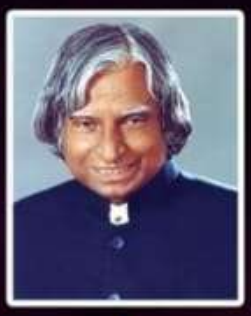
PHYSICAL SCIENCE

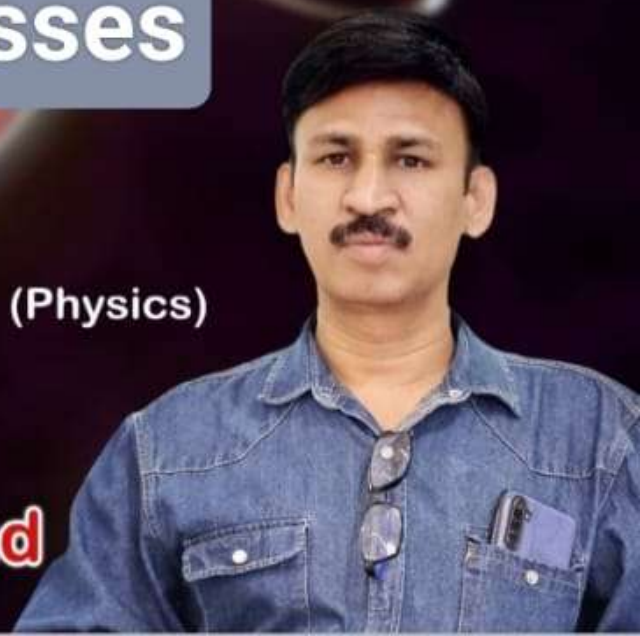


FORMATIVE ASSESSMENT - 2

Experiments/Lab activities/Activities and Projects

(2024 - 2025)

VIII, IX & X Classes



M.Srinivasa Rao, SA (Physics)
SPSMHS, GUDIVADA.
Ph: 9848143855

Visit : srini science mind

8th CLASS

Experiment -1

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 -2

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

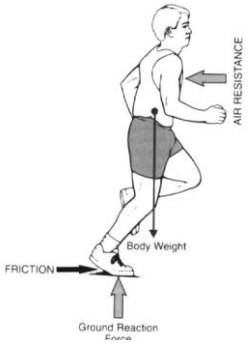
Name of the project: Collect information on methods of increasing and decreasing friction in day-to-day life
Class : 8th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 8thclass physical science book.

Project – 2

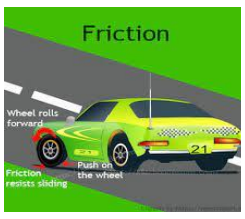
Title of the Project: WHAT HAPPENS IF FRICTION VANISHES?

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.



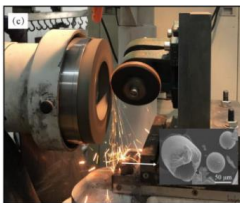
2. **Transportation:** Friction plays a crucial role in the functioning of vehicles. Cars, trains, and airplanes heavily rely on friction to generate traction and control their movements. Without it, driving or flying would become nearly impossible.



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.

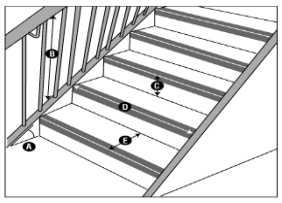
4. **Gravity and Stability:** Friction is essential for maintaining stability and preventing objects from sliding or falling. Without friction, everything from furniture to buildings would be prone to sudden movements or collapse.

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.



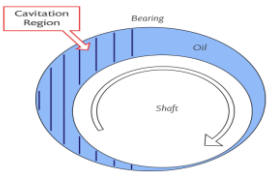
6. **Writing and Drawing:** Friction provides the necessary resistance between the pen/pencil and the paper, enabling us to write and draw. Without friction, it would be extremely difficult to create legible or precise marks on paper.

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.

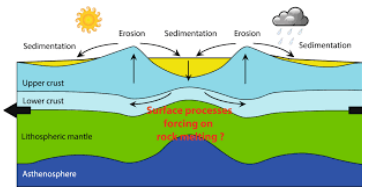


8. **Fire and Heat:** Friction generates heat, and without it, fire-making would be challenging. Rubbing two objects together to create sparks or ignite flammable material would no longer be possible.

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

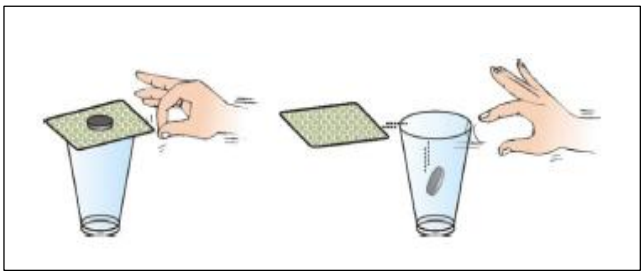
Name of the project: WHAT HAPPENS IF FRICTION VANISHES?
Class : 8th
Subject : Physical Science
Name of the School:
Time Duration :
Material used : Internet, Newspapers and 8thclass physical science book.

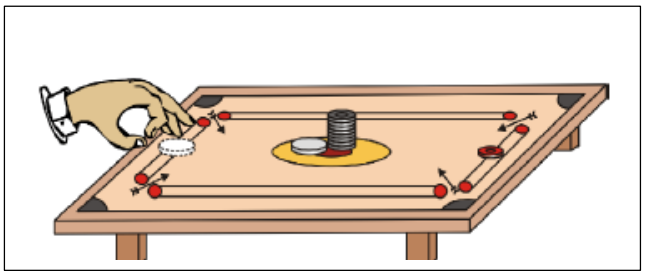
9th CLASS

Experiment -1

Aim: Prove that inertia of rest experimentally in two situations.
Materials required: Glass tumbler, A five-rupee coin, Card board
Procedure:

1) Set a five-rupee coin on a stiff card covering an empty glass tumbler standing on a table as shown in Fig.
2) Give the card a sharp horizontal flick with a finger.
3) If we do it fast then the card shoots away, allowing the coin to fall vertically into the glass tumbler due to its inertia.
4) The inertia of the coin tries to maintain its state of rest even when the card flows off.





Materials required:
Procedure:

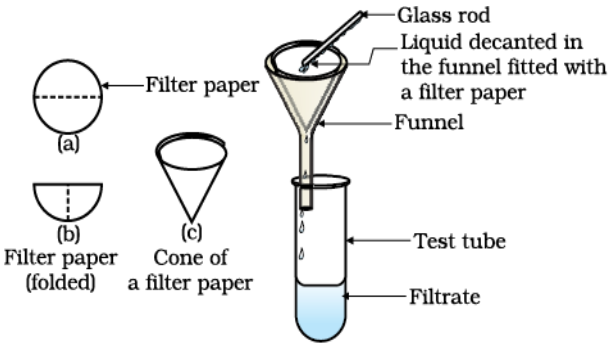
1) Make a pile of similar carom coins on a table, as shown in Fig.
2) Attempt a sharp horizontal hit at the bottom of the pile using another carom coin or the striker.
3) If the hit is strong enough, the bottom coin moves out quickly.
4) Once the lowest coin is removed, the inertia of the other coins makes them 'fall' vertically on the table.

Conclusion: Inertia is the natural tendency of an object to resist a change in its state of motion or of rest.

Experiments -2

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.

Conclusion: 1) 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.
2) Test tubes A and B have got a solution, Test tube C has got a suspension, Test tube D has got a colloidal solution.

Experiment -3

Aim: To prove that the Newton's third law of motion.
Materials required:
Procedure: 1. Request two children to stand on two separate carts as shown in Figure.
2. Give them a bag full of sand or some other heavy object.
3. Ask them to play a game of catch with the bag.

Conclusion:
1. As result of throwing and catching the sand bag, each child receives a reaction.
2. The acceleration of two carts will be nearly equal because of almost equal masses of the two carts.
3. When two children stand on one cart and one on another cart, the forces of reaction are still equal.
4. But the acceleration of the cart with two children will be smaller than the other.

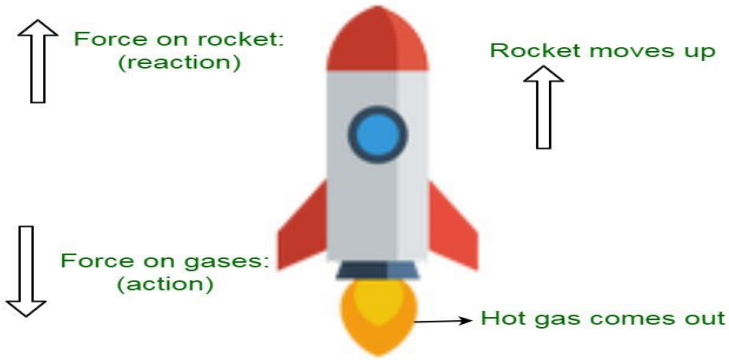
Project – 1:

Title of the Project: Applications of Newton's third law of motion in everyday life.
Aim of the Project: Applications of Newton's third law of motion in everyday life.
Hypothesis: To every action, there is an equal and opposite reaction and they act on two different bodies.

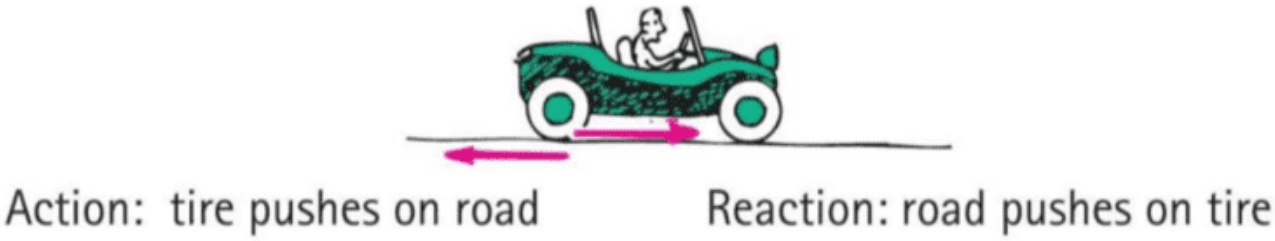
Introduction:

Applications of Newton's Third Law:

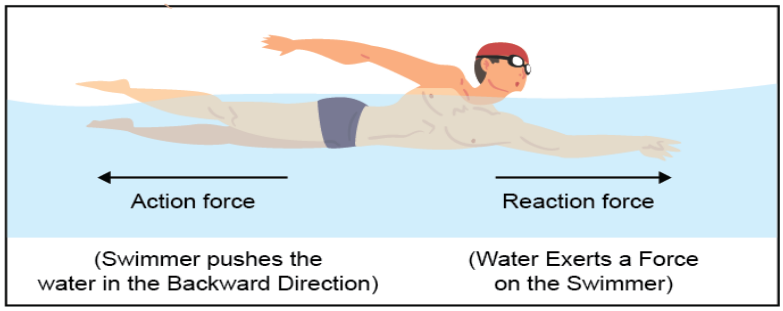
1. **Rocket Propulsion:** Rockets work based on this law. Exhaust gases are expelled downward, exerting a force (action) that propels the rocket upward (reaction).



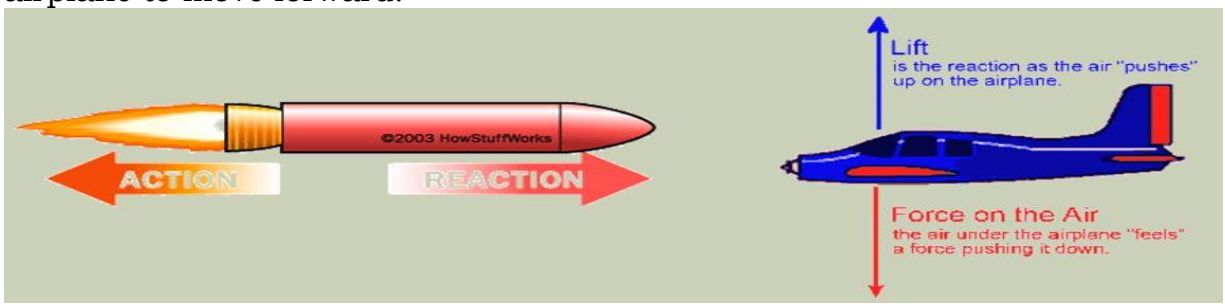
2. **Automobiles:** The movement of a car forward is the reaction to the action of the tires pushing backward against the road.



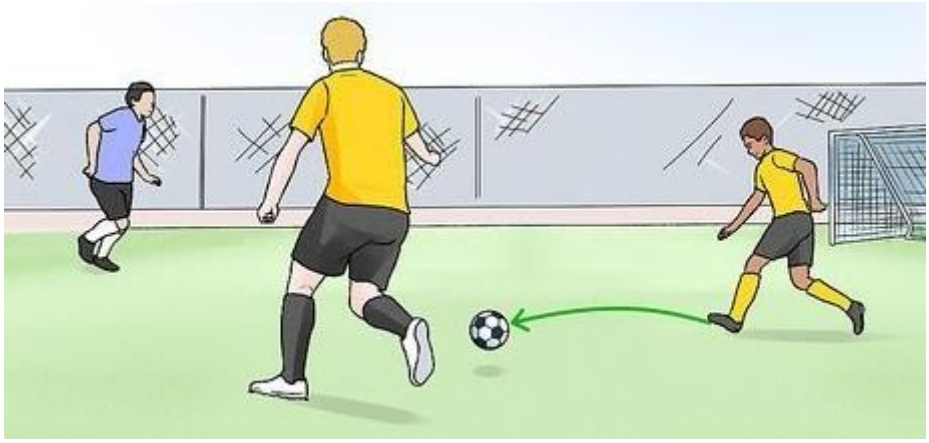
3. **Swimming:** A swimmer pushes water backward (action), and the reaction propels the swimmer forward.



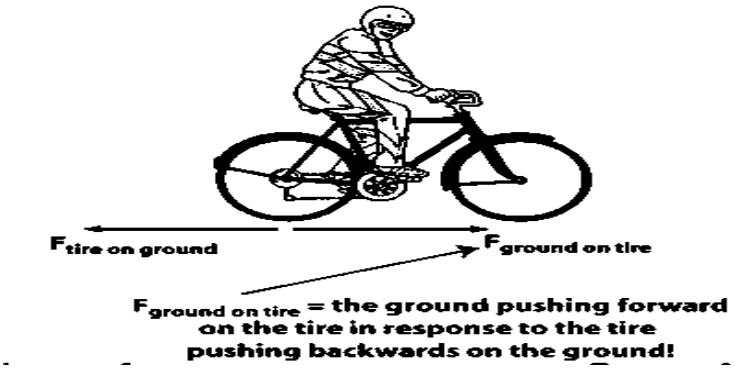
4. **Airplanes:** Thrust generated by engines pushes air backward, causing the airplane to move forward.



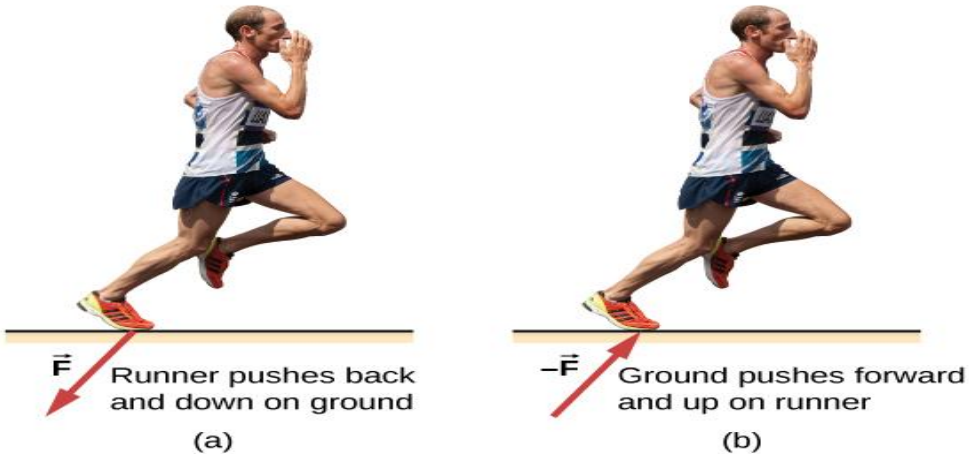
5. **Sports:** The kick of a soccer player against the ball (action) leads to the ball moving in the opposite direction (reaction).



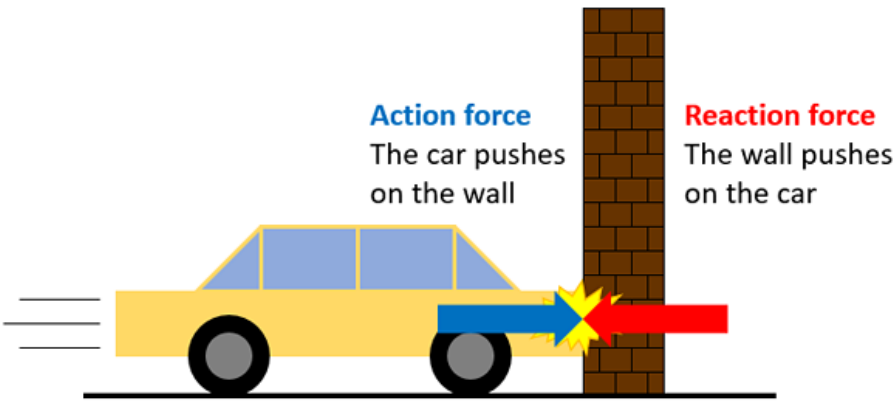
6. Riding a bicycle:



7. Walking and Running:



8. **Impact in sports or martial arts:** In martial arts, punches and kicks involve actions that generate reaction forces to deliver impact or movement.



Conclusion: Newton's third law of motion is fundamental to understanding interactions between objects and is applicable in various activities we encounter in our everyday lives, from simple movements to complex mechanical systems.

PROJECT REPORT

Name of the project : Applications of Newton's third law of motion in everyday life.
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: Tyndall effect, its examples and Affected factors.

Aim of the Project: Tyndall effects, its examples and affected factors.

Hypothesis: The Tyndall Effect is a phenomenon in physics that refers to the scattering of light as it passes through a colloid or a fine suspension of particles.

Introduction:

In 19th-century Irish scientist John Tyndall, who studied the scattering of light by small particles in gases and liquids, this effect helps explain several natural phenomena.

1. Scattering of Light:
   The Tyndall effect occurs when light passes through a medium containing small, suspended particles that are large enough to scatter light. The scattered light makes the light beam visible when viewed from the side. This effect is not seen in true solutions, where the dissolved particles are too small to scatter light effectively.
2. Colloids:
   A colloid is a mixture where one substance of microscopically dispersed insoluble particles is suspended throughout another substance. The particle size in a colloid ranges from 1 to 1000 nanometers. Colloidal solutions, such as milk or fog, exhibit the Tyndall effect because the particles are large enough to scatter light.

Examples of the Tyndall Effect

1. *Blue Sky:* The blue color of the sky is due to the scattering of sunlight by the tiny molecules of air in the Earth's atmosphere (primarily oxygen and nitrogen). While this is technically Rayleigh scattering, it's closely related to the Tyndall effect, as both involve the scattering of light by particles.
2. *Visible Light Beams in Fog or Smoke:* The Tyndall effect is evident when beams of light are made visible as they pass through fog, mist, or smoke. The light scatters off the water droplets or smoke particles, making the beam clearly visible.
3. *Dust Particles in a Sunbeam:* When sunlight passes through a window into a dusty room, the particles in the air scatter the light, making the beam visible. This is a common everyday example of the Tyndall effect.
4. *Headlights in Fog:* When car headlights shine through fog, the water droplets scatter the light, making it difficult to see. This is the Tyndall effect in action, as the light scatters off the suspended water droplets.
5. *Milk and Water Comparison:* When you shine a beam of light through milk, the light scatters and becomes visible due to the presence of colloidal fat globules. However, when the same light is passed through clear water, no scattering is observed because the water contains no suspended particles.

Applications of the Tyndall Effect

1. Identifying Colloids: The Tyndall effect is used to distinguish between colloids and true solutions. If a light beam passing through a solution becomes visible, it indicates the presence of a colloidal mixture.

2. Particle Size Measurement in Colloids: The Tyndall effect is used to measure the size of particles in colloids. The intensity of scattered light can give information about the size and distribution of particles in the colloid.
3. Medical and Biological Research: The Tyndall effect is used in medical research to study blood plasma and other biological colloids. It helps researchers analyze the concentration and size of particles in biological samples.
4. Purification Techniques: The Tyndall effect helps in the detection of impurities in liquids. If a solution is pure, it will not scatter light, but if colloidal impurities are present, light scattering will be visible.

Factors Affecting the Tyndall Effect

1. Wavelength of Incident Light: As mentioned earlier, shorter wavelengths (blue light) are scattered more than longer wavelengths (red light). This is why the sky appears blue and why scattered light from colloids often looks bluish.
2. Size and Concentration of Particles:
   Larger particles scatter more light, making the Tyndall effect more pronounced. If the particle size exceeds a certain threshold (typically larger than 1000 nm), the mixture may not behave as a colloid but as a suspension, where particles may settle over time.
3. Nature of the Medium:
   The refractive index difference between the suspended particles and the surrounding medium influences the intensity of light scattering. If the refractive index of the particles is similar to the medium, less scattering occurs.

Conclusion: The effect can be observed in everyday life, such as in fog, dusty air, or when shining a light through a colloidal solution.

PROJECT REPORT

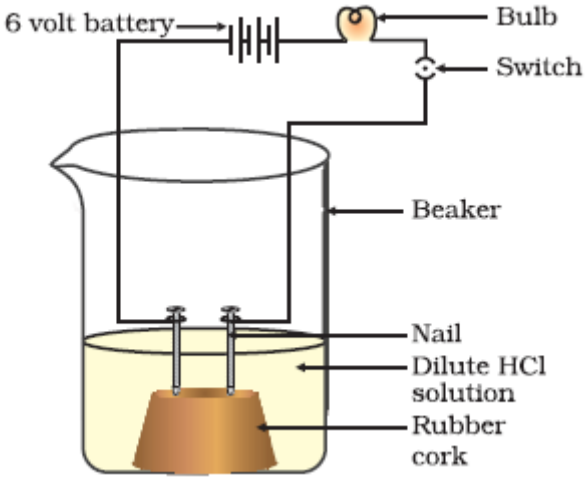
Name of the project	: Tyndall effects, its examples and affected factors.
Class	: 9th class
Subject	: Physical Science
Name of the School	:
Time Duration	:
Material Used	: Internet, Newspapers and 9th class textbook

10th CLASS

Experiment -1

Aim: Compounds such as alcohol and glucose also contain hydrogen but are not categorised as acids.

Materials required: Beaker, Bulb, Switch, Battery, Cork, Two iron nails, Solutions of glucose, alcohol, hydrochloric acid, sulphuric acid.



Procedure:

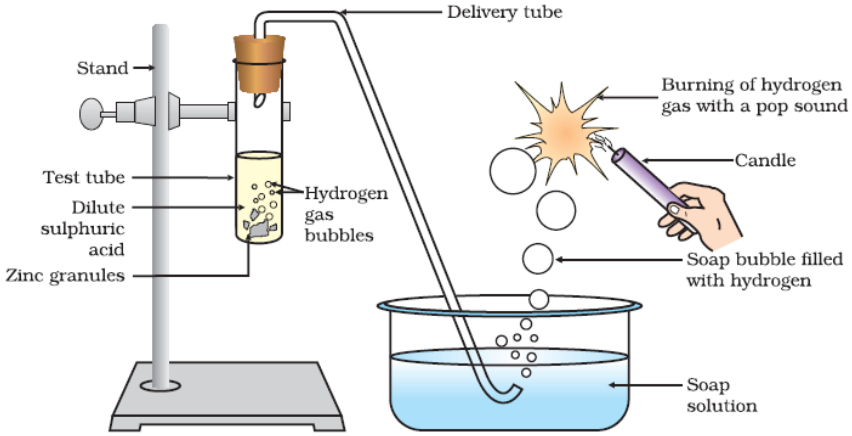
1. Take solutions of glucose, alcohol, hydrochloric acid, sulphuric acid, etc.
2. Fix two nails on a cork, and place the cork in a 100 mL beaker.
3. Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch, as shown in Figure.
4. Now pour some dilute HCl in the beaker and switch on the current.
5. Repeat with dilute sulphuric acid.
6. The bulb glows only in the case of acids because the ions are present to facilitate flow of current.
7. Repeat the experiment separately with glucose and alcohol solutions.
8. Glucose and alcohol solutions do not have ions and thus electricity is not conducted and bulb does not glow.

Conclusion: 1) The bulb will start glowing in the case of acids.
2) We observe that glucose and alcohol solutions do not conduct electricity.

Experiment -2

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

Materials required: Stand, Test tube, Delivery tube, Different dilute acids, Zinc granules, Soap water, Glass tumbler.



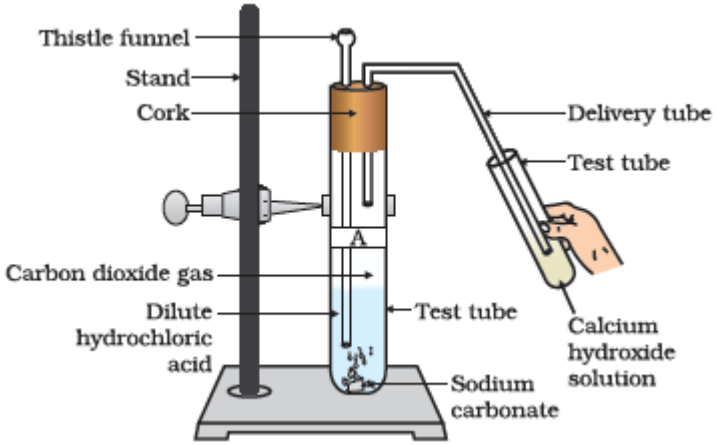
Procedure: 1. Set the apparatus as shown in figure.
2. Take about 5 ml of dilute sulphuric acid in a test tube and add a few pieces of zinc granules to it.
3. There is effervescence on the surface of zinc granules.
4. Pass the gas being evolved through the soap solution.
5. The gas H_2 evolved gets trapped in soap solution forming bubbles.
6. Take a burning candle near a gas filled bubbles.
7. Gas bubbles break up with a pop sound due to burning of hydrogen gas.
8. Repeat this activity with some more acids like HCl, HNO_3, CH_3COOH.
9. Similar observations will be seen with other acids.

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

Experiment -3

Aim: To show that dilute acid produce carbon dioxide gas reacted with metal carbonates or metal hydrogen carbonates.

Materials required:



Procedure:
1. Take two test tubes, label them as A and B.
2. Take about 0.5 g of sodium carbonate (Na CO) in test tube A and about 2 3 0.5 g of sodium hydrogencarbonate (NaHCO) in test tube B. 3
3. Add about 2 mL of dilute HCl to both the test tubes.
4. CO_2 is evolved with effervescence when sodium carbonate or sodium hydrogen carbonate react with dilute acids.
5. Pass the gas produced in each case through lime water as shown in Figure.

.**Conclusion:** 1. On passing carbon dioxide produced through lime water a milky precipitate of calcium carbonate is formed.
2. dilute acid produce carbon dioxide gas reacted with metal carbonates or metal hydrogen carbonates.

Project – 1

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

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

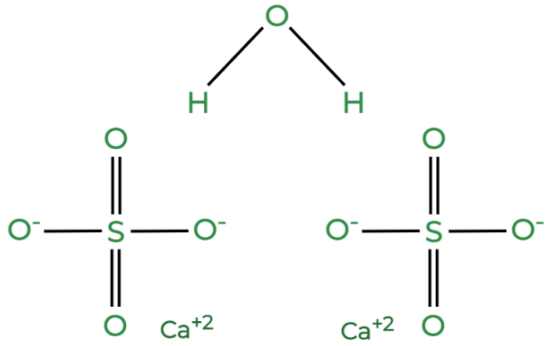
Hypothesis: Plaster of Paris is a well-known chemical compound that is widely used in sculpting materials and gauze bandages. While we have seen numerous applications of this substance in our daily lives, Plaster of Paris is a white powdered chemical compound that is hydrated calcium sulphate that is 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: Collect information on Plaster of Paris (POP)
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: Complete information of rainbow

Aim of the Project: Formation rainbow and significance

Hypothesis: A rainbow is a meteorological and optical phenomenon that occurs when light is refracted, reflected, and dispersed in water droplets, forming a spectrum of light in the sky. Rainbows are typically seen after a rainstorm when sunlight shines on water droplets in the atmosphere, but they can also form near waterfalls, fountains, or mist.

Introduction:

Formation: Rainbows form when sunlight interacts with moisture in the air. This process involves three key optical effects:

1. Refraction: As light enters a water droplet, it bends because the speed of light is slower in water than in air.
2. Reflection: The light reflects off the inside surface of the droplet.
3. Dispersion: Different colors of light are bent by different amounts (due to varying wavelengths), separating white sunlight into its component colors.

Colors: Red (longest wavelength, least refracted), Orange, Yellow, Green, Blue, Indigo, Violet(shortest wavelength, most refracted)

Types of Rainbows

1. **Primary Rainbow:** The most common and brightest rainbow, formed when light is refracted and reflected once inside the droplet. In a primary rainbow, red is on the outer edge and violet on the inner edge.

2. **Secondary Rainbow:** Sometimes, a second, fainter rainbow appears outside the primary one. This is formed by two internal reflections inside the droplet, reversing the color order (red on the inside, violet on the outside).
3. **Supernumerary Rainbow:** Faint, extra rainbow arcs can occasionally be seen inside the primary rainbow. These are caused by interference patterns of light waves, usually due to smaller water droplets.
4. **Full Circle Rainbow:** While most rainbows appear as an arc, they are actually circular. The ground usually obstructs the bottom part of the circle. From high altitudes, such as from an airplane, you might see a full-circle rainbow.

Conditions for Seeing a Rainbow

Sunlight: Rainbows form when sunlight passes through water droplets in the air. Water Droplets: Rainbows typically occur after rain, but they can also form in mist, fog, spray, or dew.

Viewing Angle: A rainbow is visible when the observer is between the sun and the water droplets, with their back to the sun. The angle between the incoming sunlight and the viewer's line of sight to the rainbow is usually about 40-42 degrees.

Scientific and Mathematical Significance

Optics: Rainbows are a clear demonstration of the principles of optics, including the refraction, reflection, and dispersion of light.

Rainbow Angle: The specific angles of reflection and refraction involved in forming a rainbow are critical in determining the shape and size of the arc. The typical viewing angle for a primary rainbow is around 42 degrees relative to the direction opposite the sun.

Wavelengths: The colors of a rainbow correspond to different wavelengths of light. Red light has a longer wavelength (~700 nm), and violet light has a shorter wavelength (~400 nm).

Double Refraction and Secondary Rainbows

- When light reflects twice inside a water droplet, it can create a secondary rainbow, which is fainter and appears outside the primary rainbow with the colors reversed (red inside, violet outside).
- The secondary rainbow is often wider and more diffuse because light is spread over a larger area due to the second internal reflection.

Rainbows in Art and Culture

Art: Rainbows have long been a symbol of beauty, hope, and wonder in art and culture.

LGBTQ+ Symbol: The rainbow flag is widely recognized as a symbol of the LGBTQ+ community, representing diversity, inclusion, and pride.

Literature: Rainbows have been featured in literature and poetry as symbols of hope, beauty, and the connection between Earth and the divine.

Conclusion: Rainbows are a striking example of natural beauty and a reminder of the complexity of light and optics. Their vibrant colors and arc-shaped appearance have made them symbols of hope, beauty, and wonder throughout human history. The physics behind rainbows, while scientifically explainable, still leaves room for awe and fascination for people of all ages.

PROJECT REPORT

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

Project – 3

Title of the Project: Collect information on Atmospheric refraction.

Aim of the Project: Atmospheric refraction and factors

Hypothesis: Atmospheric refraction refers to the bending of light (or any electromagnetic wave) as it passes through the Earth's atmosphere. This bending occurs because light travels at different speeds through different layers of the atmosphere, which vary in temperature and density. The phenomenon is most commonly observed in astronomical and terrestrial contexts, affecting how objects like stars, the sun, and distant landscapes appear.

Introduction:

1. Basic Principle

- *Light Bending:* When light enters the Earth's atmosphere, it slows down and changes direction due to variations in air density and temperature. As light passes from less dense air (higher altitudes) to denser air (closer to Earth's surface), it bends towards the normal line (perpendicular to the surface of separation).
- *Index of Refraction:* The change in the light's speed depends on the refractive index of air, which is affected by pressure, temperature, and humidity. Generally, cooler and denser air has a higher refractive index.

2. Effects of Atmospheric Refraction

- *Astronomical Refraction:* It affects the apparent position of celestial objects. For instance, stars appear slightly higher in the sky than their actual position due to the bending of light. The effect is more pronounced closer to the horizon, which is why stars near the horizon seem displaced upwards.
- *Twilight Extension:* The sun can be seen even when it is below the horizon, prolonging daylight during sunrise and sunset. This creates a phenomenon where the sun appears to rise earlier and set later than it actually does.
- Mirages: Refraction can cause optical illusions, such as mirages, where light bends in such a way that distant objects, or even the sky, are reflected on the ground, creating a false image.
- *Terrestrial Refraction:* This affects how we see objects over long distances on Earth. For example, distant mountains or buildings may appear displaced from their true position due to the bending of light over long distances through varying air densities.

3. Types of Refraction

- *Standard Refraction:* This is the normal refraction experienced under usual atmospheric conditions, where light bends gradually as it moves through layers of varying density.
- Super-refraction: Occurs when temperature gradients in the atmosphere cause light to bend more than usual, often leading to enhanced visibility of distant objects.
- *Sub-refraction:* Opposite of super-refraction, where light bends less than normal, usually in conditions where temperature increases with altitude (temperature inversion).
- *Ducting:* In extreme cases, refraction can cause light to follow the curvature of the Earth, allowing radio waves to travel much farther than usual.

Factors Influencing Atmospheric Refraction

- Temperature: Warmer air has a lower refractive index, while cooler air has a higher refractive index, leading to variations in the bending of light.
- Pressure: Higher pressure increases air density, which in turn increases the refractive index.
- Humidity: Water vapor in the air also affects the refractive index. Humid air has a slightly lower refractive index than dry air, though this effect is generally small.

Practical Implications

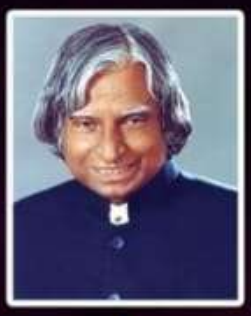
- Navigation: Atmospheric refraction is important in astronomical navigation, as navigators must account for the apparent displacement of celestial bodies.
- Telescopic Observations: Telescopes that observe stars or planets close to the horizon must correct for refraction to get accurate measurements.
- Communication: Radio waves are subject to atmospheric refraction, which affects long-distance communication systems such as radar and satellite transmission.

Conclusion: Atmospheric refraction is a crucial aspect of both everyday optical experiences and specialized fields like astronomy and meteorology, significantly affecting how we perceive light from the environment and space.

PROJECT REPORT

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

PHYSICAL SCIENCE

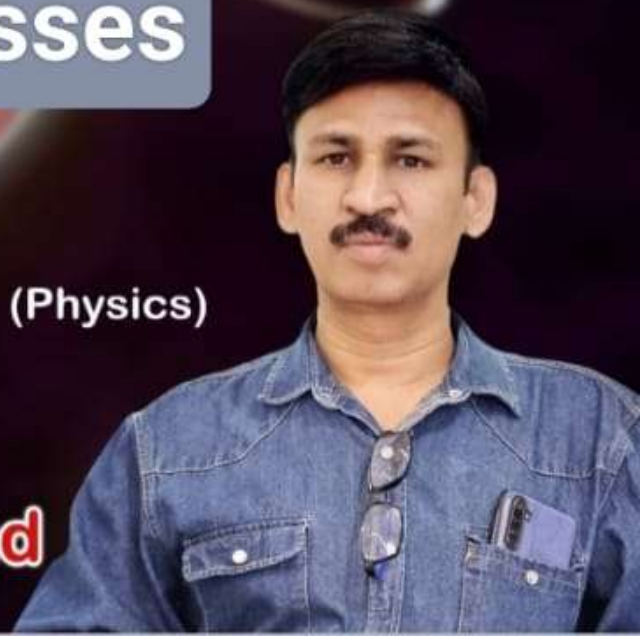


FORMATIVE ASSESSMENT - 2

Experiments/Lab activities/Activities and Projects

(2024 - 2025)

VIII, IX & X Classes



M.Srinivasa Rao, SA (Physics)
SPSMHS, GUDIVADA.
Ph: 9848143855

Visit : srini science mind