SCIENCE LAB MANUAL

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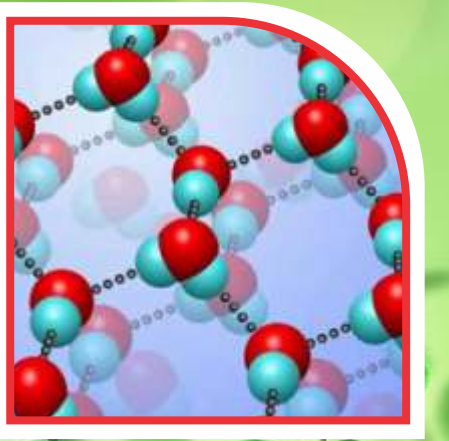

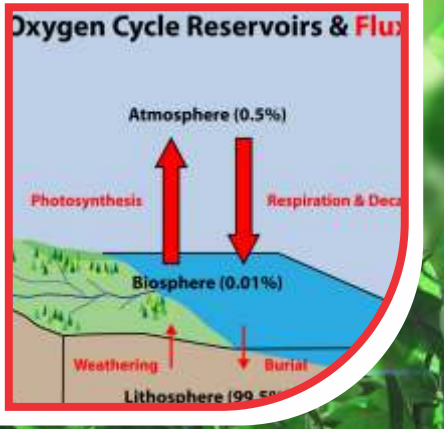

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Preface

The quality of practical work varies considerably but there is strong evidence, from this country and elsewhere, that: When well-planned and effectively implemented, science education laboratory and simulation experiences situate students' learning in varying levels of inquiry requiring students to be both mentally and physically engaged in ways that are not possible in other science education experiences. (Lunetta et al. 2007, p.405).

The importance and relevance of exercising practical work in science is widely accepted. The qualitative practical work not only promotes the engagement and interest of students but also enriches skills, experiences, knowledge and conceptual understanding of the students. In this book, we have focused on core activities, directly related activities and complementary activities.

Furthermore, to make optimum use of this practical book, Teacher should strive for making students

1. to find problems and their solutions;
2. to develop analytical and critical attitude;
3. to find new facts and arriving at new principles.

This book is designed for to provide practical knowledge as much as possible. Through the development of the project we had a great experience of various strategies that can be applied in the development of the project. This project will prove stepping stone for our carrier.

To provide proper and essential information has been guiding principle for us, As a teacher, we endeavored to achieve this important objective. We are pleased to present this project.

Salient features of this book are: --

1. A special care has been taken to present the subject matter in simple language so that student may understand it with ease.
2. Great efforts have been made to make the book free of mistakes.
3. Original diagrams are used to clarify the experiments.
4. Multiple choice question and viva voice questions have been given in experiments.

We are greatly thankful to Shri RAVI JI (SAH Sangathanmantri, Vidya bharti, Haryana) who inspired us to write this book.

AUTHORS

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INDIAN SCIENTIST

Science is an important part of our everyday life, even more so than we notice. From our fancy gadgets to the the technologies we can't live without, from our humble light bulb to the space explorations, it is all gift of science and technology.

I wonder what would we be doing if none of these things were invented? How often do we take out the time to think about those extra ordinary minds who made life easier for us?

C. V. Raman

Chandrasekhara Venkata Raman won the Nobel Prize for Physics in 1930 for his pioneering work on scattering of light. Born in Tiruchirapalli on November 7, 1888, he was the first Asian and first non-White to receive any Nobel Prize in the sciences. Raman also worked on the acoustics of musical instruments. He was the first to investigate the harmonic nature of the sound of the Indian drums such as the tabla and the mridangam.

He discovered that, when light traverses a transparent material, some of the deflected light changes in wavelength. This phenomenon is now called the Raman scattering and is the result of the Raman effect.

In October 1970, he collapsed in his laboratory. He was moved to a hospital and the doctors gave him four hours to live. He survived and after a few days refused to stay in the hospital as he preferred to die in the gardens of his Institute (the Raman Research Institute in Bangalore) surrounded by his flowers. He died of natural causes on 21 November 1970.

Born on October 30, 1909 in Bombay, **Homi Jehangir Bhabha** played an important role in the Quantum Theory.


Homi Jahangir Bhabha

He was the first person to become the Chairman of the Atomic Energy Commission of India. Having started his scientific career in nuclear physics from Great Britain, Bhabha returned to India and played a key role in convincing the Congress Party's senior leaders, most notably Jawaharlal Nehru, to start the ambitious nuclear programme.

Bhabha is generally acknowledged as the father of Indian nuclear power. But few people know that he was absolutely against India manufacturing atomic bombs, even if the country had enough resources to do so. Instead he suggested that the production of an atomic reactor should be used to lessen India's misery and poverty.

He died when Air India Flight 101 crashed near Mont Blanc on 24 January 1966. Many possible theories of the crash came up including a conspiracy theory in which the Central Intelligence Agency (CIA) is involved in order to paralyze India's nuclear program.


Satyendra Nath Bose

Born on January 1, 1894 in Calcutta, **SN Bose** was an Indian physicist specialising in quantum mechanics. He is of course most remembered for his role played in the class of particles 'bosons', which were named after him by Paul Dirac to commemorate his work in the field.

Bose adapted a lecture at the University of Dhaka on the theory of radiation and the ultraviolet catastrophe into a short article called “Planck's Law and the Hypothesis of Light Quanta” and sent it to Albert Einstein. Einstein agreed with him, translated Bose's paper “Planck's Law and Hypothesis of Light Quanta” into German, and had it published in Zeitschrift für Physik under Bose's name, in

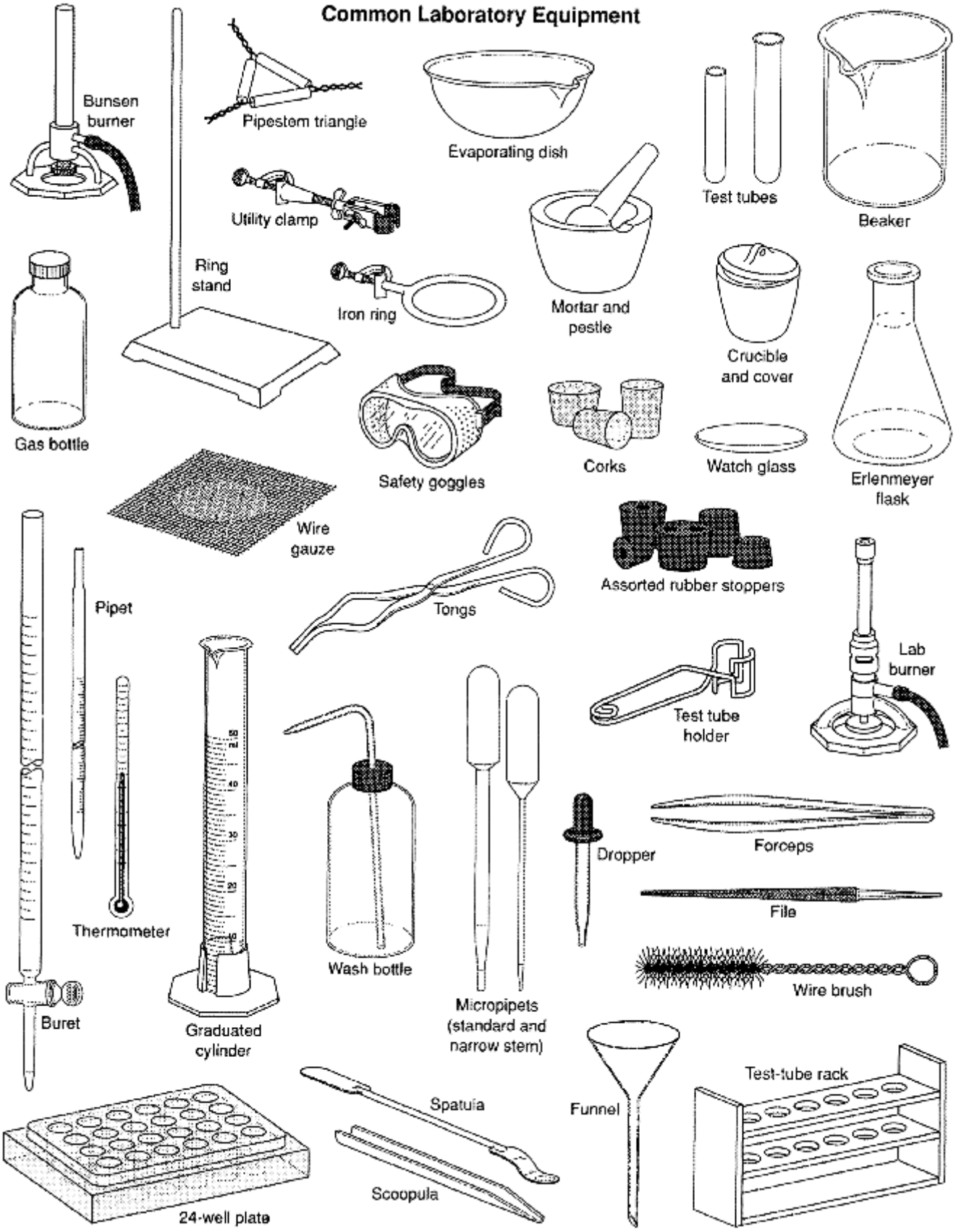
1924. This formed the basis of the Bose-Einstein Statistics. In 1937, Rabindranath Tagore dedicated his only book on science, Visva–Parichay, to Satyendra Nath Bose. The Government of India awarded him India's second highest civilian award,


Jagdish Chandra Bose

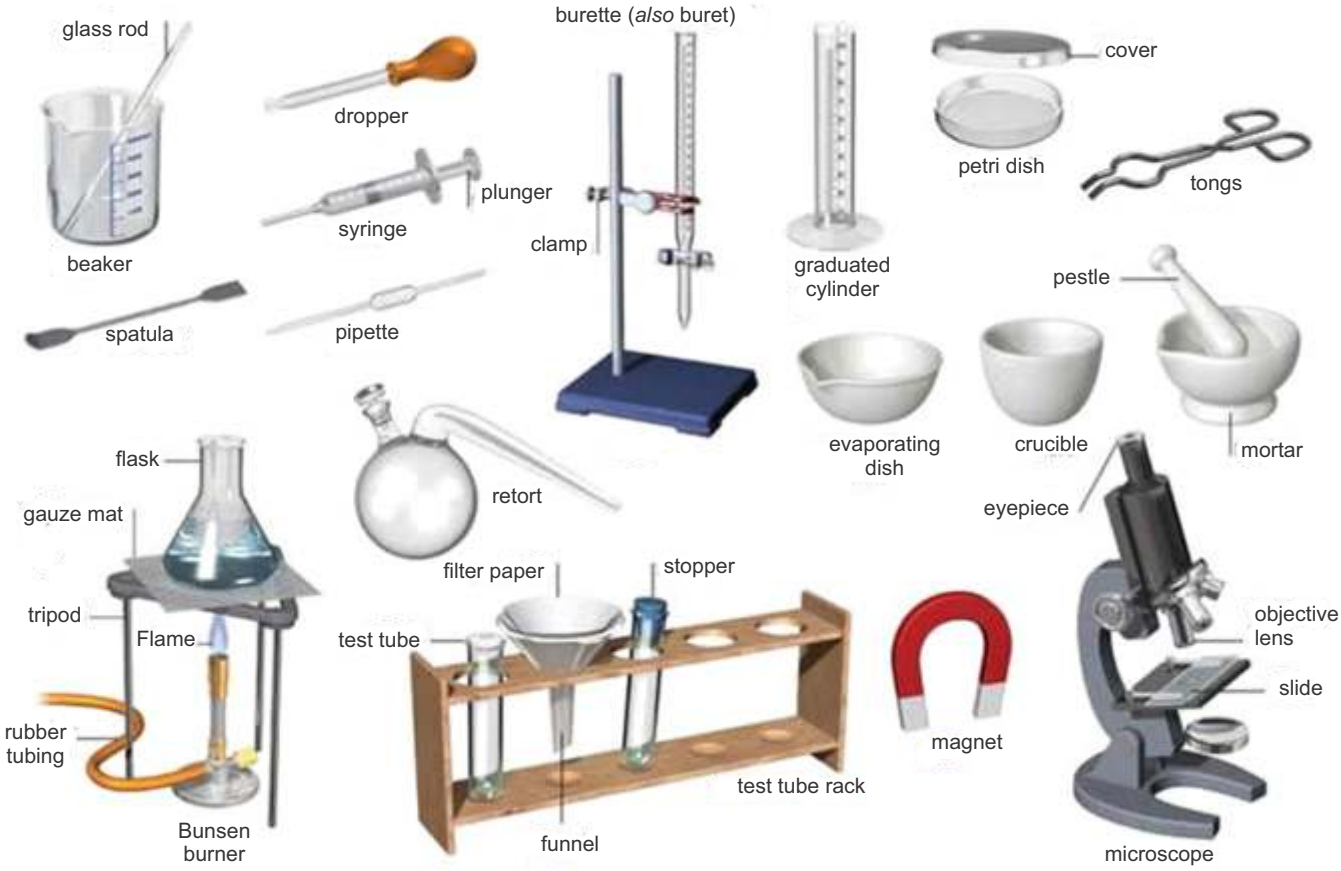
Acharya J.C. Bose was a man of many talents. Born on 30 November, 1858 in Bikrampur, West Bengal, he was a polymath, physicist, biologist, botanist and archaeologist. He pioneered the study of radio and microwave optics, made important contributions to the study of plants and laid the foundation of experimental science in the Indian sub-continent. He was the first person to use semiconductor junctions to detect radio signals, thus demonstrating wireless communication for the first time.
What's more, he is also probably the father of open technology, as he made his inventions and work freely available for others to further develop. His reluctance for patenting his work is legendary.

Another of his well known inventions is the crescograph, through which he measured plant response to various stimuli and hypothesized that plants can feel pain, understand affection etc. While most of us are aware of his scientific prowess, we might not be aware of his talent as an early writer of science fiction! He is in fact considered the father of Bengali science fiction.

Common Laboratory Equipment



laboratory equipment



EXPERIMENT 1

AIM

To Study the Presence of Starch and Fat in the Given Sample of Food.

MATERIALS REQUIRED:

Raw Potato,Spoon of Oil/Butter, Iodine Solution, test tube, petri dish, ground nut

THEORY:

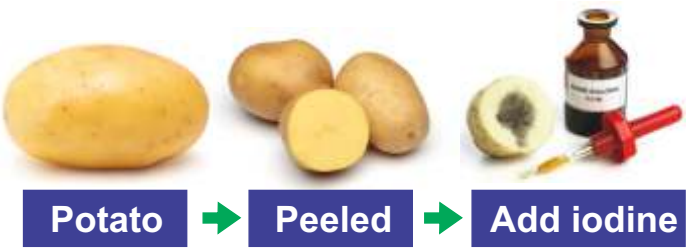
We know that food is required for the growth of our body. Food gives us energy to work and play. It gives us resisting power against diseases. The main components of food are carbohydrates, proteins, fats, vitamins, minerals, fibre and water. Carbohydrates are the energy giving nutrient.

1. Cellulose, starch, glucose and fructose are the important carbohydrates found in our food.
2. Fats act as fuels in our body since they provide more energy than carbohydrates.
3. Proteins are required for growth and repair of tissues in our body. They help in building new tissues.

PROCEDURE:

(A) Test for Starch:

1. Take 2-3 small pieces of potato in a petri dish.
2. Put 2-3 drops of dilute solution of iodine on it.



OBSERVATION

Colour of iodine solution turns into blue-black which indicate the presence of starch in potato.

CONCLUSION

The Potato Contains Starch.

PROCEDURE

(B) Test for Fat :

1. Take small amount of ground nut or fat food
2. Wrap it in a piece of Paper and Crush it.

OBSERVATION

An oily patch on paper indicates the presence of fat in the ground nut or fat food

CONCLUSION

The ground nut or fat food Contains fat.

VIVA QUESTIONS

1. What are nutrients

Ans. The components of food that are necessary for growth, maintenance and other living activities are called nutrients.

2. Name the major nutrients present in our food.

Ans. Carbohydrates, proteins, fats, vitamins and minerals.

3. Name the nutrients which mainly give energy to our body.

Ans. Fats and carbohydrates.

4. Name two foods which contain fats.

Ans. Ground nut and ghee.

5. Name two foods which contain proteins.

Ans. Milk, pulses

6. Name the body building foods.

Ans. Foods that contain proteins are often called body building foods.

7. If same amount of fat and carbohydrate is eaten, which will give more energy

Ans. Fats give more energy as compared to the carbohydrates.

8. Name two foods which contain carbohydrates

Ans. Potato, rice

9. What are different types of proteins

Ans. Globular proteins and fibrous proteins

10. Give one biological importance of proteins.

Ans. Proteins help in growth and repair of the body tissues.

EXPERIMENT 2

AIM

To identify whether the given substance is soluble or insoluble in water.

MATERIALS REQUIRED

(I) Sugar. (ii) Salt. (iii) Chalk powder, (iv) Sand,
(v) Washing soda, (vi) Beakers, (vii) Water. (viii) Glass rod.

THEORY

Two components are miscible only when they have similar nature.

Solubility depends upon the following factors.

(i) Nature of solute (ü) Nature of solvent (iii) Temperature.

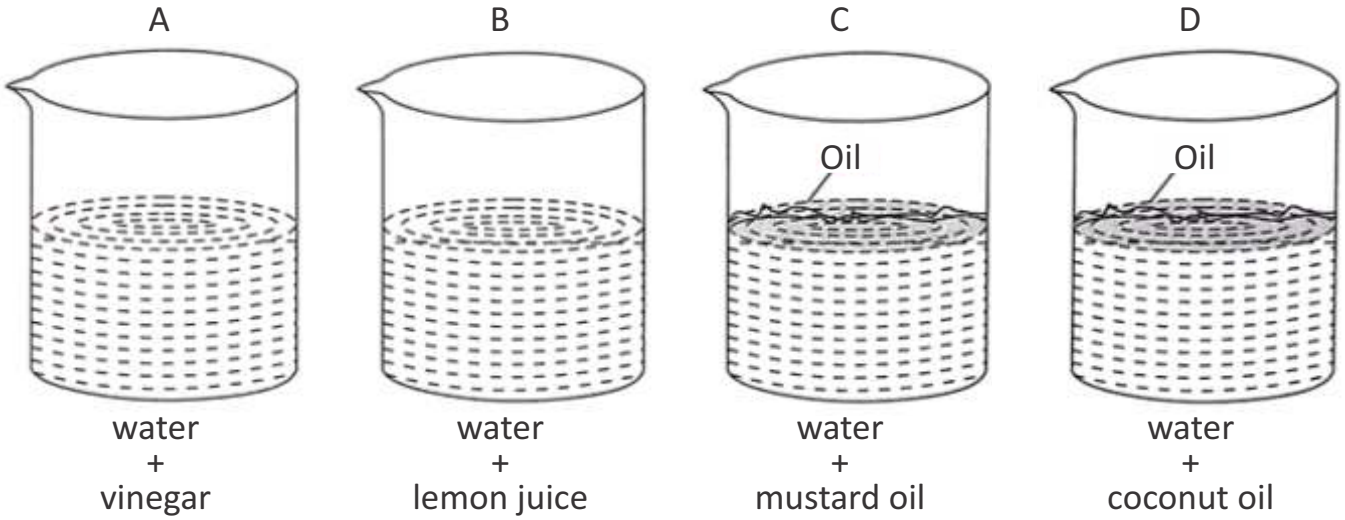
Solute. It is the small component in the binary solution.

Solvent. It is the component of the solution which is present in a large proportion.

PROCEDURE

1. Take four beakers and label them as A, B, C, D.
2. Fill each one of them upto half with water.
3. Add small amount of sugar to beaker A, salt to beaker B, chalk powder to beaker C. sand to beaker D
4. Stir the contents of each beaker with glass rod and observe the change in each beaker
5. Repeat with different substance.

DIAGRAM



OBSERVATION

Beaker A Sugar is soluble in water because sugar disappears completely in water.

Beaker B Salt is soluble because it disappears completely in water.

Beaker C Chalk powder is insoluble, because it does not disappear in water.

Beaker D Sand is insoluble, because it does not disappear in water.

CONCLUSION

All substances do not dissolve in Water.

VIVA QUESTIONS

1. What are miscible liquids?

Ans. When the liquids mix completely, they are called miscible liquids.

2. Give two examples of miscible liquids.

Ans. Alcohol and ink are miscible in water.

3. Give two examples of miscible solids in water.

Ans. Common salt, glucose,

4. What are insoluble substances?

Ans. Substances which do not dissolve in water are called insoluble substances.

5. Are gases soluble in water ?

Ans. Yes, but solubility of gases in water is very less.

6. Give two examples of immiscible liquids.

Ans. Mustard oil and coconut oil are immiscible liquids.

7. What are soluble substances?

Ans. The substances which completely disappear in water are soluble.

8. What is a solute?

Ans. It is the small component in the binary solution which is dissolved in solvent.

EXPERIMENT 3

AIM

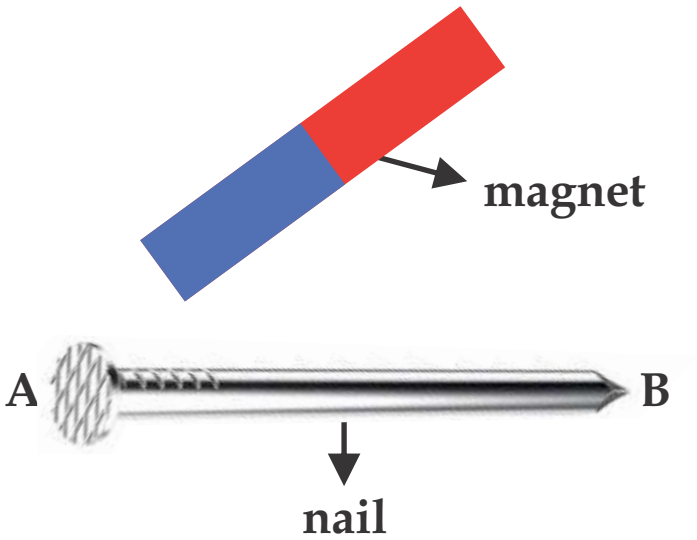
To magnetise a long iron needle.

MATERIALS REQUIRED

A long iron rod, magnet, some pins.

PROCEDURE

1. Place the iron rod on a table.
2. Bring one pole of the magnet, say north near the tip of iron rod.
3. Rub the magnet along the length of the rod (say from A to B).
4. Once it reaches the end B, lift it and bring it once again over the end A.
5. Repeat the above procedure of rubbing 40-50 times



OBSERVATION

On bringing iron pins near the rod, it is observed that they get attracted to it.

CONCLUSION

An iron object can be magnetised by rubbing it with a piece of magnet.

VIVA QUESTIONS

Choose the correct answer

1. Magnet always align itself in direction

   (a) E-W (b) N-S (c) N-W. (d) W-S

2. Poles are the regions where force of attraction is

   (a) maximum (b) minimum (c) none of these. (d) zero

3. Which of the following is a non-magnetic material

   (a) Iron (b) Aluminium (c) Cobalt (d) Nickel.

4. Magnetism is lost by

   (a) hammering (b) heating

   (c) both (a) and (b) (d) putting it with keeper.

5. Which of the following is used to make a permanent magnet

   (a) Steel (b) Iron (c) Alnico (d) Both (a) and (c).

6. ……is a sure test of magnetism.

   (a) Attraction (b) Repulsion (c) Both (a) and (b) (d) None of these.

7. Magnets are used in

   (a) stickers (b) microphone (c) audio tapes (d) all of these.