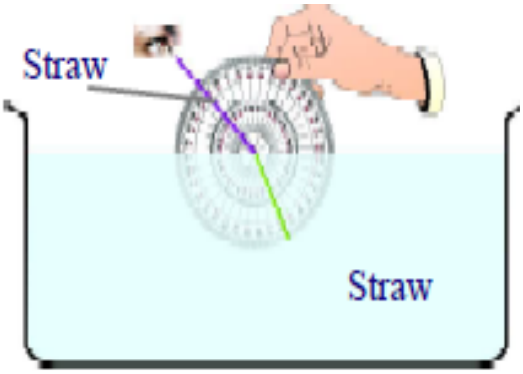
Materials required: Plastic Pro Circle, Two Plastic straws, Transparent vessel, Water,

Procedure:

1) Take a Plastic Pro circle arrange two straws at the centre of the pro circle in such a way that they can be rotated freely about the centre of the pro circle as shown in the fig.
2) Adjust one of the straws to make an angle 10^0.
3) Immerse half of the pro circle vertically into the water, filled in a transparent vessel.
4) While dipping, verify that the straw at 10^0 is inside the water.
5) From the top of the vessel try to view the straw which is inside the water as shown in fig.

6) Then adjust the other straw which is outside the water until both straws appear to be in a single straight line.
7) Then take the pro circle out of the water and observe the two straws on it. You will find that they are not in a single straight line.





8) Measure the angle between the normal and second straw. Note the value in the able.

i	r	sin i	Sin r	sin i/sin r
10^0				
20^0				
30^0				
40^0				
50^0				

9) Do the same for various angles. Find the corresponding angles of refraction and note them in the table.
10) You will observe that in the above activity, 'r' is greater than 'i' in all cases when light ray travels from denser medium to rarer medium.

Conclusion: The angle of refraction is more than angle of incidence when light rays travel from denser to rarer medium. sin i/sin r is constant.

Project – 1

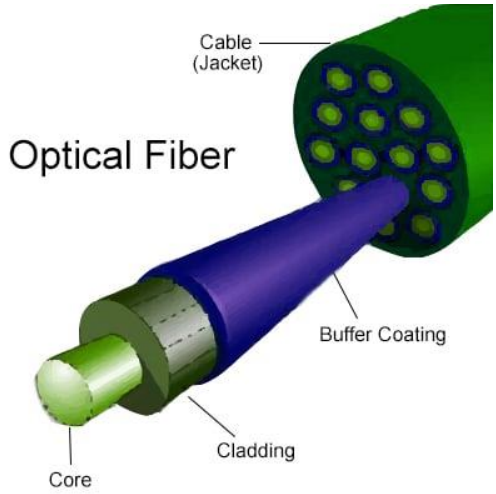
Title of the Project: Applications of Total Internal Reflection in Everyday Life

Aim of the Project: To study the applications of Total Internal Reflection in everyday life

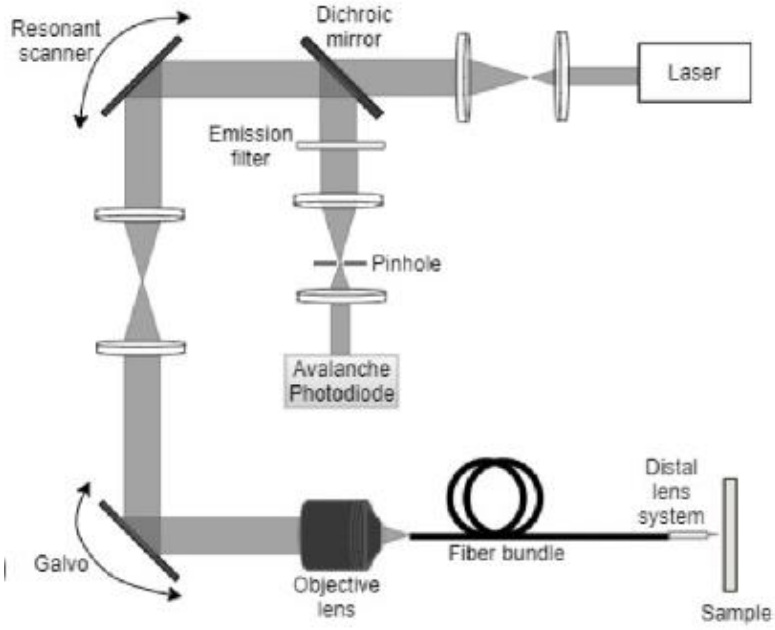
Hypothesis: When the angle of the incidence is greater than critical angle, the light ray gets reflected into the denser medium at the interface.

Introduction: Total Internal Reflection (TIR) is a phenomenon that occurs when a light ray traveling within a medium strikes the boundary of a more optically dense medium at an angle greater than the critical angle. Here's some information on the practical applications of total internal reflection in everyday life:

1. **Fiber-Optic Communication:**
   - Fiber-optic cables rely on TIR to transmit information as pulses of light over long distances.
   - The core of a fiber-optic cable is made of a material with a higher refractive index, surrounded by a cladding with a lower refractive index.
   - Light entering the fiber at an angle greater than the critical angle undergoes TIR, bouncing off the core's inner walls, ensuring it remains confined within the cable.
   - Fiber-optic communication is widely used for high-speed data transmission, internet connectivity, telephone networks, and television broadcasting.



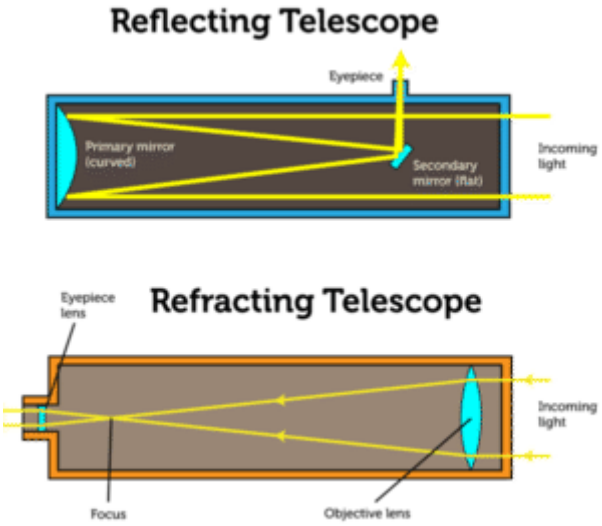
2. Endoscopy and Medical Imaging:
- Endoscopes utilize TIR to transmit light and images within the human body for diagnostic and surgical purposes.
- Fiber-optic bundles in endoscopes guide light through the device, allowing doctors to visualize internal organs, perform minimally invasive surgeries, and diagnose various medical conditions.



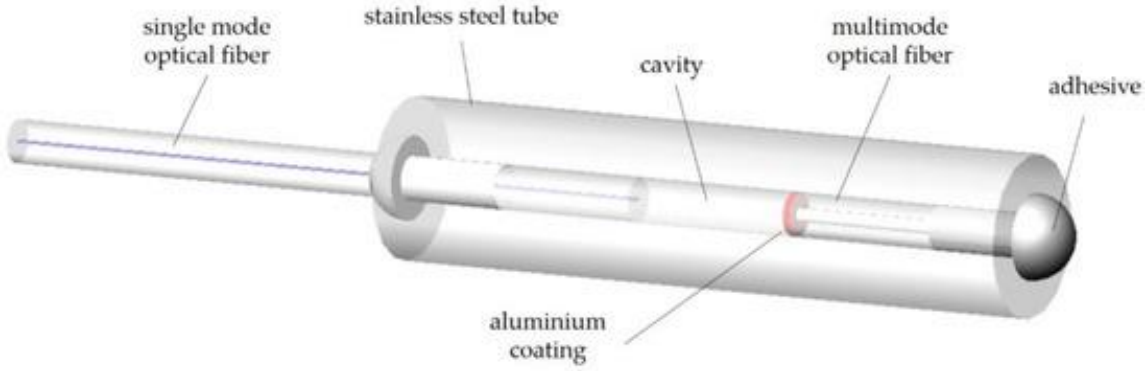
3. Reflective Signs and Roadway Safety:
- Reflective road signs and safety markings on highways often employ TIR.
- These signs have retroreflective materials, such as glass beads or prisms, that redirect light back to its source.
- TIR enables the reflection of light in a specific direction, making signs highly visible to drivers even in low-light conditions.

4. Prism-Based Optics:
- Prisms are used in a wide range of optical instruments, including cameras, binoculars, microscopes, and telescopes.

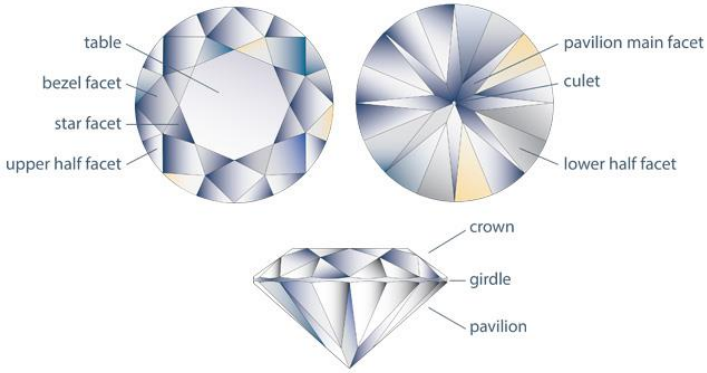
- Prisms rely on TIR to redirect light, allowing for image rotation, magnification, and dispersion of light into its spectral components.



5. Optical Fiber Sensors:
- Optical fiber sensors utilize TIR to detect physical and environmental parameters such as temperature, pressure, strain, and chemical concentrations.
- When these parameters change, it affects the refractive index at the sensing area of the fiber, causing a change in the intensity or wavelength of light reflected back to the sensor.
- This enables the measurement of various parameters with high sensitivity and accuracy.



6. Diamond Faceting and Jewelry:
- TIR is employed in the design of diamond-cut gemstones.
- Facets on the diamond's surface are carefully cut and angled to maximize TIR within the diamond, enhancing its brilliance and sparkle.



Conclusion: Total internal reflection has numerous practical applications in various fields, from communication and medical imaging to roadway safety and gemstone aesthetics. Understanding and harnessing the principles of TIR allows for the

development of innovative technologies that rely on the manipulation of light for diverse applications.

PROJECT REPORT

Name of the project:
Class : 10th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 10thclass physical science book.

Project – 2

Title of the Project: Collect information on Plaster of Paris (POP)

Aim of the Project: To study the importance of Plaster of Paris

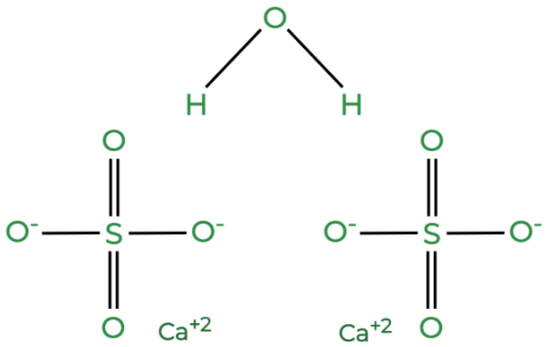
Hypothesis: Plaster of Paris is a well-known chemical compound that is widely used in sculpting materials and gauze bandages. While we have seen numerous applications of this substance in our daily lives, Plaster of Paris is a white powdered chemical compound that is hydrated calcium sulphate that is typically produced by calcining gypsum. In other words, Plaster of Paris is often produced using heated gypsum at a high temperature.

Plaster of Paris

Plaster of Paris is a quick-setting gypsum plaster made of fine white powder (calcium sulphate hemihydrate) that hardens when wet and left to dry. Plaster of Paris, known since ancient times, is so named due to its production from the plentiful gypsum found in Paris.

Plaster of Paris Formula

The chemical formula of Plaster of Paris is $CaSO_4.1/2H_2O$ known as Calcium Sulphate Hemihydrate.



$CaSO_4 . \frac{1}{2} H_2O$

Preparation of Plaster of Paris:

On careful heating of gypsum ($CaSO_4.2H_2O$) at 373 K it loses water molecules partially to become calcium sulphate hemihydrate ($CaSO_4 .½ H_2O$). This is called plaster of paris (POP), the substance which doctors use as plaster for supporting fractured bones in the right position. Plaster of paris is a white powder and on mixing with water, it sets into hard solid mass due to the formation of gypsum.

$$\underset{\text{(Plaster of Paris)}}{CaSO_4 . ½\, H_2O} + 1½\, H_2O \rightarrow \underset{\text{(Gypsum)}}{CaSO_4 . 2H_2O}$$

Types of Plaster of Paris

Plaster of Paris is primarily of three types, that are widely used,

Gypsum Plaster – Gypsum plaster, also referred to as Plaster of Paris, is made by heating gypsum to a temperature of 300 °F. Additionally, Anhydrite is produced when gypsum is heated over 392 °F. Dry gypsum plaster powder or Anhydrite transforms into

gypsum when combined with water. By adding water, Plaster of Paris hardens very quickly.

Cement Plaster – Cement plaster is a compound made of suitable plaster, Portland cement, sand, and water. The interiors and exteriors are plastered with cement to provide a smooth surface. Over the cement plaster, a final coat of gypsum plaster is frequently applied.

Lime Plaster – Lime Plaster is a compound made of sand, calcium hydroxide, and various inert fillers. Quick lime is created by heating limestone, while slaked lime is created by mixing water into the quick lime. Wet putty or white powder are two common names for it.

Clay Plaster – Clay Plaster is simply the mixture of sand, water and clay along with the addition of plant fibers for more strength. This plaster had been in great use since ancient times for making the interiors of houses.

Heat Resistant Plaster – This kind of plaster is mostly used as a building material for coating walls, ceilings, chimneys, etc. An example of heat-resistant plaster is Portland cement.

Properties of Plaster of Paris:

Plaster of Paris exhibits the following properties:

- Plaster of Paris is a white-colored powder, that forms crystals of gypsum when mixed with water.
- However, when it is heated at 473 K forms an anhydrous calcium sulphate.
- It expands slowly and slightly upon setting. So. it is highly fire-resistant.
- It results in the formation of a thick surface to resist regular knocks after drying.
- It is easy to spread on any surface.
- It is easy to level.
- It does not cause cracking of surfaces.
- It gives a decorative interior finish.

Uses of Plaster of Paris:

Plaster of Paris founds its usage in the following areas:

1. **3D Printing:** Gypsum plaster can be used for 3D Printing. The water is applied by the inkjet head.
2. **Architecture and Decorations:** Plaster of Paris is used to produce fine artwork to decorate and beautify monuments and buildings. It is also used to imitate wood or stone which is found in ancient buildings and monuments.
3. **During Burial Services:** Plaster of Paris is used by executives of funeral houses in order to remake the damaged tissues and fill up the wounds.
4. **Medicines:** It is used as a mold and cast. It is used to heal broken bones and cast into a supportive coating known as an orthopedic cast.

Fireproofing and fire protection systems

Conclusion: Plaster of Paris is used for making toys, materials for decoration and for making surfaces smooth.

PROJECT REPORT

Name of the project:
Class : 10th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 10thclass physical science book.