Scheme of Practical Examination

(Class–9)

Time : 3 hrs. **Total marks : 25**

1.	Any three experiments	15 marks (5+5+5)
	(One experiment each from biology, chemistry, physics)	
2.	Oral questions related to experiment (Viva-voce)	02 marks
3.	Practical records	03 marks
4.	Project (done during the session)	05 marks
	Total	25 marks

Distribution of marks for Biology

1.	List of materials required	01 mark
2.	Method and labeled diagram	02 marks
3.	Presentation	01 mark
4.	Result, precautions	01 mark
	Total	05 marks

Distribution of marks for Physics and Chemistry

1.	List of materials required	01 mark
2.	Theory and formula, labeled diagram	01 mark
3.	Observation, calculation	02 mark
4.	Result, precautions	01 mark
	Total	05 marks

Practical Work

Biology

S.No.	Title
1.	Observing cells in a leaf peel.
2.	Observing human cheek cells.
3.	Observing the arrangement of cells in the longitudinal and transverse section of the plant stem and correlating it to function.
4.	Observing plant parenchyma tissue.

Chemistry

S.No.	Title
1.	Preparation of colloids of starch/gum/milk and testing the formation of colloid using Tyndall effect.
2.	Studying displacement reactions using an aqueous solution of copper sulphate and iron metal (iron nail/ awlpin).
3.	Studying double displacement reaction using the example of reaction between sodium sulphate and barium chloride.
4.	Studying exothermic and combination reactions using the example of reaction between anhydrous lime (CaO) and water.

Physics

S.No.	Title
1.	Using vernier caliper to measure the length/internal and external diameter/depth of a hollow cylinder.
2.	Using a screw guage to determine the diameter of a wire.
3.	Using a simple pendulum to determine the relationship of time period(T) to the length(L) of pendulum and drawing a L vs T2 graph.
4.	Studying the type of motion by drawing position-time graph using asset of given values related to motion.

Practical Work

Biology

Practical Work (Fundamental Unit of Life : Cell)

Objective : Observing cells of the leaf

Materials Required : leaf Rheo/Bryophyllum/etc. slide, cover slip, red ink, microscope.

Method : Take a Rheo leaf. Tear it in a stroke. See the torn portions against light. You would find a violet translucent layer. Take a small portion of this on a drop of water on a slide. Gently cover this with a cover slip(see to it that no bubbles remain add a few more drops of water for this).

Observe this under low magnification first to locate the material try to make a sketch of this, then increase the magnification to observe the cells clearly (try to draw this as well).

Questions :

1. What were the new things that you could see under higher magnification? Does it match with the figure given in your textbook in the chapter on cell(see the chapter to compare).
2. Label the sketch made by you with the help of figure-2 of chapter, "Fundamental Unit of Life: Cell"
3. Write about the structures and arrangement of cells as you observe them under the microscope. You could keep in mind the following points while making your note - shape of the cells, presence or absence of intercellular space, presence or absence of chloroplast, other structures.

Instruction : You could do this experiment with other leaves as well, a thick fleshy leaf will help you to get a better layer of peel.

You may stain the material with ink, alta, safranin etc.

Precautions :

1. Bubbles should not be there in you slide.
2. Wash out excess stain if you stain your sample.

Practical Work (Fundamental Unit of Life : Cell)

Objective : Observe cheek cells.

Materials Required : Slide, cover slip, ice- cream spoon, redink/alta/safranin, microscope.

Method : Use an ice-cream spoon to gently scrape off a layer (inside your mouth) from the inner walls of your cheek. Do not scrape too hard. Spread the scrapings in a drop of water on a slide. Use a few drops of dilute red or blue ink, safranin or alta to stain the scrapings. Observe the slide under a microscope. Try to draw a sketch of what you see. Label it with the help of figure-3 of the

Question : Make a note of the similarities and differences between cheek cells and cells in the leaf peel.

Practical Work (Multicellular Structure: Tissue)

Objective : To observe the arrangement of cells in the transverse section and longitudinal sections of stem of a plant and try to relate it to function.

Materials Required : A plant with soft stem(moneyplant/ small periwinkle/ marigold), a glass, red ink, blade, handlens

Method : Take two stems/stalks of the selected plant (nearly 5-6 inch in length). Small rooted plants would also be a good sample. Observe the transverse and longitudinal section of any one of the stems/stalks. Observe the arrangement of cells in these sections and make a note of it. You may use a hand lens or a microscope for your observations. You may take the help of figure-1a and b of Chapter-7 "Multicellular Structure:Tissue" for this.

Now fill upto 2/3rd of the glass with water. Mix red ink such that the water becomes deep red. Now keep the other stem/stalk in this and leave the set up in the sun for around 2 hours. Take this stalk out of the water and observe its longitudinal and transverse section once again. Compare your observations of sections of both the stems and write the differences that you observe.

Take care to observe the veins and edges of the leaves of the plant kept in red water. Do you find red colour in these areas as well? See if the base of the leaf also has the colour.

Question: What do you think is the pathway of water from the base of the stem to the tip of the leaf? Make a sketch to show the same.

Practical Work (Multicellular Structure: Tissue)

Objective : Observing the plant tissue: parenchyma.

Materials Required : Banana, petri-dish/watch glass/ any bowl, iodine solution, slide, coverslip, microscope

Method : take a small portion of banana pulp in a watch glass and spread it out in a thin layer with a needle. Take a small portion of this on a drop of water on a slide. Spread it out in a thin layer. Add a few drops of iodine to this and cover it with a coverslip. No air bubbles should remain under the coverslip. Now observe this under the microscope and try to make a sketch of this. You may take the help of Activity-6 of Chapter 7 "Multicellular Structures: Tissue" for this.

Precautions :

1. If there are extra drops of iodine, wash it off using water.
2. Observe your slide under both low and high magnification of your microscope.

Chemistry

Practical Work (Matter : Nature and Behaviour)

Objective : Prepare colloids of starch/glue/milk and check colloid formation by Tyndall effect.

Matrials Required : Beaker (250 mL), test tubes, glass rod, burner, tripod stand, wire gauze, droppers, laser light, starch powder/glue/milk and water.

Theory : The solute particles in a colloid are so small that we cannot see them through naked eyes. These particles do not settle at the bottom of the vessel and we cannot even filter them. The particles of a colloide have a tendency to disperse light rays due to which we can see the path of light rays. This effect is known as Tyndall effect. This effect is not shown by a solution.

Procedure : Fill a test tube with water upto half level. Mix about 0.5 g starch powder in the test tube and form a paste. Take 100 ml water in another beaker and boil it. Add 2-4 drops of the paste from the test tube into the beaker, slowly, and stir it using a glass rod. Boil this mixture for 5 minutes and then allow it to cool down slowly.

Shine a laser torch being on the mixture made by this method. Observe the Tyndall effect from a direction perpendicular to the direction of light rays and conclude whether the prepared mixture is a colloid.

Conclusion : Write down the nature of the prepared mixture and give reasons for your conclusion.

Precautions :

1. Test tubes should be clean.
2. While mixing the paste into water, keep strring the mixture continuously with a glass rod.

3. The colloid must be allowed to cool down slowly.
4. The Tyndall effect should be seem from a direction perpendicular to the direction of light rays.

Preparing a colloid of glue :

To form a colloid of glue, grind the solid glue. After this, take 100 ml of water in a beaker and mix 2 g of glue powder into it. Keep stirring it with a glass rod. Warm it once or twice. After the mixture has cooled, shine a light beam on it using a laser torch. Observe Tyndall effect.

Note : Instead of using solid glue, you can also use 15-20 drop of liquid glue.

Precautions: Along with the precautions mentioned above, follow the given measures as well.

1. Use glue powder solid or liquid glue.
2. Warm the colloid lightly and then allow it to cool down. Only then observe Tyndall effect.

Preparing a colloid of milk :

To prepare a colloid of milk, take 100 ml water in a beaker and add 3-4 drops of milk to it. Stir it with a glass rod. Use a laser torch and observe the Tyndall effect.

Practical work (Chemical Reactions and Equations)

Objective : To study displacement reactions using aqueous solution of copper sulphate and iron (iron nail, awlpin).

Materials Required : Test tubes, 3 iron nails or allpins, sandpaper, thread, test tube stand, copper sulphate, water.

Theory : A reaction in which one element displaces another element from the aqueous solution of its compound is called displacement reaction.

$$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$$

In the reaction, iron displaces copper from the aqueous solution of copper sulphate and takes its place, therefore it is a displacement reaction.

Procedure : Take 3 nails of iron or 3 awlpins and clean them using sandpaper. Now mark the test tubes as A and B. Take 10 ml copper sulphate solution in both the test tubes. Tie 2 nails carefully with a thread and drop them into the copper sulphate solution in test tube B and keep for atleast 30 minutes. For comparison, keep a separate nail outside the test tube. After 30 minutes, take out both the nails from

the copper sulphate solution. Compare the colours of both the copper sulphate solution (in test tubes A and B). Also compare the colour of iron nail kept outside with the iron nail dropped in the copper sulphate solution. Note your observations in the following table.

Observation Table

S.No.		Test tube A (nail taken for comparison)	Test tube B		Result
			Before experiment	After experiment	
1.	Colour of copper sulphate solution				
2.	Colour of iron nail				

Result :

- A layer of which product and of which color got deposited in the nail?
- What change did occur to the color of copper sulphate solution and why?
- In this displacement reaction, which ion displaced what ion? Explain it with an equation.

Precautions :

- Test tubes should be clean.
- Nails should be cleaned using sandpaper, before the experiment.
- Nails should be kept totally dipped in copper sulphate solution.
- Copper sulphate solution should not be saturated or concentrated, otherwise the colour of solution will not change.

Practical work (Chemical Reaction and Equations)

Objective : To study double displacement reaction using the reaction between sodium sulphate and barium chloride.

Materials Required : Four test tubes, dropper, test tube stand, barium chloride, sodium sulphate, filter paper.

Theory : A reaction in which exchange of ions takes place between the reactants is called double displacement reaction.

Double displacement reaction takes place between sodium sulphate and barium chloride. Exchange of ions takes place between the ions of both the solutions. Following reaction ocurrs:

$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow 2NaCl\ (aq) + BaSO_4(s)$

colourless colourless colourless white precipitate

Procedure : Prepare an aqueous solution of sodium sulphate and barium chloride in two separate test tubes. Fill a test tube ¼ with sodium sulphate solution and with the help of a dropper add few drops of barium chloride solution to it. Mix the solution continuously. Add barium chloride solution until you get a precipitate. Filter this precipitate and divide into three parts. Dissolve these in dilute HCl, dilute HNO_3 and dilute H_2SO_4 respectively. Note your observations in following table.

Observation Table

S.No.	Experiment	Observation	Result
1.	On adding few drops of barium chloride solution to sodium sulphate solution.		
2.	Adding more drops of barium chloride solution to sodium sulphate solution.		
3.	On dissolving white precipitate in dil. HCl, dil. HNO_3 and dil. H_2SO_4 respectively.		

Result :

1. Write down the name, colour and state of the product formed by the reaction between sodium sulphate and barium chloride solutions.
2. Write down the solubility of the white precipitate of barium chloride in dil. HCl, HNO_3 and H_2SO_4.
3. Explain double displacement reactions using equations.

Precautions :

1. Fill only ¼ part of test tube with sodium sulphate solution.
2. Continuously stir the solution while adding barium chloride solution.

Practical work (Chemical Reactions and Equations)

Objective : To understand combination reactions and exothermic reactions using the reaction between calcium oxide and water.

Materials required : Test tubes, 250 ml beakers (borosil), dropper, dry calcium oxide.

Theory : A reaction in which 2 or more than 2 reactants form a product is called combination reaction. A reaction in which heat is produced during product formation is called an exothermic reaction.

Procedure : Take a clean and dry 250 mL beaker and add 5 g of calcium oxide powder to it. Touch the beaker and note your observation. Take some water in a dropper and add 5 mL of water to beaker every minute. Observe the reaction and write down your observations. Repeat the procedure 5 times. Everytime, touch the beaker from outside and write your experience of temperature change in the following table. After half an hour, write the observation of the solution formed in the following table:

Observation Table

S.No.	Experiment	Observation	Result
1.	On adding 5 ml of water first time to calcium oxide.		
2.	On adding 5 ml of water every minute to calcium oxide.		
3.	On touching the beaker before the reaction.		
4.	On touching the beaker after reaction.		
5.	On observing the solution after half an hour.		

Result :

- On the basis of the reaction and the heat produced which type of reaction is this? Explain both the reactions.
- Described the above reaction with an equation.

Precautions :

1. Beaker should be clean. Always use borosil glass beaker for this experiment.
2. Add water carefully.
3. Do not touch calcium oxide with wet hands, you may get blisters. Always handle the pieces of calcium oxide using forceps.

Note : You can get calcium oxide in solid form in a shop selling paints. Always keep calcium oxide in a sealed glass container.

Important equipment used in the lab

Vernier Callipers

Normally we can measure upto 1 mm length by a meter scale. For measuring even smaller lengths a french scientist Pierre Vernier developed Vernier callipers.

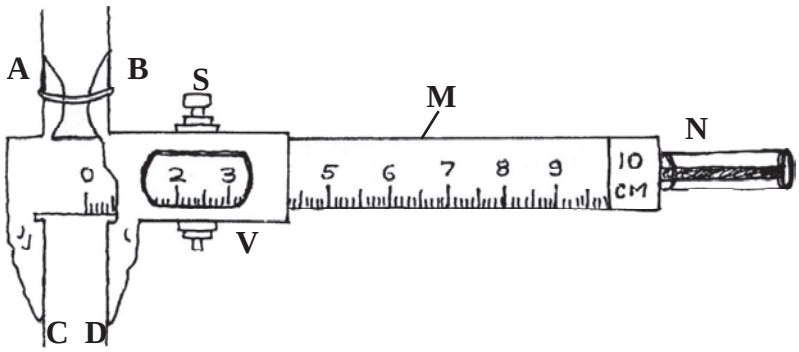


Fig. : Vernier Calliper

1. Construction- Vernier callipers has four main parts.

(i) Main scale- Vernier callipers is made up of steel whose one side has cm. or mm. scale and another is in inches. It is denoted by M in the figure.

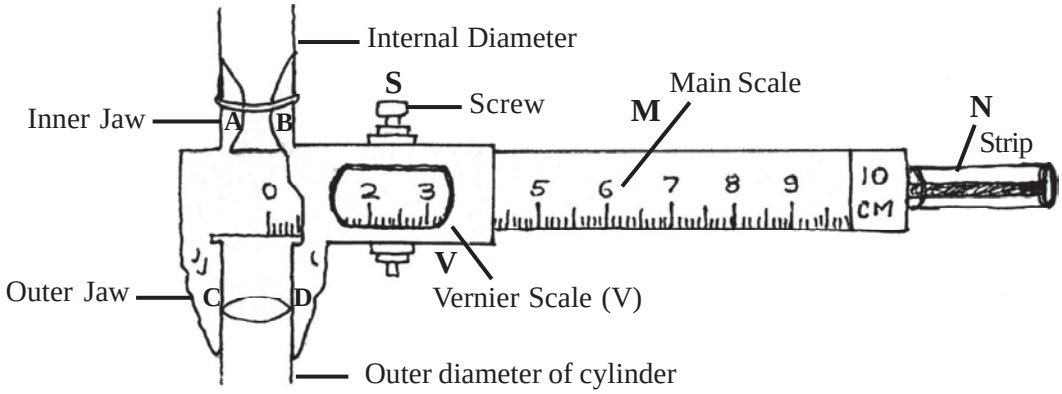


Fig. : Measuring diameter of a glass marble by using a pair of Vernier Callipers

(ii) Vernier Scale- This scale can be moved on main scale with the help of a screw and can be fixed on the main scale at any place to take reading. It is shown as V in the fig.

(iii) Jaws- Vernier callipers has two jaws. One is fixed as shown in figure PC and second jaw QD is fixed on vernier scale (frame). Outer jaws or lower side are used to find out the length or outer radius of any objcet (Rod and Cylinder) and upper jaws (internal) are used to find out internal radius of hollow cylindrical objects. With the help of strip N, depth of any part can be measured.

(iv) Screw- Jaws QD can be moved in any direction with the help of screw 'S'.

2. Principle-

The smallest quantity which an instrument can mearuse is called its least count. Therefore the difference between the length of 1 division of main scale and the length of 1 division vernier scale is called Vernier Constant or Least Count. It is the smallest length that can be accurately measured by this instrument.

The value of 1 division of main scale is 'S' unit and value of 1 division of vernier is 'V' unit. Suppose the value of "n" parts or divisions of vernier scale is equal to (n–1) of main scale.

$$(n-1)s = nv$$
$$ns-s = nv$$
$$ns-nv = s$$
$$n(s-v) = s$$
$$s-v = s/n$$

$$\text{Least count} = \frac{\text{Value of division of main scale}}{\text{Total no. of divisions of vernier scale}}$$

This is called vernier constant or least count. Total reading of vernier scale is obtained by multiplying least count with total no. of vernier scale. Total no. of vernier scale will be equal to its total no. of main scale and total no. of vernier scale.

If the value of 1 division of main scale S = 1 mm and total number of divisions of vernier scane n = 10, then least count of vernier callipers will be s/n = 1/10 = 0.1 mm = 0.01 cm.

If the length PQ of any object is to be measured by vernier callipers then the said object must be fixed in between the jaws. Now take the reading of vernier scale as following.

So the length PQ of the object is =

Reading of main scale + value of 5^{th} division of V scale x least count.

$= 1.2 \text{ cm} + 5 \times 0.01 \text{ cm}.$

$= 1.2 \text{ cm} + 0.05 \text{ cm}.$

$= 1.25 \text{ cm}.$

Thus the length PQ of given object is 1.25 cm.

3. Zero error

On coinciding both the jaws of Vernier callipers, the zero of vernier scale and main scale do not meet with each other then their error is called 'Zero Error' of instrument. It is of two kinds :

(i) Positive zero error.

(ii) Negative Zero error.

(i) Positive Zero Error

On coinciding both the jaws, if the zero of vernier scale lies on the right side of the zero of main scale, then the error is called Positive zero Error. To find values of zero error, we observe which division of vernier scale coincides with which division of main scale. This value of division of Vernier scale is multiplied with least-count and then it is subtracted from total reading along with its sign.

True Reading = Total Reading - (Zero error)

Positive Zero Error = 6 × 0.01 cm.

= 0.06 cm.

If Total Reading is 1.25 cm. Then

True Reading = 1.25 – (+0.06)

= 1.19 cm.

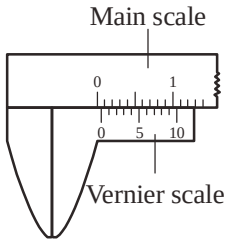


Fig. Positive Zero Error

(ii) Negative Zero Error

On coinciding both the jaws, if the zero of vernier scale lies on the left side of the zero of main scale, then the error is called Negative Zero Error. It is calculated same like positive zero error and the value is subtracted from the previous reading to get the true reading.

True Reading = Total Reading – (Zero Error)

Negative Zero Error = 7 × 0.01

= 0.07 cm

If reading is 1.25 cm then

True Reading = 1.25 – (–0.07)

= 1.18 cm.

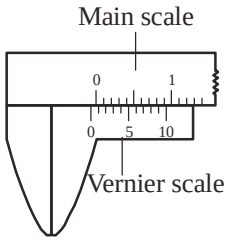


Fig. Negative Zero Error

4. Reading of Vernier Scale

For reading of vernier first we check what is the reading on main scale before zero of Vernier. Then we check which division of vernier matches with which division of main scale. The division of vernier, which matches with division of main scale, is then multiplied with least count of vernier and we get vernier reading. In the given fig. (a) zero of main and vernier scale both are matching and 10 division of vernier is equal to 9 divisions of main scale. Then by above mentioned method least count 0.1 mm or 0.01 cm. is measured in fig. Zero of vernier is nearest to 4 mm division of main scale and 4th division of vernier scale is matching with same division of main scale. So difference is equal to 4 divisions only.

(a) Main scale (b) Main scale

Fig.

Difference for 1 division = 0.1 mm.

For 4 divisions = 0.1 × 4 = 0.4 mm.

Total reading = Reading on main scale + Reading on Vernier scale.

= 4 mm + 0.4 mm = 4.4 mm.

In short, to measure a given length by vernier callipers, the following procedure should be adopted.

1. Least count of the vernier shold be calculated.
2. Value of a sub-division of main scale should be found out.
3. Zero error should be found out.
4. Main scale reading should be taken
5. Vernier scale reading should be taken.

5. Uses of Vernier Callipers

(i) Length, breadth and thickness of any object can be measured.

(ii) To find the internal and external diameter of a solid or hollow vessel.

(iii) To find the depth of a hollow vessel.

Screw Gauge

We know that with vernier callipers we can measure up to 0.01 cm or 0.1 mm acurately but sometimes we have to measure even smaller quantity like 0.001 cm or 0.01 mm. For this we use even micro measuring instrument than vernier, it is known as screw gauge. It is based on principle of micro-meter screw and with its help we can measure up to third decimal accuracy.

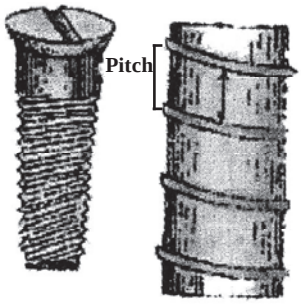


Fig. Ring interval

Principle of screw gauge

When a screw with uniform threads rotates clockwise through a nut, its tip moves forwards and backward in a straight line. This linear displacement is directly proportional to the circular displacement rotated by screw.

For one compete rotation of screw head the distance its screw tip covers is called pitch or thread internal of screw gauge. It is the distance between two threads of screw.

Least count- Suppose in one complete rotation of screw head distance travelled by screw tip is S. So pitch or thread-interval to screw gauge is S. If there are n number of division on circular scale of screw head then-

$$\text{Least count} = \frac{\text{Pitch or thread interval}}{\text{Number of divisions on circular scale of screw head}}$$

Normally thread interval in screw gauge is 1 mm and total number of divisions on circular scale is 100.

Least count of

Screw Gauge = 1/100 mm = 0.01 mm = 0.001 cm.

Construction of Screw Gauge

Screw gauge has mainly three parts-

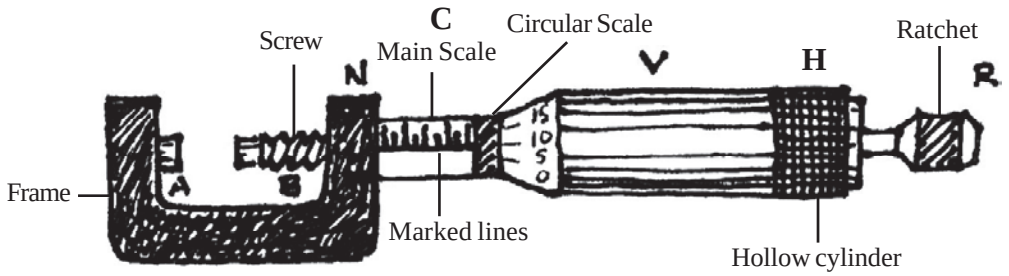
(i) U-shaped metal frame.

(ii) Screw and Main scale

(iii) Head Scale or circular scale.

i) U-shaped metal frame- In U- shaped metal frame, inside the extreme arm a fixed small metal block 'A' called stud. In other arm of the frame a threaded hole is present though which screw 'B' slides forward and backward.

(ii) Screw and Main scale- It is major part of this instrument. It is tubular hub denoted by 'C' in the fig. It is extends from the right side of the frame and has small division a of an mm or half millimeter.



(iii) Head Scale or circular scale- Screw can be moved forward and backward using a long screw head. It is like a circular head which is divided in 100 divisions in circular manner so it is called circular scale.

Modern screw gauges are provided with a ratchet 'R' to keep the scale tight.

Possible Errors- While using Screw Gauge following errors are possible-

(i) Backlash error (ii) Zero error

Backlash Error

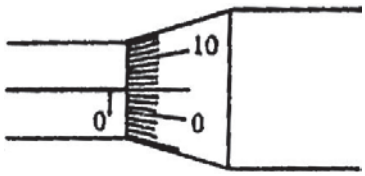
We know the principle of screw that the linear distance travelled by a screw, on moving forward and backward, is directly proportional to the rotation of the head. But due to continuous use of screw gauge, its threads are worn out due to friction and screw becomes loose in the nut and in such case if we move the screw forward suddenly, it goes backward and head scale rotates and screw tip does not move forward or backward. This error is called backlash error.

For removing this error screw should be moved in one direction only. If it is needed to move backward then it should be rotated backward more and again rotated forward.

Zero Error

When screw tip is moved up to stud and is touching it, and in this condition base line of the main scale does not match with Zero (O) of head scale then there is Zero error in the intrument. It is of two types-

(i) **Positive Zero error-** If zero of head scale is below the reference of main scale after touching the screw tip to stud then this error is known as positive zero error.



Positive Zero error

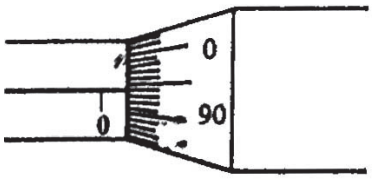
To determine the magnitude of zero error we check which division of head scale is exactly in front of reference line of main scale and number of this division is then multiplied with least count, the value so obtained is positive Zero error. This value is subtracted from observed reading. Positive zero error is shown in the fig. 4.8.

Suppose in front of reference line of main scale a higher division of circular scale comes then,

Positive zero error = n × least count

Where n = No. of divisions above zero.

(ii) **Negative Zero error-** When after touching the screw tip with stud. reference line of main scale is below the Zero of head scale then there is negative zero error in the screw gauge.



Negative Zero error

For determining value of this error we check how many number of divisions of head scale are below zero which matches the reference line of main scale. Then these number of divisions is multiplied with least count. The value so obtained is added to observed reading.

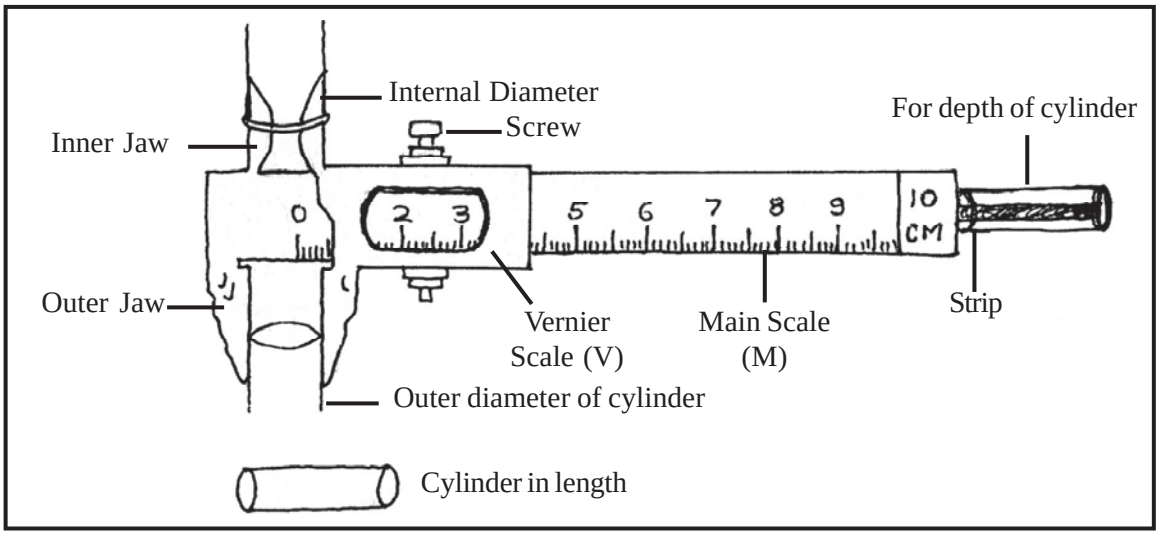
Physics

Practical Work (Measurement)

Objective : Measurement of length/internal or external diameter/depth of a hollow cylinder with the help of vernier callipers.

Materials Required : Vernier callipers, hollow cyliner.

labelled Diagram :



The oretical formula : Least count of vernier callipers (L.C.)

$$\text{Least Count} = \frac{\text{Magnitude of 1 division Main Scale}}{\text{Total no.of divisions in Vernier scale}}$$

Procedure : Procedure for measuring length/diameter/depth with the help of vernier callipers is same for all.

If cylinder is hollow then for its internal and external diameter measurement we take reading by fixing the cylinder as per fig. 3 and for measuring depth of cylinder it is kept as per fig. and correct reading is noted.

Observation tables for length/diameter/depth are similar. Here measurement of length of cylinder by vernier callipers is explained.

(i) First of all least count of vernier is calculated.

(ii) If apparatus has any zero error then its type and magnitude is measured.

(iii) Now given cylinder is put between jaws in such manner that its length should be parallel to main scale.

(iv) In this condition by tightening the scale, cylinder is taken out from both the jaws.

(v) Now take the reading on main scale which is ahead of the zero of vernier. This is main scale reading.

(vi) Them check which division of vernier matches with some division of main scale. This division of vernier is then multiplied with least count.

(vii) Sum of main scale reading and vernier scale reading will be the length of cylinder.

(viii) This exercise is done for few times and their average is taken.

(ix) From this average value zero error is subtracted along with sign. This is actual length of cylinder.

Observation Table :

Least count of apparatus = ... cm.

S.No.	**Reading of main scale (in cm.)**	**Reading of vernier scale**		**Total reading (in cm.)**
		No. of divisions	**No. of division × least count**	
1.	.....	.....	.....×.....=.....	.....
2.	.....	.....	.....×.....=.....	.....
3.	.....	.....	.....×.....=.....	.....
4.	.....	.....	.....×.....=.....	.....
5.	.....	.....	.....×.....=.....	.....

Average Zero Error = ... cm.

Observation Table for Length of Cylinder

S.No.	Main Scale Reading	Vernier Scale Reading		Total Reading
	(in cm.)	No. of divisions	No. of division × least count	(in cm.)
1.	.....	.....	.....×.....=.....	.....
2.	.....	.....	.....×.....=.....	.....
3.	.....	.....	.....×.....=.....	.....
4.	.....	.....	.....×.....=.....	.....
5.	.....	.....	.....×.....=.....	.....

Actual length = observed length – (Zero error with actual sign)

Result : Actual length of cylinder ..... cm. (similarly value of diameter or depth is also measured).

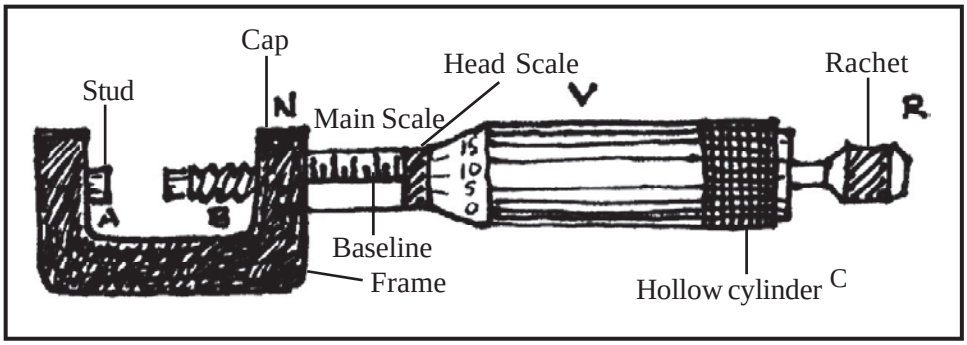
Precautions :
1. Cylinder must be properly tightened between jaws.
2. Reading should be taken from different positions of cylinder.
3. While taking a reading, eye should be perpendicular to the scale.
4. After calculating zero error it should be adjusted with main scale reading.

Practical Work (Measurement)

Objective : To measure diameter of wire with the help of screwgauge.

Materials Required : Screw gauge, wire etc.

labelled Diagram :



Theoretical Formula : $\text{Least count} = \frac{\text{Thread Interval of screw gauge}}{\text{Total no. of divisions on circular scale}}$

$= \frac{0.1}{100}$

$= 0.001$ cm.

Procedure : Before using screw gauge for measuring diameter of wire we first calculate zero error. After this we find least count which is generally 0.001 cm.

Now experimental wire is tightened between screw and stud by rotating the cap and main scale reading is noted.

Reading on circular scale is also noted. (Here we observe which division of circular scale is in front of main scale)

By putting the values in observation chart diameter of wire is calculated and actual diameter is calculated by deducting zero error value.

Observation table for zero error

S.No.	Main Scale Reading	Reading on Circular Scale		Total Reading
		No. of divisions above/below baseline	No. of division × least count	(in cm.)
1.	.....	.....	.....×.....=.....	.....
2.	.....	.....	.....×.....=.....	.....
3.	.....	.....	.....×.....=.....	.....

Average Zero error = ± .....

Observation Table of Diameter of Wire

S.No.	Main Scale Reading	Reading on Circular Scale		Total Reading
		No. of divisions matching baseline	No. of division × least count	(in cm.)
1.	.....	.....	.....×.....=.....	.....
2.	.....	.....	.....×.....=.....	.....
3.	.....	.....	.....×.....=.....	.....

Average diameter of wire = ... cm.

Calculation : 1. Actual diameter of wire = Observed diameter – (Zero error along with sign)

2. Radius of wire = $\frac{\text{Diameter of wire}}{2}$ = ... cm.

Result : Thus diameter of given wire is ..... cm. and Radius is ..... cm.

Precautions : 1. Wire should not be over tightened.

2. Reading should be taken at different places of wire.

3. Rachet must be used.

4. Screw should be rotated in one direction only.

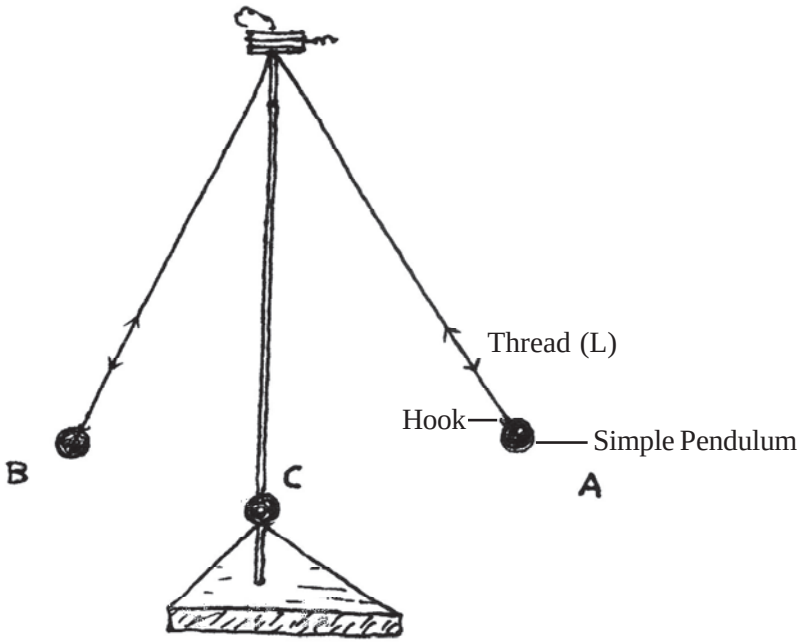
Practical Work (Sound)

Objective : To study the change in time period with respect to length of simple Pendulum and draw a graph of length (Time period)^2

Materials Required : Simple pendulum, thread, Vernier-Callipers, stop watch etc.

Principle : Acceleration due to gravity is different at different places. If acceleration due to gravity at any place is g. time period of simple pendulum at that place is T, length of simple pendulum also known as effective length is L then according to law of simple pendulum Time period is directly proportional to its length.

labelled Diagram :



Procedure :

1. First of all, with the help of Vernier Callipers, radius of pendulum is measured or pendulum of known radius is used.
2. Length of hook is measured with the help of scale.
3. Length of thread is taken as such that the sum of radius of ball, length of hook and thread length should come to the simple multiple of 10.

   Ex.- Radius of ball + hook length + thread length

   = 1.2 + 1.4 + 77.4

   = 80 cm.

   This length is known as total length or effective length.
4. In this way length is changed to 80, 90, 100 ..... cm.

5. By taking different length and giving 15 to 20 oscillations time taken is noted by stop watch.
6. Lastly a graph is plotted between length and square of time period.

Observation Table

1. To measure radius of ball with the help of vernier callipers.

Table-1

S.No.	Reading of Main Scale (x)	Reading of Vernier Scale		Diameter
		No. of division	No. of div. × Least count (y)	Total reading ($x + y$)
1. 2. 3.				

Zero is deducted from diameter

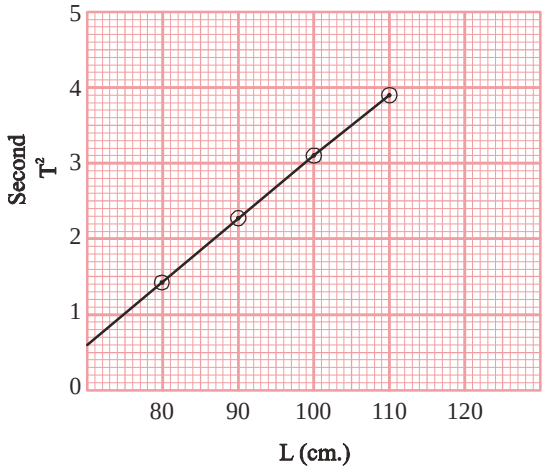
$$\text{Radius} = \frac{\text{Diameter of wire}}{2}$$

Radius = ... cm.

Table-2

S.No.	Hook length (a)	Radius (b)	Thread Length (l)	Effective Length (a+b+1)	Oscillation Period (T)	T^3
1. **2.** **3.**						

Result : Straight line obtained in the graph verifies that $T \propto \sqrt{L}$ or $T^2 \propto L$ which means square of time period is directly proportional to effective length.



Precautions :
1. Least count of Vernier Callipers and stop watch should be calculated and simultaneously zero error corrections is also necessary.
2. Motion of simple pendulum should be simple harmonic motion.
3. Displacement of pendulum should be 4°-5°.
4. Effect of fraction should be least on the motion of simple pendulum.

Practical Work (Motion)

Objective : To draw position-time graph using the figures of motion and to understand the type of motion.

Materials Required : Figures of position and time, graph paper, pencil, scale etc.

Principle : When an object moves non uniform distance in uniform time, then its motion is called as non-uniform motion. When a body moves uniform motion in uniform time then its motion is called as uniform motion. The position time graph of a uniform motion is straight line.

Procedure :
1. According to the given figures, choose a suitable scale for position and time.
2. Now place time on *x* axis, and position on *y* axis and draw a graph.

Observation Table :

Time	0	1	2	3	4	5	6	7
Position	2	6	12	12	12	18	22	29

Result : The line AB and CB in the graph show uniform motion while BC shows non-uniform motion.

Precaution :
1. Choose the scales carefully so that it is appropriate.
2. Take time on *x* axis and position on *y* axis only.

Project Work

Important instructions related to project work–

1. Projects can be done in small groups of students.
2. It is compulsory for each student to do a minimum of 3 projects, one each in physics, chemistry and biology.
3. Project writing should follow a sequence. You can include pictures, paper cuttings, graphs, collections, photographs and other exhibits to elaborate.
4. During practical examinations, it is compulsory to conduct oral assessment of project work and experiments.
5. Project work may also be done on local issues.

Biology

1. Understand the process of classification.
2. Understand the different ways of treatment/testing/identifying symptoms of diseases.
3. Study the habitat of a plant.
4. Identify biodegradable and non-biodegradable wastes.

Chemistry

1. Collecting and making a list of different mixtures used in daily life and categorization into solutions, colloids and suspensions.
2. Making a list of elements, compounds and mixtures found around you and writing two uses of each one of them.
3. Understand the role of plastic codes in the recycling of objects made of plastics.
4. Ask 5 persons involved in different occupations in the locality of your school, whether their consumption of fossil fuels (coal, L.P.G. petrol, kerosene) has increased or decreased over time. Discuss in detail. Also find out the steps taken by them to reduce fossil fuel consumption.

Physics

1. Making a comparative study of examples from daily life related to acceleration, velocity and retardation.
2. Calculating the amount of electrical energy consumed daily at home/school.

Biology

Project work (Biodiversity and classification)

Objective : Understand the process of Classification

Materials required : Plastic scale, wooden scale, pencil, wooden block, alpin, rubber ball, cricket bat, key, rope, chalk, book, rubber, cycle tube, a piece of glass, plane mirror

Process: Write down the names of all these objects on the blackboard. Form two groups to start playing this game. The number of members of a team should not exceed 15. Choose a leader for each team. As you start playing, the leader of one of the teams must discuss with the team members and write the name of an object from the list on a piece of paper and hand it over to the teacher. The members of the other team should not get any idea of the chosen object. They have to find out the name of the object by asking appropriate questions the answer to which should be in 'yes' or 'no' only like is the object used for playing games? The questions must be asked by proper discussion within group members. Both groups should get a turn each in deciding the name of object. The group that asks a minimum number of questions to find out the object wins.

Question :

1. What were the characters that were made basis for asking the questions?
2. Make a flow chart of classification of the objects by taking the help of Figure1 of the chapter(Biodiversity and Classification).

Project Work (Our Health)

Objective : to conduct a survey to find out the number of people whogofor confirmation of disease before treatment (raise awareness towards need of tests and proper line of treatment).

- Contact any five people who are sick. Collect information from them on the basis of the following table and answer the questions given in this section.

Name of the sick person	Symptoms of the disease	Did the patient undergo test for confirmation? (Yes/No)	Name of the disease	Treatment

- How many patients resorted to confirmatory tests for the disease?
- How many patients underwent treatment?
- What were the different ways adopted for treatment?

Project Work (Habitat)

Objective : To study the habitat of a plant

Materials required : copy, pencil, rubber, sharpener, rope, hand lens, matchbox, bottle, paper bag etc.

Method : Divide into groups of 3-5 members. Let half of the group study Parthenium sp.(gajarghas)/grass and the other half study railway creeper(besharam)/Dhatura. Include the following points essentially to collect information-

- What were the plants found around an area of one square meter of the plant under study? Note their number. Animals feeding on these plants, try to collect some evidences in the form of the insect itself(be careful not to hold the insect rather collect the whole leaf on which the insect may be found to feed in a paper bag) or a leaf eaten by insect. Note the names of animals if you know, take the help of your teacher as well.
- Describe the kind of soil that you find in which the plant grows(like dry/wet, redsoil/blacksoil/etc.,sandy/clayey/etc.)
- Use of the plant if any.
- Collect any other information you find notable and worth observing.
- Try to make a sketch of the plant that was studied.

Get back to the class and share the informations collected with your friends.

Questions :

1. What were the similarities and differences found while comparing your observations?
2. There can be some difference in the habitat of the same species. Discuss this aspect on the basis of your findings.

Project Work (Waste and its Management)

Objective : Identify biodegradable and non- biodegradable wastes

Materials required : 8-10 earthen pots, soil, plain paper, gum, water, natural and human generated waste like vegetable or fruit peels, toffee papers, nails, glass pieces(be careful while handling them) or glass balls, covers of bottles etc.

Method : Follow the following method to find out about biodegradable and non-biodegradable wastes.

Fill soil upto a certain level in all the earthen pots. Add water to retain moisture. Separate out the waste materials and add them to the soil in the pots like add fruit and vegetable peels in one, a bottle cover in another, a nail in the third one etc. now cover up the materials with soil and add water over the same. Label the pots by writing the date and thetype of waste in it. Keep the pots in a shaded area for 3 to 4 weeks and leave them aside(remember to sprinkle water on them to keep the soil moist).

Dig out the waste material of all the pots after four weeks, observe the condition of the waste materials and write a report of your observation(use rubber gloves to carry out your work with soil). You could take the help of the following table for this.

S.No. of Pot	Name of object(waste)	Fully degraded	Partially degraded	No change
1.				
2.				
3.				
4.				

- What was the nature of objects that were fully degraded?
- What kind of waste is it?

Chemistry

Project work (Matter : Nature and Behaviour)

Objective : Classify the mixtures used in daily life into solutions, colloids or suspensions.

Theory : Solution is a homogenous mixture. The particles of a solution are so small that they cannot be seen through naked eye and we cannot seperate the particles of a solute from a solution by the process of filtration. As the particles are very small they do not disperse light rays. Therefore, we cannot observe the path of light rays in a solution.

Suspension is a heterogeneous mixture. We can see its particles through naked eye. These disperse light rays and hence we can see the path of light rays. We can seperate its particles through the process of filtration.

A colloid is a heterogenous mixture. Its particles are so small that we cannot see then by naked eyes. But they are large enough to disperse light rays. We cannot seperate its particles through filteration.

Procedure : Make a list of all the mixture that you use in your daily life.

S.No.	Substance	Solution/Colloid/Suspension	Basis of classification
1.	Lemonade	Solution	Cannot see the particles and cannot seperate them by filtration.
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Discuss your observation in the classroom and on this basis write down point wise conclusions in your project report.

Note : Take examples of solution/colloids/suspension from your surroundings and items such as medicines etc.

While writing down the project report, include the difficulties faced by you and their solutions. If you had to make any changes in the procedure, do mention it. Also mention the things you learnt during this project.

Project work (Matter : Nature and Behaviour)

Objective : Classify the items in your surroundings into elements/compounds and mixture and write down 2 uses of each.

Theory : An element is a fundamental form of matter and cannot be divided into other simpler substances through chemical reactions. Elements can be classified as metals and non-metals. Metals have lustre, are good conductors of heat and electricity, ductile, malleable and produce metallic sounds. Non-metals do not show these properties. Non-metals are of different colour, are bad conductors of electricity and are brittle. Compounds are made from chemical combination

of 2 or more elements in a specific ratio. Properties of a compound are different from its constituent elements. Mixtures are made from two or more elements or compounds mixed in any ratio. Chemical reactions do not take place during the formation of mixtures. They possess the properties of constituent elements.

Procedure : Form your surroundings, classify items into elements/compounds/mixtures based on their properties and note your observations in the following table–

S.No.	Example	Element/ Compound/ Mixture	Constituents	Basis of classification	Uses
1.	Iron nail	Element	Iron	Cannot be divided into simpler susbstances.	
2.	Water	Compound	Hydrogen & Oxygen	Formed by chemical combination	
3.	Brass	Mixture	Copper and Zinc	Chemical reaction does not take place during formation.	
4.					
5.					
6.					
7.					
8.					
9.					

Project work (Coal, Petroleum and Petrochemicals)

Objective : To understand the role of plastic codes in the recycling of plastic items used in daily life.

Theory : In recent times, the plastic industry has rapidly grown as has the petrochemicals industry.We use a vast number of plastic objects in our daily life. On the basis of its property, plastic is coded and the code is mentioned on the item. We can easily see the code on plastic objects. Recycling of plastic is done on the basis of these codes.

Procedure :

- Formation of groups of students should take place under the supervision of teachers.
- Each group should visit at least 5 houses in their surrounding and gather information about the plastic items used by them and their plastic codes. Note down the plastic codes in your notebook. Discuss about the recycling of plastic.
- Students can do this survey in their locality.
- After the survey, discuss your observations and form a table of all the items under plastic codes 1 to 7 respectively.
- Make a report on the recycling process of all these tabulated items.
- Talk with the person of your neerby junkyard and collect information about the importance of plastic codes for them.
- The growing use of plastics is hazardous for our health. With the help of your head teacher arrange a discussion on this topic and include the points in your report.

Project work (Coal, Petroleum and Petrochemicals)

Objective : To know about the work done for conservation and use of fossil fuels. To encourage ourselves and society for the conservation of fossil fuels.

Theory : Fossil fuels are a source of energy which takes millions of years to form but our current stores will last only another 100 years. Therefore, we should try to stop misuse of fossil fuels. It will be available for future generations only if we use it wisely. We may face energy crisis in future therefore it is necessary to motivate society and community to use fossil fuels wisely.

Procedure :

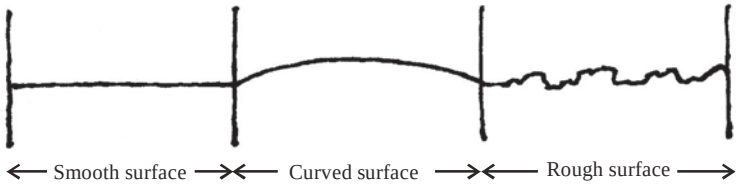
- Formation of groups should be done by the teacher.
- Each group must visit 5 houses near there school and have a discussion with 5 persons occuped in 5 different occupations. Gather information about their fossil fuel (coal, LPG, petrol, Kerosene) utilization. Ask whether their consumption has increased or decreased in last 5 years. Ask whether they take any steps for the conservation of fossil fuels and write down about it after a through discussion. Suggest them your own ideas about fossil fuel conservation. Note down your discussion in your project report.

Project Work (Physics)

Motion

Objective : To study velocity, acceleration and deceleration using daily life examples.

Materials required : Stop watch, different types of vehicles (cycles, motor-bike, car, auto), paper, pen, pencil, tape etc.



Theory : Distance covered in a given direction in a unit time by an object in motor is called velocity.

velocity = displacement / time

Acceleration : Rate of change of velocity in a non-uniform motion is called acceleration.

acceleration = change in velocity/time interval

Procedure :

1. Form a group of 4-5 members to study daily life examples of velocity, acceleration and deceleration.
2. Choose a path which has some part as plane surface, some part as curved surface and some rough patches.
3. Mark a point at some fixed distance. Ask one of the members to stand at that point.
4. Note down the distance and time of travel taken by various vehicles and fill in the table. Measure the distance using metre scale or tape and measure the time using a stopwatch.

Observe the figures carefully and study them.

S.No.	Description	Walking	Cycle	Auto	Bike	Car
1.	Time taken to cover 20 m. of plane surface.					
2.	Time taken to cover 20 m. of ..... surface.					
3.	Time taken to cover 20 m. of rough surface.					

Result : By doing a comparative study of the velocity, acceleration and deceleration of various vehicles we conclude that acceleration takes place on plane surface while deceleration takes place on rough surface.

Safety measure :

1. Use a common scale while marking distances so that we find regular distances and error free results.
2. Stand at a safer place on the roadside. to calculate the time. Be alert to avoid any mishappenings.

On the same basis you can take another example of walking on plane surface, climbing on stairs and climbing down from stairs.

Project work (work and energy)

Objective : Calculate the energy spent daily in your house/school.

Materials required : Watch, various electrical equipments, multi-meter etc.

Theory : We calculate the daily expenditure of energy using the following formula.

Total energy expended daily = No. of equipments × power of equipments (watts) × time (in hours) / 1000

Procedure : Calculate the energy spent daily at your house or school using the above formula.

Observation table

S.No.	Name of equipment	No. of equipment	Power of equipment	Time spent when the equipment was on	Energy spent	Total energy spent

Calculation :

1. Daily energy =
2. Monthly energy = daily energy × no. of days
3. Energy expenditure = total energy spent in month / rate.

Result : Energy spent daily in your house/school is .....

Safety measures :

1. Take proper safety measures for electricity use.
2. Don't touch any electrical equipment when it is on.
3. Stay away from equipments when they are in running condition.

Future scope : What measures can you take to avoid electrical energy wastage?