Formative Assessment - II

(2023-2024)

PHYSICAL SCIENCE

VIII, IX, X Classes

Experiments/Lab activities & Projects

Special Edition

M.SRINIVASA RAO
SA(PS)
SPSMHS, GUDIVADA
Ph: 9848143855
Visit: srini science mind

8th CLASS

Experiment -1

Aim: Identifying a substance as coal experimentally.

Materials required: Sample suspected to be coal, Bunsen burner or a heat source, Ceramic crucible or a fire-resistant container, Test tubes and test tube holder, Hydrochloric acid (HCl), Water, Balance or scale, A source of ignition(matches or a lighter), Safety goggles and gloves.

Procedure:

Visual Examination:

1. Examine the sample's appearance. Coal is typically black or brownish-black and has a matte or dull luster.
2. Check for any layered or irregular texture on the surface.

Density Measurement:

1. Weigh the sample using a balance or scale to determine its mass.
2. Calculate the density by dividing the mass by the volume. If you don't know the volume, you can estimate it based on the sample's dimensions.
3. Compare the calculated density to typical coal densities, which are generally lower than most rocks and minerals.

Combustion Test:

1. Ignite a small piece of the sample using a Bunsen burner or a heat source.
2. Observe the flame color and characteristics. Coal typically burns with a yellow or orange flame, releasing carbon dioxide.
3. Note the odor and any visible ash left behind after burning.

Acid Reaction:

1. Place a small portion of the sample in a test tube.
2. Add a few drops of hydrochloric acid (HCl) to the sample.
3. Observe if there is any reaction. Coal should not react with the acid, indicating its organic nature.

Heating Test:

1. Heat a small sample of the material in a ceramic crucible or fire-resistant container.
2. Observe the material's behavior as it heats up: Coal will release volatile components, such as water vapor or gases, and may shrink in size.
3. Note any change in color or texture.
4. Coal will leave behind ash after heating.

Conclusion: Based on the results of the experiments and comparisons, determine whether the material is coal or another substance.

Experiment -2

Aim: Identifying inexhaustible and exhaustible natural resources experimentally

Materials required: Samples representing potential natural resources (e.g., water, sunlight, fossil fuel, soil), Containers or setups for experiments, Measuring instruments(e.g., measuring cups, thermometers, light sensors), Timer or clock

Procedure:

Part 1: Identification of Inexhaustible Natural Resources

Inexhaustible natural resources are those that are virtually unlimited in supply and can be replenished naturally over time. Here's how you can identify them experimentally:

1. Water (as an example):
   a. Fill a container with water (a small basin or beaker).

b. Set up a simple experiment to measure the rate of water evaporation. You can use a thermometer to monitor the water temperature and a timer to record the time it takes for a noticeable decrease in water level due to evaporation.
c. Observe and record the results over a period of time (several days or weeks).
d. Conclude that water is an inexhaustible resource because it can be replenished through natural processes like the water cycle.

Part 2: Identification of Exhaustible Natural Resources

Exhaustible natural resources are finite and can be depleted over time. Fossil fuels like coal, oil, and natural gas are examples. Here's how you can identify them experimentally:

1. Fossil Fuel (as an example):
   a. Take a small piece of coal, representing a fossil fuel resource.
   b. Set up a simple experiment to simulate combustion (burning) of the coal. Place the coal in a controlled environment, such as a heat-resistant dish or crucible.
   c. Ignite the coal using a heat source (e.g., a Bunsen burner or a candle) and observe the combustion process.
   d. Record the time it takes for the coal to burn completely or to a significant extent.
   e. Conclude that coal is an exhaustible resource because it can be depleted through consumption and combustion.

Conclusion: 1. Inexhaustible natural resources like water demonstrated a sustainable supply or the ability to replenish naturally over time.
2. Exhaustible natural resources like fossil fuels showed a finite supply and the potential for depletion through consumption.

Experiment -3

Aim: Simulated Distillation and Fractionation of Crude Oil

Materials required: A small sample of crude oil (representing the feedstock),A distillation apparatus (e.g., a simple distillation setup or a fractional distillation column), Heat source (e.g., Bunsen burner or hot plate), Collection flasks or test tubes, Thermometer, Water-cooling system (condenser or Liebig condenser), Fractionating column (if performing fractional distillation), Safety goggles and lab coat.

Procedure:

1. Sample Preparation:
a) Obtain a small sample of crude oil. This represents the feedstock that enters a real petroleum refinery.
b) If necessary, filter the crude oil to remove any solid impurities.
2. Setting Up the Distillation Apparatus:
a) Assemble the distillation apparatus. If you have a fractional distillation column, attach it to the setup.
b) Ensure that the distillation flask is clean and dry.
c) Attach the condenser to the distillation flask, and connect it to a water source for cooling.
d) Place a collection flask or test tube at the distillate outlet.
3. Heating and Distillation:
a) Begin heating the crude oil sample gently using the heat source (Bunsen burner or hot plate).
b) Record the temperature as it rises throughout the process.
c) As the temperature increases, different fractions of the crude oil will start to vaporize.
d) The lowest boiling fractions (such as gases and light naphtha) will condense and collect in the first collection flask or test tube.
e) Continue heating until you have collected several fractions representing different boiling ranges (e.g., gasoline, kerosene, diesel, etc.).
4. Observation and Data Collection:
a) Observe the different fractions collected and note their physical properties, such as

color and viscosity.
b) Record the temperature ranges at which each fraction was collected.
c) Label each fraction according to its expected petroleum product (e.g., gasoline, kerosene).
5. Safety Precautions:
a) Ensure proper ventilation in the laboratory.
b) Wear safety goggles and a lab coat.
c) Handle heating equipment with care to prevent accidents.
d) Use caution when working with open flames.

Conclusion: This simplified experiment demonstrates the concept of distillation and fractionation in petroleum refining, providing a basic understanding of how crude oil is separated into various useful products in a real refinery.

Project – 1

Title of the Project: Formation of Petroleum: Nature's Liquid Gold

Aim of the project: Formation of Petroleum

Hypothesis: Petroleum, often referred to as "liquid gold," is a valuable natural resource that powers our modern world.

Introduction: Understanding how petroleum forms is essential to appreciate its significance. Petroleum originates from organic materials buried deep within the Earth and undergoes a transformation over millions of years, ultimately resulting in the formation of this precious resource.

1. Source Material: Petroleum primarily originates from the remains of ancient marine organisms such as plankton and algae. These microorganisms accumulated at the bottom of ancient oceans and seas.
2. Deposition: Over time, layers of sediment accumulated on top of these organic remains. The pressure from these layers compressed the organic material, causing it to become buried deeper within the Earth's crust.
3. Heat and Pressure: As the organic material sank deeper into the Earth's crust, it encountered increasing heat and pressure. This combination of high temperatures and pressure initiated a process called "diagenesis," which transforms the organic material into a waxy substance called kerogen.
4. Cooking Process (categenesis): Further burial and increased temperature transform kerogen into hydrocarbons. This process, known as catagenesis, involves the cracking of long-chain hydrocarbons in kerogen into shorter and more complex hydrocarbons like oil and natural gas.
5. Migration: Once formed, petroleum tends to migrate through porous rock layers, seeking reservoirs where it can accumulate. The movement of petroleum is driven by buoyancy and geological structures.
6. Trapping: Petroleum is usually found in reservoirs trapped beneath impermeable rocks, like shale or salt domes. These geological traps prevent the oil and gas from escaping to the surface.
7. Maturation: Over millions of years, petroleum continues to mature, with some components breaking down into natural gas, while others remain as liquid crude oil.
8. Exploration and Extraction: To access petroleum, exploratory drilling is conducted to locate and extract it from reservoirs deep underground.
9. Conclusion: The formation of petroleum is a remarkable geological process that takes millions of years. It begins with the accumulation of organic material from ancient marine life, undergoes heat and pressure-driven transformations, and ultimately leads to the creation of valuable oil and gas deposits. Understanding

this process is crucial for efficient petroleum exploration and the sustainable management of this vital natural resource.

PROJECT REPORT

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

Project – 2

Title of the Project: *Collect information on Various Constituents of Petroleum and their Uses*

Aim of the project: Various Constituents of Petroleum and their Uses

Hypothesis: Petroleum is a complex mixture of hydrocarbons and various other compounds.

Introduction: Petroleum, often referred to as "liquid gold," is a valuable natural resource that powers our modern world. Understanding how petroleum forms is essential to appreciate its significance.

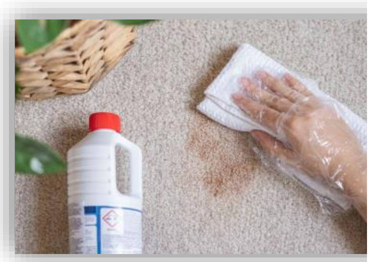
1. Petroleum Gas in Liquid Form(LPG)

Use: Fuel for home and Industry


2. Petrol

Use: Motor fuel, Aviation fuel, Solvent for dry cleaning





3.Kerosene

Use: Fuels for stove, Lamps and for Jet aircrafts



4. Diesel

Use: Fuel for heavy motor vehicles, Electric generators

5. Lubricating oil

Use: Lubrication

6. Paraffin wax

Use: Ointments, Candles, Vaseline etc.

7. Bitumen

Use: Paints, Road surfacing

Conclusion:

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 – 3:

Title of the Project: **The function of major thermal power plants in India.**

Aim of the Project: Collect information on major thermal power plants.

Hypothesis: Generate electric energy from thermal energy

Introduction: The functioning of major thermal power plants in India involves a series of steps and processes to generate electricity from thermal energy. Here's a general overview of how these power plants operate.

1. Fuel Supply:
   - Thermal power plants primarily use coal, natural gas, or oil as fuel sources.
   - The fuel is transported to the power plant site and stored in large stockpiles or storage tanks.
2. Combustion Process:
   - The fuel is burned in a combustion chamber, typically within a boiler, to produce high-temperature and high-pressure steam.
3. Steam Generation:
   - Water is heated to produce steam using the heat generated from the combustion process.
   - The high-pressure steam is directed to a steam turbine.
4. Steam Turbine:
   - The steam turbine is connected to a generator.
   - As the high-pressure steam flows through the turbine, it causes the turbine blades to rotate.
5. Electricity Generation:
   - The rotation of the turbine drives the generator, which converts mechanical energy into electrical energy.
   - This electricity is then transmitted to the grid for distribution to consumers.
6. Cooling:
   - The steam exiting the turbine is condensed back into water in a condenser.
   - Cooling water, often from a nearby river or cooling tower, is used to reduce the temperature of the steam.
7. Steam Cycle:
   - The water, now in liquid form, is returned to the boiler to repeat the steam generation cycle.
   - This closed-loop system ensures efficient use of water.
8. Emissions Control:
   - Thermal power plants employ various technologies to control emissions of pollutants, such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter.
   - Technologies like flue gas desulfurization (FGD) and selective catalytic reduction (SCR) help reduce air pollution.
9. Ash Handling:
   - In coal-fired power plants, ash is produced as a byproduct of combustion.
   - Ash handling systems collect and transport the ash to ash ponds or for disposal.
10. Environmental Compliance: -
    - Power plants must adhere to environmental regulations and obtain necessary permits to operate.
    - Regular monitoring and reporting of emissions and compliance with emission limits are essential.
11. Maintenance and Upkeep: -
    - Thermal power plants require regular maintenance to ensure safe and efficient operation.
    - Planned shutdowns or outages are scheduled for maintenance activities.
12. Modernization and Efficiency Improvements: -

- Power plants may undergo upgrades and improvements to enhance efficiency and reduce emissions.
- These upgrades may include adopting cleaner technologies and improving fuel efficiency.

13. Grid Integration: -
    - Electricity generated at thermal power plants is integrated into the national or regional grid for distribution to consumers.

Conclusion: It's important to note that while the general process remains consistent, the specific operations of thermal power plants can vary depending on factors such as the type of fuel used (coal, natural gas, or oil), the size and capacity of the plant, and the technology employed. Additionally, there is a growing emphasis on cleaner and more efficient technologies in the Indian power sector to reduce environmental impacts and increase energy efficiency.

PROJECT REPORT

Name of the project	:
Class	: 8th class
Subject	: Physical Science
Name of the School	:
Time Duration	:
Material Used	: Internet, Newspapers and 8th class textbook

Experiment -1

Aim: To prove that law of conservation of mass in a chemical reaction.

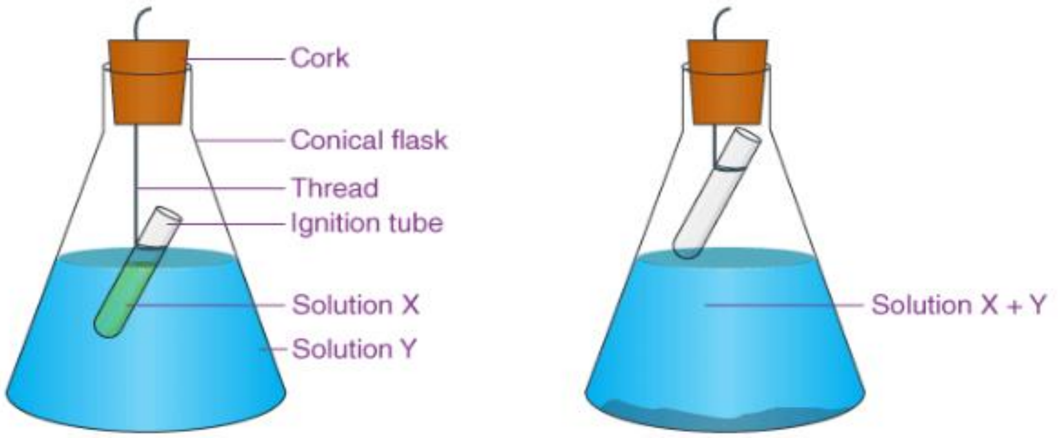
Materials required: Copper sulphate, Barium chloride, Lead nitrate, Sodium carbonate, Sodium sulphate, Sodium chloride, Water, Conical flask, Ignition tube,

Procedure:

1. Take one of the following sets X and Y of chemicals.

X		Y	
i) Copper sulphate	1.25g	Sodium carbonate	1.43g
ii) Barium chloride	1.22g	Sodium sulphate	1.53g
iii) Lead nitrate	2.07g	Sodium chloride	1.17g

2. Prepare separately 5% solution of any one pair of substances listed above X and Y each in 10 ml. in water.
3. Take a little amount of solution of Y in a conical flask and some solutions of X in an ignition tube.
4. Hang the ignition tube in the flask carefully, see that the solutions do not get mixed. Put a cork on the flask.
5. Weigh the flask with its contents carefully.
6. Now tilt and swirl the flask, so that the solutions X and Y get mixed.
7. Weigh again.
8. Cork is put on the mouth of the flask so that no material escapes out of splits out on swirling.
9. The mass of the flask and its contents are the same before the reaction and after the reaction.



Record the weight of reactants   Record the weight of product

Observations and Interpretation:

1. Some precipitate is formed in all the cases.
2. A chemical reaction takes place in all the cases.

Conclusion:

By comparing the initial and final masses of the reactants and products, you can demonstrate that the total mass is conserved during the chemical reaction. This is law of conservation of mass in chemical reaction.

Experiment -2

Aim: To prove that law of law of constant proportions

Materials required: Hydrogen Peroxide (H_2O_2), Distilled Water (H_2O), Balance, Measuring cylinder (10 ml), Small test tubes, Cork stoppers or rubber stoppers with holes, Delivery tube, Gas collection setup (water displacement method), Graduated cylinder (100 ml), Matches or a lighter

Procedure:

1. Fill a measuring cylinder with 10 ml of hydrogen peroxide (H_2O_2).
2. Weigh a small empty test tube using the digital balance and record its mass.
3. Insert a cork stopper or rubber stopper with a delivery tube into the test tube.
4. Place the other end of the delivery tube under the rim of a container filled with water, creating a water displacement setup.
5. Carefully immerse the test tube with the delivery tube into the measuring cylinder filled with hydrogen peroxide. Ensure that the delivery tube does not touch the liquid.
6. Gently heat the hydrogen peroxide using a Bunsen burner or a heat source. As the hydrogen peroxide decomposes, oxygen gas (O_2) will be released and collected in the container through the water displacement setup.
7. Continue heating until no more oxygen gas bubbles are produced. Allow the apparatus to cool.
8. Measure the volume of the collected oxygen gas using the graduated cylinder.

Observations and Interpretation:

1. During the decomposition of hydrogen peroxide, it breaks down into water (H_2O) and oxygen gas (O_2) according to the chemical equation: $2H_2O_2 \rightarrow 2H_2O + O_2$.
2. By measuring the volume of oxygen gas collected, you can determine the ratio of oxygen to hydrogen peroxide in the compound.

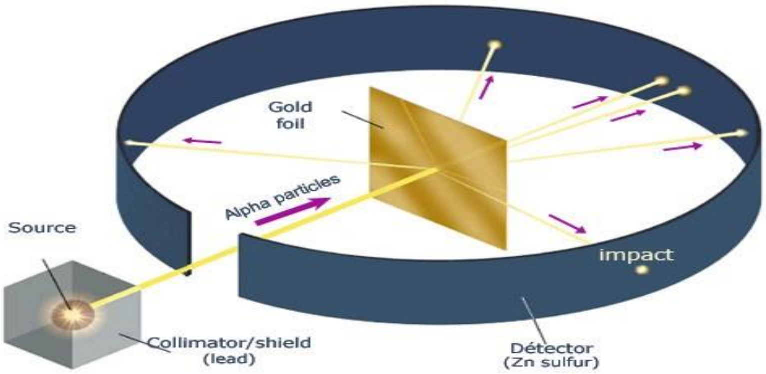
Conclusion:

According to the law of constant proportions, the ratio of hydrogen and oxygen in hydrogen peroxide should remain constant, regardless of the source or method of preparation. If you compare the ratio of oxygen in the collected gas to the original mass of hydrogen peroxide used, you'll find that they are in a fixed ratio. This supports the law of constant proportions.

Experiment -3

Aim: Rutherford's Alpha Scattering Experiment

Materials required: A radioactive source that emits alpha particles (e.g., radium or polonium), thin sheet of gold foil (a few atoms thick), fluorescent screen or zinc sulfide screen, lead shield to block background radiation, collimator to direct the alpha particles.



Procedure:

Collimation: Adjust the collimator to direct a narrow beam of alpha particles from the radioactive source towards the gold foil.

Observation: Without applying any voltage, observe the pattern of alpha particles hitting the fluorescent screen. Most alpha particles should pass through the gold foil with little deflection.

Applying Voltage: Gradually increase the voltage applied to the gold foil setup. This can be done by using a source of potential difference (e.g., a battery) connected to the gold foil.

Data Collection: Record the following observations:

The number of alpha particles that pass through the gold foil without any deflection. The number of alpha particles that are deflected at various angles. Any alpha particles that bounce back towards the source.

Analysis: Use the data collected to draw conclusions about the structure of the atom:

a) Most alpha particles pass through the gold foil with little deflection, indicating that atoms are mostly empty space.
b) Some alpha particles are deflected at various angles, suggesting the presence of a dense, positively charged nucleus in the atom.
c) A few alpha particles bounce back towards the source, indicating direct collisions with the nucleus.

Safety Precautions:

a) Handle radioactive sources with extreme care, ensuring that exposure to radiation is minimized.
b) Conduct the experiment in a controlled environment and follow safety guidelines for radiation handling.

Conclusion: Rutherford's alpha scattering experiment provided crucial evidence for the nuclear model of the atom, which revolutionized our understanding of atomic structure and paved the way for modern atomic theory.

Project – 1:

Title of the Project: Applications/Uses of Isotopes in different fields.

Aim of the Project: Applications of Isotopes in Various Fields.

Hypothesis: In nature, a number of atoms of some elements have been identified, which have the same atomic number but different mass numbers.

Introduction: Isotopes are variants of chemical elements with the same number of protons but different numbers of neutrons. These atomic variants play a crucial role in numerous scientific and practical applications across various fields. From healthcare to agriculture, environmental science to archaeology, isotopes have found diverse applications that have revolutionized our understanding of the natural world and improved our quality of life. This essay explores the multifaceted applications of isotopes in various fields.

1. Medicine and Healthcare:

Isotopes have had a profound impact on the field of medicine and healthcare. They are widely used in medical diagnostics and therapy. Some notable applications include:

- Radio diagnosis: Isotopes like technetium-99m are commonly used in nuclear medicine for imaging purposes. Positron emission tomography (PET) scans use isotopes like fluorine-18 to visualize metabolic processes in the body.
- Radiotherapy: In cancer treatment, radioactive isotopes such as cobalt-60 and iodine-131 are employed to destroy cancer cells while sparing healthy tissue.
- Tracers: Isotopic tracers are used to track the movement of substances within the body. For instance, carbon-14 dating helps estimate the age of organic materials, while radioactive iodine is used to assess thyroid function.

2. Environmental Science:

Isotopes play a crucial role in understanding and monitoring environmental processes and changes. They are employed in:

- Climate Studies: Oxygen and carbon isotopes are used to reconstruct past climate conditions by analyzing ice cores, tree rings, and sediment layers.
- Hydrology: Isotopes of hydrogen and oxygen in water help trace the movement and origin of groundwater, which is essential for managing water resources.
- Pollution Control: Radioactive isotopes can be used to track the spread of pollutants and contaminants in the environment.

3. Archaeology and Anthropology:

Isotopic analysis has transformed our understanding of human history and culture. Applications include:

- Dating Artifacts: Carbon-14 dating helps determine the age of archaeological artifacts and fossils, providing insights into ancient civilizations.
- Dietary Analysis: Isotope ratios in human remains can reveal information about ancient diets and migration patterns.
- Forensic Science: Isotopic analysis is used in forensic investigations to identify victims, trace geographical origins, and solve crimes.

4. Agriculture:

Isotopes are employed in agriculture to improve crop yield, manage soil fertility, and control pests. Some applications include:

- Nutrient Uptake: Radioactive isotopes help study nutrient uptake by plants, leading to better fertilization practices.
- Pest Control: Sterile insect technique (SIT) uses irradiated insects to control pest populations.

5. Energy Production:

- Isotopes are used in nuclear energy production, which offers a significant source of clean and efficient power generation. Uranium-235 and plutonium-239 are commonly used isotopes in nuclear reactors.

6. Geology and Earth Sciences:

- Isotopic dating methods, such as radiometric dating, are vital in determining the ages of rocks and minerals, aiding in understanding the Earth's geological history.

7. Space Exploration:

- Isotopes have applications in space exploration, such as powering spacecraft using radioisotope thermoelectric generators (RTGs) fueled by isotopes like plutonium-238.

8. Industrial and Material Science:

- Isotopes are used to trace and monitor industrial processes, ensuring product quality and safety.

Conclusion: Isotopes are invaluable tools across a wide range of scientific disciplines and practical applications. From revolutionizing healthcare to uncovering archaeological mysteries, from enhancing agriculture to powering spacecraft, isotopes continue to advance our knowledge and improve our lives. As technology continues to evolve, the potential applications of isotopes in various fields are likely to expand, promising further breakthroughs and discoveries. It is clear that isotopes will remain an indispensable part of our scientific and technological toolkit for the foreseeable future.

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: The Fascinating Journey of Discovery of Elements

Aim of the Project: The discovery of Elements

Hypothesis: Hypotheses regarding the discovery of elements have been proposed to explain the processes and conditions under which new elements are found. Here are several hypotheses related to the discovery of elements.

Introduction: The discovery of elements is a captivating journey that spans centuries, shaped by the relentless curiosity of scientists, advances in technology, and a deepening understanding of the natural world. This explores the historical timeline and remarkable stories behind the discovery of elements, from ancient times to the modern era.

I. Ancient Alchemy and the Quest for the Philosopher's Stone

- The quest to discover and manipulate elements has ancient roots, dating back to the time of alchemy. Alchemists, such as Geber (c. 721-815 AD), sought to transform base metals into noble ones and discover the elixir of life. While their pursuits were often shrouded in mysticism and symbolism, they laid the groundwork for future chemical investigations.

II. The Emergence of Modern Chemistry

The transition from alchemy to modern chemistry marked a pivotal moment in the history of element discovery. Key milestones include:

- Robert Boyle (1627-1691): Boyle's work on the properties of gases and his concept of chemical elements as fundamental substances laid the foundation for modern chemistry.
- Antoine Lavoisier (1743-1794): Lavoisier's systematic approach to chemical analysis and his development of a precise nomenclature system transformed chemistry. He identified and named several elements, including oxygen, hydrogen, and carbon.

III. Isolation of Elemental Gases

The late 18th and early 19th centuries witnessed groundbreaking discoveries related to elemental gases:

- Joseph Priestley (1733-1804): Priestley is credited with discovering several gases, including oxygen, by isolating them from various compounds.
- Carl Wilhelm Scheele (1742-1786): Scheele independently discovered oxygen and several other elements, such as chlorine and manganese.

IV. The Alkaline Earth Metals and Alkali Metals

The 19th century saw significant strides in the discovery of new elements, particularly in the alkali metal and alkaline earth metal groups:

- Humphry Davy (1778-1829): Davy isolated potassium, sodium, calcium, strontium, barium, and magnesium through the use of electrolysis.

V. The Periodic Table and Dmitri Mendeleev

- One of the most iconic moments in the history of element discovery was the creation of the periodic table by Dmitri Mendeleev in 1869. Mendeleev organized the known elements by their atomic mass, arranging them into rows and columns based on their properties. His periodic table not only served as a classification system but also predicted the existence of undiscovered elements.

VI. The Radioactive Elements

- The late 19th and early 20th centuries marked the discovery of radioactive elements, including radium and polonium, by Marie Curie and her husband Pierre Curie. Their groundbreaking work in radioactivity led to a deeper understanding of the atom's structure and the existence of isotopes.

VII. Synthetic Elements and Nuclear Reactions

As technology advanced, scientists began to create elements artificially through nuclear reactions:

- Glenn T. Seaborg (1912-1999): Seaborg's research led to the discovery of several transuranium elements, including americium, curium, and berkelium. He also proposed the actinide series, which expanded the periodic table.
- Element 118 (Oganesson): In 2002, scientists at the Joint Institute for Nuclear Research in Russia and Lawrence Livermore National Laboratory in the United States synthesized element 118, oganesson, by colliding californium and calcium nuclei.

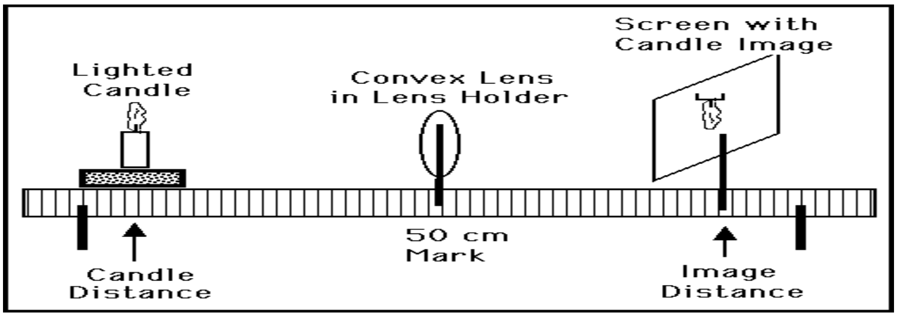
PROJECT REPORT

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

Experiment -1

Aim: Determination of focal length of bi-convex lens using UV method.
Materials required: V stand, Convex lens, Light source, Screen, Meter scale.
Procedure:

1. Take a v-stand and place it on a long table at the middle.
2. Place a convex lens on the v-stand. Imagine the principal axis of the lens.



3. Light a candle and ask your friend to take the candle far away from the lens along the principal axis.
4. Adjust a screen (a sheet of white paper placed perpendicular to the axis) which is on other side of the lens until you get an image on it.
5. Measure the distance of the image from the v-stand of lens and also measure the distance between the candle and stand of lens.
6. Record the values in a table

S.No	Object distance(u) In cm	Image distance(v) In cm	Focal length(f) $f = \frac{u-v}{uv}$
1	20		
2	30		
3	40		
4	50		
5	60		

7. Now place the candle at a distance of 60 cm from the lens, such that the flame of the candle lies on the principal axis of the lens.
8. Try to get an image of the candle flame on the other side on a screen. Adjust the screen till you get a clear image. Measure the image distance (v) from lens and record the values of 'u' and 'v' in table.
9. Repeat this for various object distances like 50 cm, 40 cm, 30 cm, 20 cm etc. Measure image distances in all the cases and note them in table.
10. Find 'f' values in all cases by using the formula of 1/f = 1/v-1/u.

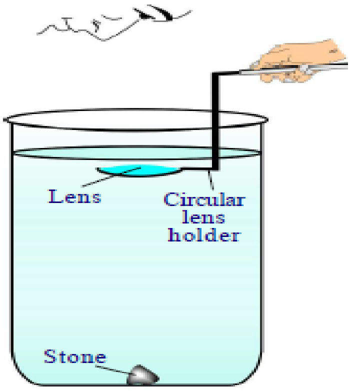
Conclusion: We observe that f value is equal in all cases and this is the focal length of a given lens.
The focal length of the given lens is ____ cm

Experiment -2

Aim: How to prove the focal length of the lens depends on the surrounding medium
Materials required: Glass tumbler, Convex lens, Circular lens holder, Stone, Water
Procedure:

1. Take a convex lens whose focal length is known.
2. Take a cylindrical vessel such as a glass tumbler. Its height must be four times of the focal length of a lens.

3. Keep a black stone inside the vessel at its bottom.
4. Now pour water into the vessel up to a height such that the height of the water level from the top of the stone is greater than the focal length of a lens.
5. Now dip the lens horizontally using a circular lens holder as shown in the figure above the stone.



6. Set the distance between stone and lens that is equal to or less than the focal length of a lens. Now look at the stone through the lens.
7. You can see the image of the stone if the distance between a lens and the stone is less than the focal length of the lens.
8. Now increase the distance between the lens and the stone until you cannot see the image of the stone.
9. You have dipped the lens to a certain height which is greater than the focal length of the lens in air. But you can see the image.

Conclusion: This shows that the focal length of the lens has increased in water.

Experiment -3

Aim: Finding the refractive index of a prism.

Materials required: Prism, piece of white chart, pencil, pins, scale and protractor.

Procedure:

1. Take a prism and place it on the white chart, draw the boundary lines by using a pencil.
2. Remove the prism and name the vertices as P,Q and R
3. Calculate the angle of the prism and note in the book
4. Draw a normal to PQ at M and draw a line with 30^0 to the normal
5. This is incident ray AB. Fix two ball pins on this ray at A and B.
6. Place the prism in its exact position and fix another two pins at C and D such that all four pins appear to lie along the same line by seeing the images of pins through the prism from the other side PR
7. Draw a line joining C and D, extend it to meet PR at N this is an emerging ray.
8. Draw normal at PR at N and measure the angle between normal at N and emergent ray.
9. If we extend the incident ray AB and emergent ray CD, they meet at O.
10. Measure angle between these two rays and note as angle of deviation(d).
11. The same experiment repeated for different angles of incidence and measured corresponding angle of deviation, noted drawn in the following table.

Angle of incidence(i_1)	Angle of emergence(i_2)	Angle of deviation(d)
30^0		
40^0		
50^0		
60^0		

xii) We draw a graph by taking i_1 values on X-axis and d values on Y-axis.
xiii) The graph is a curved line and find angle of minimum deviation(D).

xiv) We can calculate the refractive index of the prism by using the formula

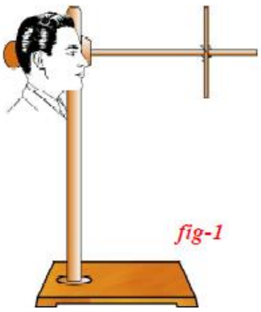
$$n = \frac{Sin\left(\frac{A+D}{2}\right)}{Sin\frac{A}{2}}$$

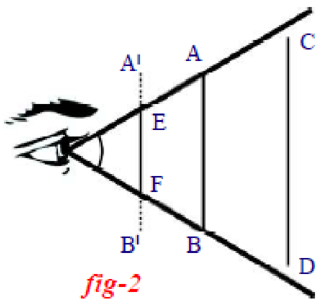
Conclusion: Refractive index of the prism is ________

Experiment - 4

Aim: Find the angle of vision.
Materials required: 20 cm, 30 cm, 35 cm, 40 cm and 50 cm of wooden sticks or pipes.
Procedure:

1. Collect a few wooden sticks used in cloth rollers in clothes store (or) collect waste PVC pipes that are used for electric wiring.
2. Prepare sticks or pipes of 20 cm, 30 cm, 35 cm, 40 cm and 50 cm from them.
3. Place a retort stand on a table and stand near the table such that your head is beside the vertical stand.
4. Adjust the clamp on the horizontal rod and fix it at a distance of 25 cm from your eyes.





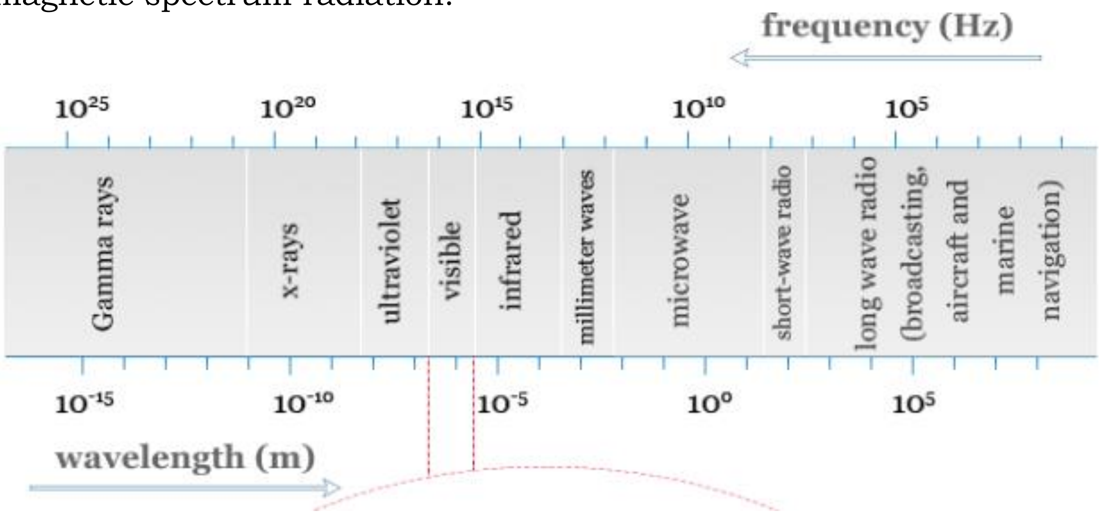
5. Ask one of your friends to fix a wooden stick of 30 cm height to the clamp in a vertical position as shown in the figure.
6. Now keeping your vision parallel to the horizontal rod of the stand, try to see the top and bottom of the wooden stick kept in vertical position.
7. If you are not able to see both end of the stick at this distance (25 cm), adjust the vertical stick on the horizontal rod till you are able to see both ends of the stick at the smallest possible distance from your eye. Fix the vertical stick at this position with help of the clamp.
8. Without changing the position of the clamp on the horizontal rod, replace this stick of 30 cm length with other sticks of various lengths one by one and try to see the top and bottom of the stick simultaneously without any change in the position of eye either upwards downwards or sideways.
9. You can see the whole object AB which is at a distance of 25 cm (least distance of distinct vision) because the rays coming from the ends A and B of the object AB will enter the eye.

Conclusion: This maximum angle, at which we are able to see the whole object is called angle of vision. The angle of vision for a healthy human being is about 60^0. It varies from person to person and with age.

Project – 1

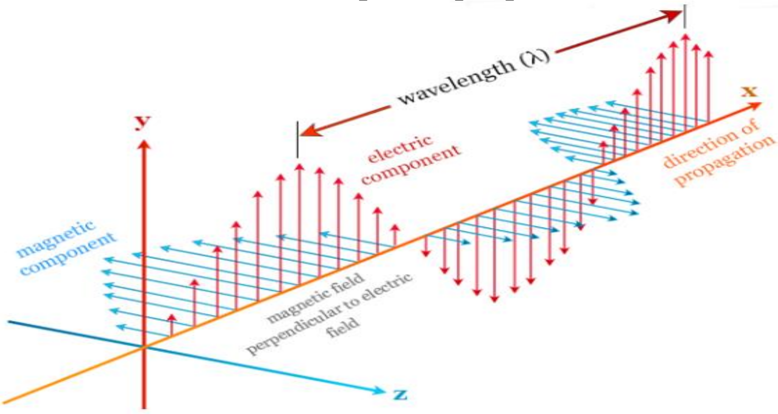
Title of the Project: **Collect information on electromagnetic radiation.**
Aim of the Project: Brief history of electromagnetic radiation.

Hypothesis: Electromagnetic radiation in physics or chemistry describes the form of energy that is transmitted through space at an enormous velocity. Each type of electromagnetic radiation has both the properties of waves and particles.
Introduction: Gamma rays, x-rays, ultraviolet (uv), visible, infrared (ir), microwave, and radio frequency are examples of electromagnetic radiation which contain a definite region of the spectrum. We used wavelength and frequency to describe different types of electromagnetic spectrum radiation.



Electromagnetic wave

An electromagnetic wave has electric and magnetic components. The two components in electromagnetic radiation oscillate in the plane perpendicular to each other.



From the above picture, the vector representation of electromagnetic waves moving along the x-axis. The electric field varies in the direction of the y-axis and the magnetic field H varies in the direction of the z-axis. The velocity of electromagnetic waves in a vacuum is independent of frequency.

In comparison to other wave phenomena such as sound, the electromagnetic wave does not require any supporting medium for its transmission. An electromagnetic wave can be characterized by the following parameters such as wavelength, frequency, wavenumber, and velocity.

Electromagnetic energy

The wave nature of electromagnetic radiation fails to explain the phenomena like photoelectric effect. To explain such phenomena, it is assumed that electromagnetic radiation contains a stream of discrete particles of pure energy. These streams of discrete particles are called photons or quanta.

According to Planck's quantum theory, the energy of the photon is proportional to the frequency of radiation. Electromagnetic energy is given the relationship,

$$E = h\nu$$

where ν = frequency of electromagnetic radiation

h = Planck constant = $6.62607004 \times 10^{-34}$ m^2 kg/s.

A higher frequency of radiation shows greater photon energy. Therefore, x-rays are more energetic than the rays obtained from visible light.

Gamma rays radiation

Gamma rays are the shortest and most energetic waves in electromagnetic radiation. The main ways for the formation of gamma rays are nuclear fusion and nuclear fission reactions. Most of the gamma waves are generated by nuclear explosions, lighting, and the radioactive decay of substances.

Gamma rays are harmful radiation due to their high penetrating power. It can damage the bone marrow and internal organs of living organisms. Gamma rays are used mainly to sterilize medical equipment, tracers in medicine, and kill cancerous cells in radiotherapy.

X-rays radiation

X-rays are the type of electromagnetic radiation which absorbed or emitted by the movement of electrons close to the nuclei of relatively heavy atoms. Energetically, it is similar to radio waves, microwaves, visible light, and gamma rays.

It has enough energy to break down the molecules of living cells. X-rays are used mostly for medical imaging for the detection of bone fractures.

Ultraviolet radiation

Ultraviolet radiation is non-ionizing radiation obtained mostly from the sun and other sources like mercury vapor lighting, fluorescent, and incandescent lights. It is beneficial for our health because uv radiation from the sun produces vitamin D.

Visible radiation

Visible radiation or visible light is the form of waves with wavelengths between 400 to 750 nm.

Visible light radiation is used mostly in photography and illumination. In optical fiber communication technology, we also used visible types of radiation transmitted through glass fiber.

Infrared radiation

Infrared radiation (IR) is a region of the electromagnetic spectrum where wavelengths lie between the visible and microwave region. The infrared waves are longer than that of visible light but shorter than that of the microwave.

Infrared radiation can be subdivided into three regions,

1. Near-infrared
2. Mid-infrared
3. Far-infrared

All the three sub-regions of infrared are part of the electromagnetic spectrum associated with the changes in the vibration of the molecules.

Infrared waves are used mostly in communication technology, spectroscopy, and astronomy. In spectroscopy, it is used for the structure determination of inorganic or organic molecules. It is also used as a source of heat energy in medical and different types of industrial production.

Microwave radiation

Microwave radiation lies between far infrared and conventional radiofrequency regions of the electromagnetic spectrum. Microwave spectroscopy deals with the pure rotational motion of the molecules. Therefore, it is also called rotational spectroscopy.

For microwave rotation, a molecule must possess a permanent dipole moment. Microwaves are widely used in modern technology, for the study of various problems in physics, chemistry electronics, and astronomy. Particularly, it is very useful for structure determination.

Microwave radiation is used widely in various communication links such as wireless networks, radio relay networks, radar, satellite and spacecraft, remote sensing, and radio astronomy.

Conclusion: Electromagnetic waves are widely used in the communication field and other fields.

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: **Historical development of atomic model theories.**

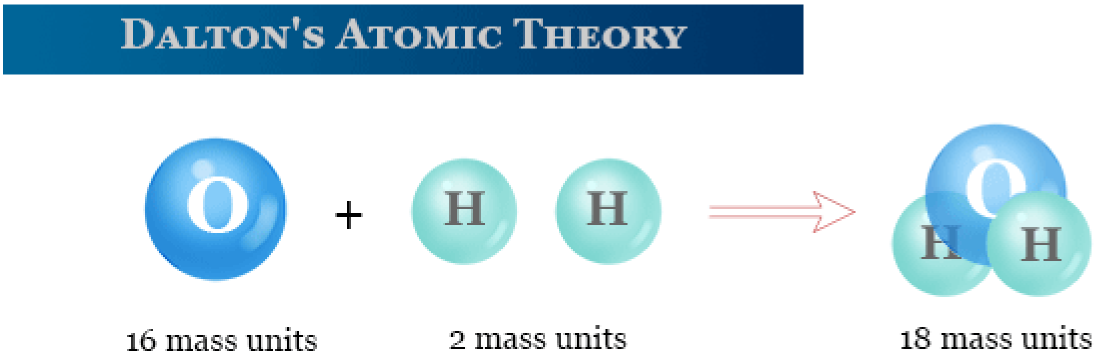
Aim of the Project: Collect information on atomic model theories.

Hypothesis: Atom is spherical shape; the entire mass of the atom is located at centre of atom. Every atom has stationary orbits around the nucleus.

Introduction:

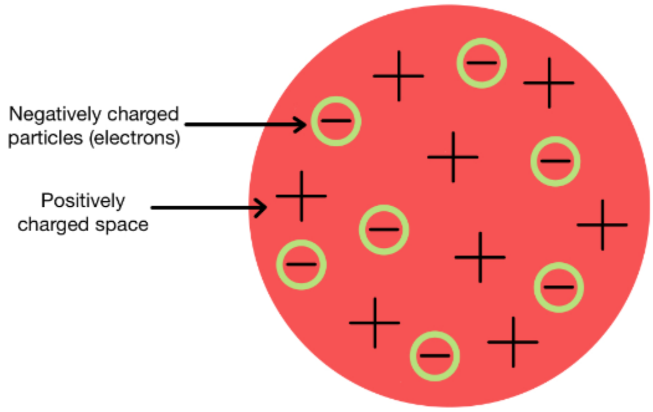
1. **Dalton's Atomic Theory (1803):**

- John Dalton proposed the first modern atomic theory.
- He suggested that elements are composed of indivisible particles called atoms.
- Dalton's theory also stated that all atoms of the same element are identical and that compounds are formed by the combination of atoms in simple, whole-number ratios.



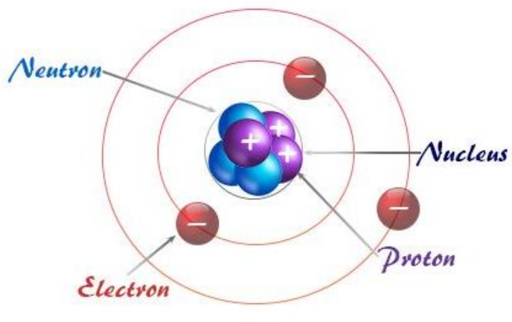
2. **Thomson's Plum Pudding Model (1897):**

- J.J. Thomson discovered the electron.
- He proposed the "plum pudding" model, where atoms were viewed as positively charged spheres with electrons scattered throughout, like plums in a pudding.



3. **Rutherford's Nuclear Model (1911):**

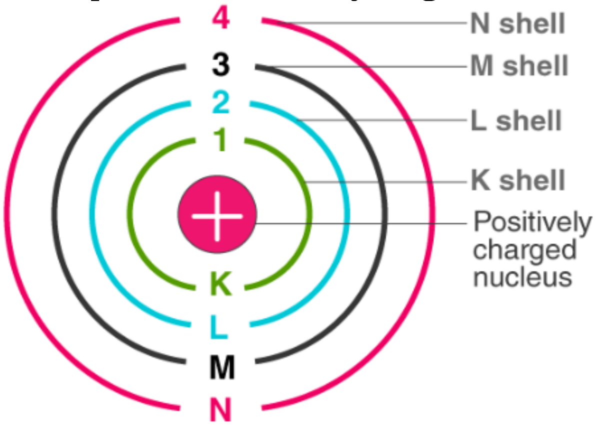
- Ernest Rutherford conducted the gold foil experiment.
- He discovered that most alpha particles passed through the foil, but some were deflected, indicating a small, dense nucleus at the atom's center.
- Rutherford's model described the atom as mostly empty space with a central nucleus and electrons orbiting it.



Atomic Structure of Lithium

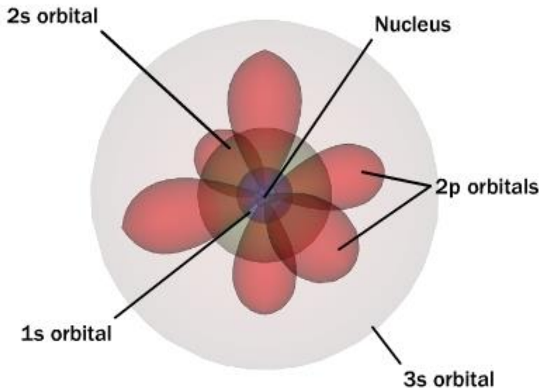
4. Bohr's Atomic Model (1913):

- ❖ Niels Bohr expanded on Rutherford's model.
- ❖ He introduced the idea of quantized energy levels or "shells" where electrons orbit the nucleus.
- ❖ Bohr's model explained the spectral lines of hydrogen.



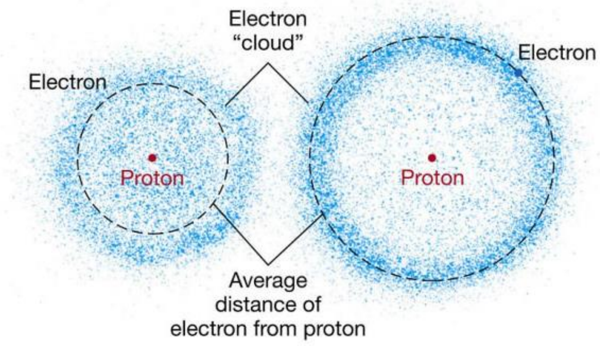
5. Quantum Mechanical Model (1926 - Present):

- ❖ Developed by Schrödinger, Heisenberg, and others, this model treats electrons as both particles and waves.
- ❖ It uses mathematical equations to describe the probability distribution of electrons in "orbitals" rather than specific orbits.
- ❖ The quantum mechanical model revolutionized atomic theory and provides a more accurate depiction of atomic behavior.



6. Electron Cloud Model (Present):

- ❖ An extension of the quantum mechanical model.
- ❖ Describes electrons as existing within regions of probability called orbitals rather than specific paths.
- ❖ This model better explains the behavior of electrons in atoms and molecules.



(a) Ground state (b) Excited state

7. **Modern Advances (Present - Ongoing):**
- ❖ Ongoing research continues to refine our understanding of atomic and subatomic particles.
- ❖ The Standard Model of particle physics describes elementary particles that make up atoms, including quarks, leptons, and bosons.

Conclusion: The historical development of atomic model theories is a testament to the relentless curiosity and ingenuity of scientists throughout history. It represents a continuous journey of exploration and discovery, and it has laid the foundation for our modern understanding of matter, energy, and the fundamental building blocks of the universe.

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 - 3

Title of the Project: Historical events of Raman's scattering effects.

Aim of the Project: Historical events of Raman scattering effects.

Hypothesis: Raman scattering, also known as the Raman effect, is a phenomenon in spectroscopy where light is scattered by molecules, resulting in a shift in its wavelength.

Introduction:

Raman's effect was discovered by the Indian Physicist Sir C. V. Raman in 1928. The discovery of the Raman effect was a significant milestone in the history of science, and it has had various historical events and developments associated with it. Here are some key historical events related to the Raman scattering effect:

1. Discovery of Raman Scattering (1928):
- ❖ In February 1928, Sir C. V. Raman, an Indian physicist, was working at the Indian Association for the Cultivation of Science (IACS) in Kolkata, India.
- ❖ While studying the scattering of light by liquids, Raman observed that a small fraction of the scattered light had a different wavelength than the incident light. This phenomenon was named the Raman effect after him.

2. Publication of the Discovery (1928):
- ❖ Raman published his findings in the journal "Nature" in March 1928, in a paper titled "A New Radiation." This publication quickly drew attention from the scientific community.

3. Award of the Nobel Prize in Physics (1930):
- ❖ In recognition of his groundbreaking discovery, Sir C. V. Raman was awarded the Nobel Prize in Physics in 1930. He became the first Asian to receive a Nobel Prize in the sciences.

4. Further Research and Explanation (1930s):
   ❖ After the initial discovery, Raman continued to study the effect. He provided a theoretical explanation for the phenomenon, attributing it to the inelastic scattering of light by molecules, which resulted in changes in their vibrational and rotational energy levels.
5. Development of Raman Spectroscopy (1950s-1960s):
   ❖ The Raman effect led to the development of Raman spectroscopy, a powerful analytical technique used to study the vibrational, rotational, and other low-frequency modes of molecules.
6. Wide Applications in Chemistry and Materials Science (20th Century):
   ❖ Over the decades, Raman spectroscopy found applications in various fields, including chemistry, materials science, biology, and environmental science. It is used for molecular identification, chemical analysis, and the characterization of materials.
7. Advancements in Instrumentation and Technology (Late 20th Century - Present):
   ❖ Advances in laser technology and spectrometers have significantly improved the sensitivity and versatility of Raman spectroscopy.
8. Nobel Prize for Laser-Based Raman Spectroscopy (1981):
   ❖ Arthur Schawlow and Nicolas Bloembergen were awarded the Nobel Prize in Physics in 1981 for their contributions to laser spectroscopy, which includes laser-based Raman spectroscopy techniques.
9. Space Exploration (2000s-Present):
   ❖ Raman spectroscopy has been used in space missions to analyze the composition of planetary surfaces and study extraterrestrial materials. For example, it was employed in the analysis of rocks on Mars by the Mars rover missions.
10. Ongoing Research and Applications (Present):
   ❖ Raman spectroscopy continues to be a subject of active research, with applications in fields such as pharmaceuticals, forensics, art conservation, and nanotechnology.

Conclusion: The discovery of the Raman scattering effect by Sir C. V. Raman revolutionized our understanding of the interaction of light with matter and has had a profound impact on various scientific disciplines and technologies, making it one of the most important developments in the history of physics and spectroscopy.

<u>PROJECT REPORT</u>

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

Formative Assessment - II

(2023-2024)

PHYSICAL SCIENCE

VIII, IX, X Classes

Experiments/Lab activities & Projects

Special Edition

M.SRINIVASA RAO

SA(PS)

SPSMHS, GUDIVADA

Ph: 9848143855

Visit: srini science mind