Let's pave the way for learning and

Move Forward

Class 9

PHYSICS

State Council of Educational Research and Training (SCERT),
Kerala
2022

Preface

Dear students,

The evaluation of the answer scripts of the First Terminal Examination 2022 and the classroom experiences shared by the teachers concerned, have brought to light the fact that our children have suffered some serious learning gap due to the non-availability of proper learning experiences as a result of the unprecedented situation created by the Covid Pandemic from 2019 to 2022. An activity book has been designed to assist children internalize the concepts which they ought to have mastered in the previous classes and with the intention to facilitate further learning. Necessary explanations and activities are included in the booklet to help children bridge the gap.It is hoped that this package will facilitate the learners for self-study or for studying with the help of their teachers and I wish them success in their endeavors to move forward with confidence.

Director

SCERT, Kerala

Density

Objective : To understand density and to apply in appropriate situations

Activity : Experiment, Work sheet

Materials needed : Thermocol block, Iron block, Beaker, Water and common balance

Procedure

Thermocol block

Iron block

Take a rectangular thermocol block and an iron block of the same size. Measure the volume and mass of both the blocks and complete the table.

Object	Mass (kg)	Volume (m^3)	Mass/Volume (kg/m^3)
Thermocol Block			
Iron Block			

Both blocks are placed in water taken in a beaker.

Worksheet

- Write down the observation when the blocks are placed in water.
- Are the volumes of both blocks equal?
- Which one has greater mass (quantity of matter)?
- Which one has greater mass per unit volume?
- Which will sink more, when placed in water?

  (block with greater $\frac{\text{Mass}}{\text{Volume}}$ or that with less $\frac{\text{Mass}}{\text{Volume}}$

Inference

- Iron block having greater $\frac{\text{Mass}}{\text{Volume}}$ sinks more in water.
- $\frac{\text{Mass}}{\text{Volume}}$ or mass per unit volume of a substance is referred to as its density.
- Density = $\frac{\text{Mass}}{\text{Volume}}$
- Unit of density=unit of mass/unit of volume =kg/m^3

Worksheet

Density of some substances are given in the table.

Object	Density in kg/m^3
Thermocol Block	20
water	1000
kerosene	810
iron	7800
mercury	13600

Complete the worksheet based on the data given in the table.

- Which are the objects that sink in water?
- Which are the liquids in which iron block sinks?
- Will the iron block sink in mercury? Why?

State the reason.

- An egg sinks in pure water, but floats on saline water.
- If petrol, diesel etc., catches fire, one should never try to extinguish it using water. Why?

Pressure

Air pressure

Objective : To understand air pressure.

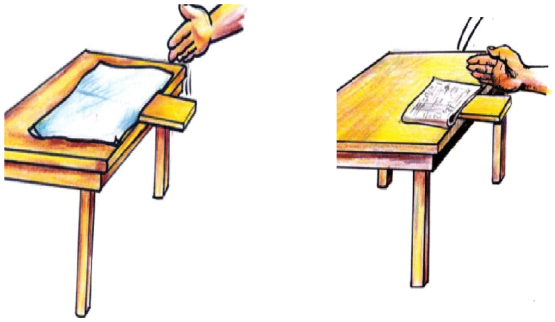
Activity : Experiment and worksheet

Experiment 1

Aim : To understand the atmospheric pressure

Materials needed : Newspaper, a wide ruler of length 1 m

Procedure:



Arrange a wide wooden ruler and newspaper as shown in the figure. Try to raise the newspapers on both occasions by pressing on the wooden ruler.

Worksheet

- Is there any difference in weight of the news paper when it is folded and unfolded?
- Why was it difficult to raise the paper when it was unfolded?
- Which force prevents the raise of the paper?
- Can atmospheric air exert force?

Inference

- Atmospheric air can exert force.
- When the newspaper is spread (unfolded), atmospheric air exerts more force on the paper as the area is large. Hence it was difficult to raise it.

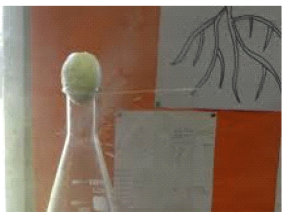
Experiment 2

Objective : To understand the atmospheric pressure

Materials needed : Conical flask, boiled egg, paper and match box.

Procedure:

Place a boiled egg on the mouth of a conical flask.



After removing the egg, burn a piece of news paper and put it in the flask. Place the boiled egg again over the mouth of the flask, when the paper is almost burnt.

- What happens to the pressure of air inside the conical flask when the paper burns?
- When the pressure inside increases and the air expands, won't some air get expelled? Will the air go out when the air gets heated and expands?
- What happens to the pressure of air inside the conical flask when the mouth of the conical flask is shut by the egg?
- What happens when the flask is cooled?
- Why does the egg slip into the flask?

Inference

- When the paper burns the pressure inside the bottle increases and air gets expelled. On cooling, the pressure inside decreases. As the atmospheric pressure is greater than this, the egg slips into the bottle.
- Atmospheric air can exert pressure. The weight of the air column acting normally over unit area of the earth's surface is atmospheric pressure.
- Unit of atmospheric pressure is bar.

Liquid pressure

Objective : To understand liquid pressure.

Activity : Experiment and work sheet

Experiment 1

Materials needed : Polythene bag, water and a bucket

Procedure

Place a polythene bag on your hand and immerse the hand in a bucket of water, without letting water in.

- What do you observe?

Inference

- The polythene bag sticks to the hand. The force exerted by water presses the bag to your hand.
- Liquids can also exert pressure like gases. Pressure exerted by a liquid is the liquid pressure.

Experiment 2

Materials needed : Plastic bottle and water

Procedure

Make small holes of the same size around a plastic bottle about 3 cm above the bottom, as shown in the figure.

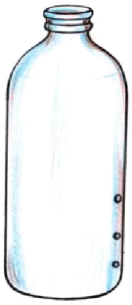
Pour water into the bottle. What do you observe? What is the reason?.

Inference

- As water exerts pressure in all directions, it flows out through all holes
- Liquids exert pressure in all directions.

Experiment 2

Materials needed: Plastic bottle and water



Procedure

Make three holes at equal distances from each other upwards from the bottom of a long plastic bottle. The holes should not come one below the other vertically. Fill the bottle with water, keeping the holes closed. Then take away the hand

- Does water coming out through all the holes fall at the same distance?
- Why does the water through the hole at the bottom fall at a greater distance?
- What is the change in liquid pressure towards the bottom?
- What change occurs to the liquid pressure as the depth from the liquid surface increases?.

Inference

- Water comes out through all the holes do not fall at the same distance. Water through the hole at the bottom falls at a greater distance as it is at a greater depth from the top.
- Liquid pressure increases with increase in depth.

Pressure

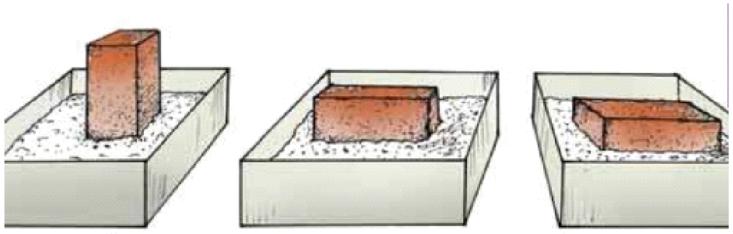
Objective : To understand pressure and the relation between pressure and surface area

Activity : Experiment and worksheet

Materials required : Tray, powdered lime and brick

Procedure

Take powdered lime in the tray. Place the brick into the powdered lime in three separate ways as shown in the figure.



Tabulate the observations

The manner in which brick is placed on powdered lime.	Depression resulting in powdered lime.	Weight of the brick or the force experienced vertically (F)	The area of contact of brick with powdered lime (A)	The vertical force exerted by the brick on unit area $P = \frac{F}{A}$
Vertical				
Horizontal				
with broader side downward				

Worksheet

Thrust is the total force acting on an area, perpendicular to it.

- Is the total force or the thrust the same, in all the three cases of placing the brick in the lime powder?

The thrust per unit area is the pressure.

- Is the force exerted by the brick in unit area (pressure) the same in all the three situations?

- Are the total normal force (thrust) acting on an area and normal force per unit area (pressure) the same?
- In which of the above three cases is the pit having maximum depth?
- On placing the brick in three different ways into the lime powder pits are formed. In which case is the depth of the pit maximum?
  (when the area of contact is maximum / minimum)

Inference

- The depth of the pit formed in the powdered lime increases with decrease in the area of contact.
- As the area of contact increases the pressure decreases.
- As the area of contact decreases, the pressure increases
- The total normal force acting over an area is the Thrust.
- The unit of thrust is newton (N)
- The pressure is the thrust experienced in unit area.
- Pressure = $\frac{\text{Thrust}}{\text{area}}$
- The unit of pressure = unit of thrust /unit of area = N/m^2
- The unit of pressure is N/m^2 or pascal (Pa).
- When applying a given force, pressure decreases when the area of the surface of contact increases. When the area of contact decreases the pressure increases.

State the reasons.

1) A person cannot stand on a nail. But one can lie on a bed of nails.
2) Basements of buildings are made wider.
3) The tip of a sewing needle is made sharp.

Acceleration

Objective : To understand acceleration

Activity : Worksheet

Procedure

1) A person P travels 10 km in a bicycle in 1 hour and another person Q travels the same distance in 0.25 hour in a motor cycle.

- Who travels with greater speed ? (P/Q)
- What is the speed of P?
- What is the speed of Q?
- Speed = X/time, what does 'X' represent?

2) A stone thrown vertically upward attains a height 1 m and falls back to the hand.

Distance is the length of the path travelled.

- What is the distance travelled by the stone?

Displacement is the straight line distance from the initial position to the final position.

- What is the displacement of the stone?

Physical quantities having both magnitude and direction are referred to as vector quantities. Physical quantities, of which, the direction is not to be specified are scalar quantities.

- Among distance and displacement, which one is a vector quantity?
- Write down the units of distance and displacement.

3) An ant starts from one end of a stretched string of length 5 m. It takes 20 second to reach the other end of the string.

- What is the distance travelled by the ant?
- What is its displacement?

Speed is the distance travelled in unit time.

- Calculate the speed of the ant.

Velocity is the displacement in unit time.

- Find out the velocity of the ant.
- Velocity = Y/time, 'Y' represents.....

4) An ant travels 10 m forward along a stretched string and then travels 5 m in the opposite direction in 60 s.

- What is the distance travelled by the ant in this situation?
- What is its displacement?
- What is the speed of the ant?
- What is its velocity?

- Write down the unit of speed.
- What is the unit of velocity?
- Among speed and velocity, which one is the vector quantity?

5) Pass a long string through a straw and stretch the string well. Paste an inflated balloon on the straw. When the balloon is deflated and released, the straw moves 10 m forward in first second, moves 6 m in the next second and then stops.

> If a body in motion covers equal distance in equal intervals of time, then the body is said to have uniform speed.

- State whether the straw has uniform speed or not.

> A body has uniform velocity if it travels with uniform speed in a straight line, in the same direction.

- Is the velocity of the straw uniform?
- Is the velocity of the straw increasing or decreasing?

6. Details of the journey of a car in a straight line are given.

Consider the motion of the car from 'A' to 'C'

Find the following.

- Initial velocity of the car.
- Final velocity.
- Change of velocity.
- Rate of change of velocity.

> Acceleration is the rate of change of velocity.

- The rate of change of velocity is known as .....
- If the initial velocity of a body is 'u', final velocity 'v', time taken for the velocity change is 't', write down the equation for calculating acceleration.

7. A body is dropped from a height reaches the ground in 4 second. If the velocity

with which it touches the ground is 40 m/s,

- What is its initial velocity 'u'?
- What will be the final velocity 'v'?
- What is the change in velocity (v-u)?
- How much will be the acceleration $\frac{(v-u)}{t}$?

Inference

- Distance is the length of the path travelled. The basic unit of distance is metre (m). Distance is a scalar quantity.
- Displacement is the straight line distance from the initial position to the final position.
- The unit of displacement is metre (m).
- Displacement is a vector quantity.
- Speed is the distance travelled in unit time.
- Speed is a scalar quantity.
- Unit of speed is m/s.
- Velocity is the displacement in unit time.
- Velocity is a vector quantity.
- Unit of velocity is m/s.
- If a body in motion covers equals distances in equal intervals of time, the body is said to have uniform speed.
- If it covers unequal distances in equal intervals of time, the body is said to have non uniform speed.
- A body has uniform velocity if it covers equal distances in the same direction in equal intervals of time.

Acceleration is the rate of change of velocity.

Acceleration = change in velocity / time

$$\text{Acceleration} = \frac{(v-u)}{t} .$$

- If either speed or direction or both changes, then the velocity is non uniform.
- Deceleration or negative acceleration is the rate of decrease in velocity.

1) Velocity of a body changes from 2 m/s to 10 m/s in 20 s. Calculate the acceleration.
2) A car travelling with a velocity 40 m/s comes to rest in 20 s. What is its acceleration? What is the retardation?

Static Electricity

Objective : To understand static electricity

Activity : Experiment and work sheet

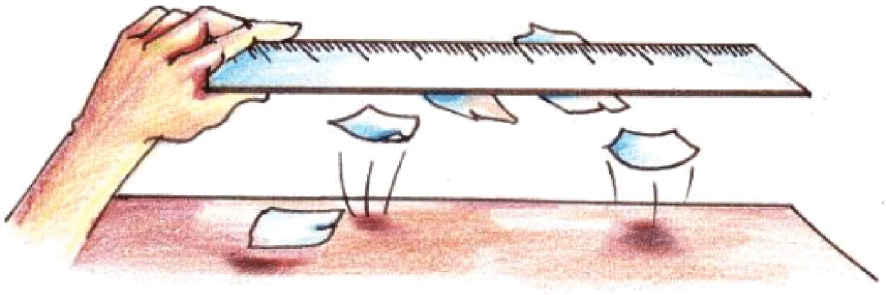
Materials needed : Balloon, Flannel, Polyester cloth and Plastic pen /Plastic scale.

Procedure

1) An inflated balloon is rubbed with polyester cloth and is brought near pieces of paper.

- Write down the observation.

2) Rub a plastic pen or scale on dry hair and bring it near pieces of paper.



Write down the observation.

Worksheet

- Can a glass rod rubbed with silk attract small pieces of paper?
- Can an ebonite rod rubbed with wool attract small pieces of paper?

- How does the body get the ability to attract other bodies on rubbing?
- Can a steel spoon rubbed with polyester cloth attract pieces of paper?
- Which are the sub atomic particles in an atom?
- Which subatomic particle is transferred from one body to another when certain bodies are rubbed against each other?
- What kind of charge do electrons possess?
  (positive / negative)
- While rubbing, which body gets negative charge?
  (The body which receives electron / the body which loses electrons)
- Which one gets positive charge?
  (The body which receives electron / the body which loses electrons)

Inference:

- When certain bodies are rubbed against each other they are able to attract some other substances.
- The sub atomic particles in an atom are protons, neutrons and electrons.
- When certain bodies are rubbed against one another, electron transfer takes place.
- An atom gets negative charge on receiving electron.
- An atom gets positive charge on losing electron.
- Electrification or charging is the process of converting an object into an electrically charged one.
- If the electric charge produced on an object at a point remains at the same place on it, it is called static electricity.
- When a metal surface is electrified by friction, the charge is spread immediately to other parts of it on the surface, as it is a conductor. So static electric charge is not formed on metals.