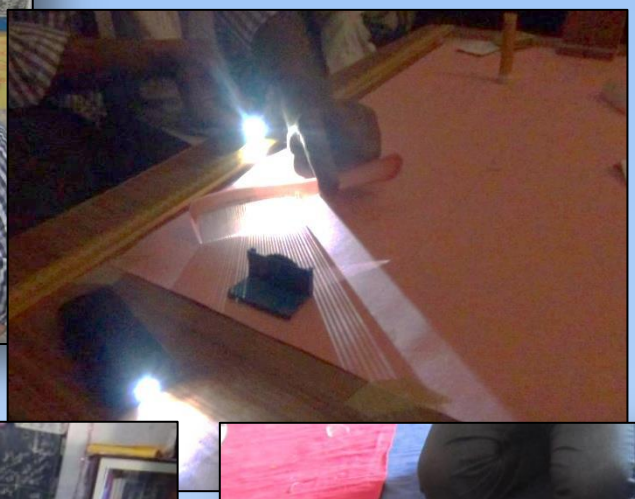


Science Voluntary Teacher Forums

District Institute, Yadgir

December 01, 2013

Report by Chandrakanth Reddy, TLC Coordinator, Gurmitkal, Janaki, TLC Coordinator, Shahapur and Naseema, Resource Person, Science

Azim Premji Foundation

TLCs are functioning as spaces for teacher capacity building by organising subject forums. Forums provide the space for structured learning in an informal context. They allow facilitators to give individual attention to teachers and address their specific queries. It also allows participants to articulate their capacity building needs and discuss granular topics. The response to forums has been very positive.

A total of **eight science teacher forum interactions have been completed** in the last five months: five at TLC Shahapur, two at TLC Gurmitkal and one at TLC Yadgir. It is interesting to see that **teachers are willing to come even on a Sunday and the number of teachers is also increasing with every meeting**. They have started expressing their capacity building needs and are taking up responsibility in preparing themselves to address these needs.

Two science voluntary teacher forums took place on December 1, 2013 in TLC Shahapur and TLC Gurmitkal. The science resource persons from District Institute, Yadgir team divided themselves into two groups and facilitated the sessions. Brief reports of the day with some interesting photographs which convey the flavour and vibrancy of the forum meetings are given below.

Science Voluntary Teacher Forum, Shahapur TLC

Place: Shahapur TLC

Time: 11.00am to 3.00pm

Total no. of science teachers present: 24

Others: 4 (2 SST teachers and 2 BRPs)

TLC coordinators: Janaki and Manjula

Science team members from DI Yadgir: Naseema, Akkamahadevi, Shankar and Rangnath

Objectives:

- To develop understanding on terms related to spherical mirrors
- To develop understanding of the difference between convex and concave mirrors
- To analyze the formation of images by concave and convex mirrors
- To understand the experimental setup for image formation by spherical mirrors

The meeting began with introductions of each member. After this Naseema spoke about the agenda of the forum mentioning that this topic was demanded by forum members in the last meeting.

Reading material was given to teachers which included a brief history about mirrors and the nature and specific terms related to spherical mirrors to initiate the discussion.

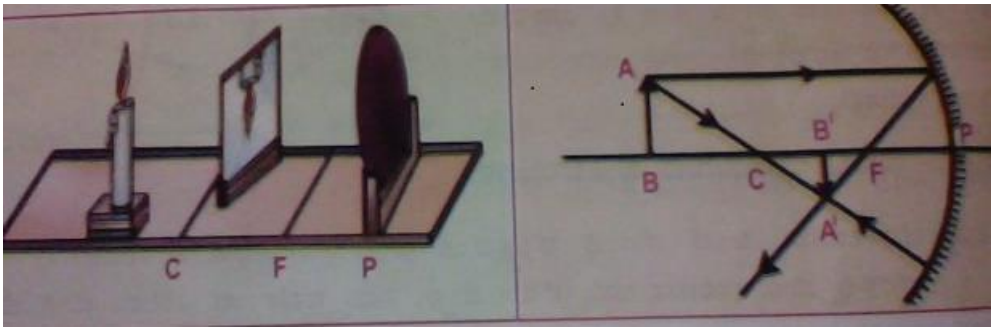
After this one of the teachers presented a summary of the reading materials with the help of diagrams and explanations. Then materials required for the experiment and the procedure list with observation sheet was provided to the participants. Instructions were given to conduct the experiments.

Process: Image formation by concave mirrors

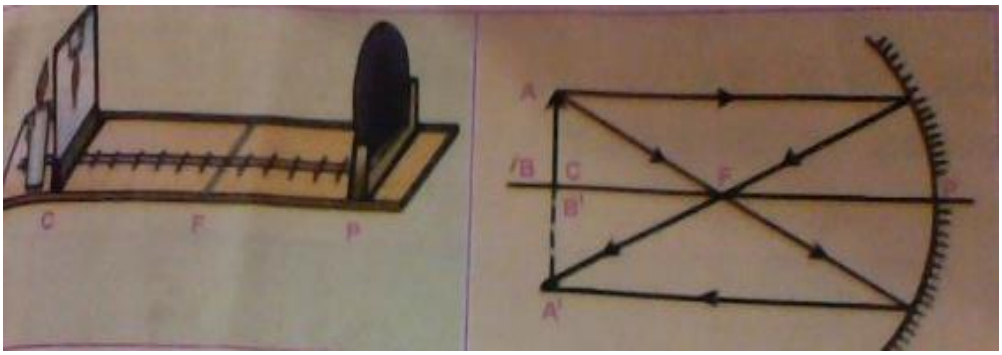
- Each group got a set of materials. (There were 4 groups.)
- Groups were instructed to mark the position of C, F and P with the help of the focal length of the mirror (given on cover) and the scale.
- For each experimental set up teachers were asked to mark P's to observe keenly and analyze the nature of the image as clear, diminished, inverted, same as the object, real or virtual and the specific location of the image formation at C, beyond C, in between C & F, in between F & P, etc.
- Groups were asked to perform experiments under the following conditions.

IMAGE FORMATION BY CONCAVE MIRRORS

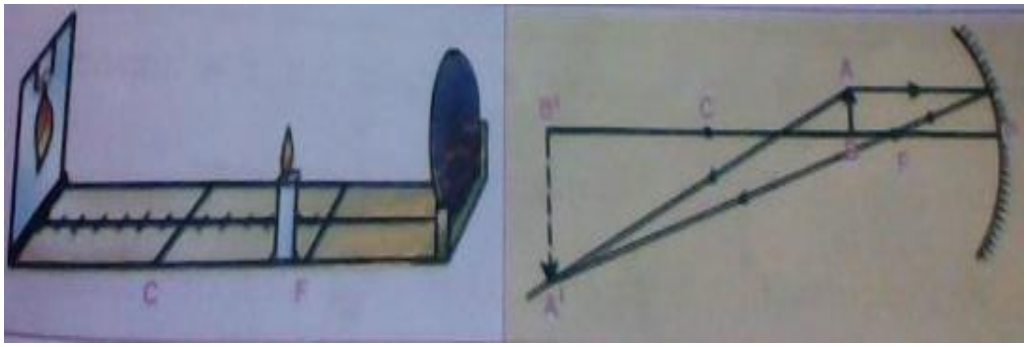
1. When object is placed far from the C, (C= 2f i.e. 2 times the distance of the focal length) (15 minutes)



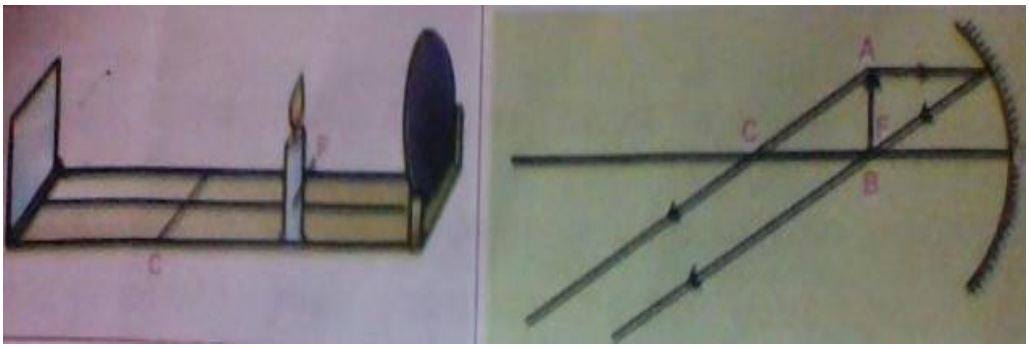
2. When the object is placed at C. (10 minutes)



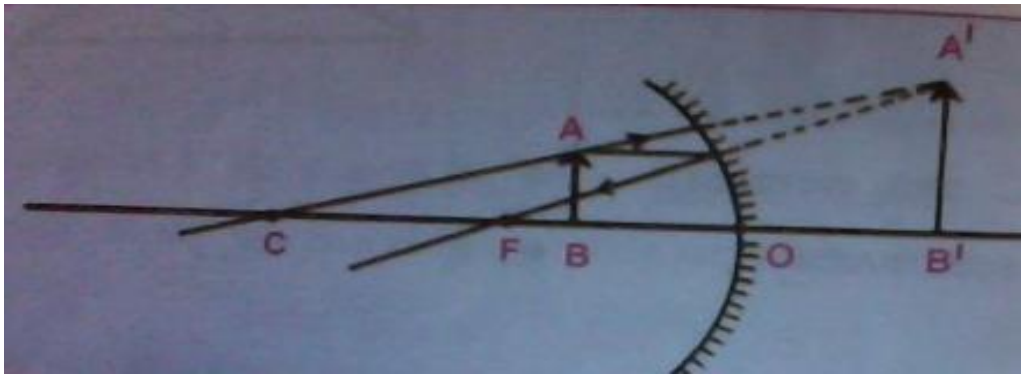
3. When the object is placed between C and F. (10 minutes)



4. When the object is placed at F. (10 minutes)



5. When the object is placed between F and P. (10 minutes)



- Each group presented the explanation about experimental facts after the completion of each condition. (15 minutes)
- The facilitator summarized the explanation about each condition from each presentation. If any stage was missed in the presentation, the facilitator pointed it out with the agreement of the group. (10 minutes)

Some participants were not aware about the reference line while conducting the experiments and the laws of reflection which are applicable to all reflecting surfaces. They did mark on cardboard the position of C, F and P and did arrange the materials according to the markings.

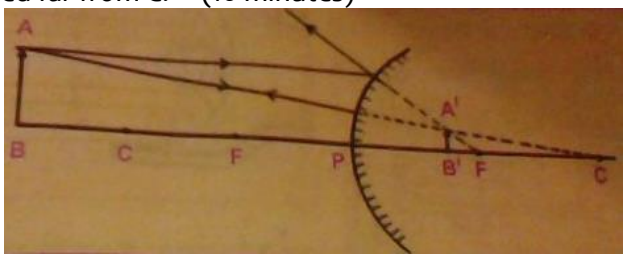
Observations can be summarized as follows:

Observations	**When the object is placed far from C**	**When the object is placed at C**	**When the object is placed between C and F**	**When the object is placed at F**	**When the object is placed between P and F**
Image formation point	Between C and F.	At C (beside C)	Beyond C	At infinity	Behind the mirror
Nature of the image	Real image	Real image	Real image	Real image	Virtual image
Size of the image as compared to the object	Image size is reduced	Size of the image is same as the object	Image size is larger than the object	Image size is larger than the object (highly enlarged)	Enlarged
Pattern of image formed as compared to the object	Inverted	Inverted	Inverted	Inverted	Erect

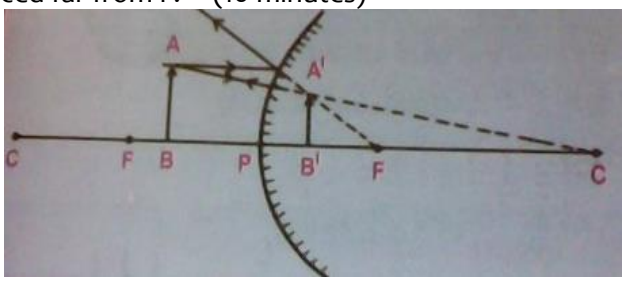
A similar experimental set up was also followed with convex mirrors.

IMAGE FORMATION BY CONVEX MIRRORS

1. Object is placed far from C. (10 minutes)



2. Object is placed far from F. (10 minutes)



Observations	When the object is placed far from C (at infinity)	When the object is placed between P and F (less than F)
Image formation point	At the focus F, behind the mirror	Between P and F Behind the mirror
Nature of the image	Virtual image	Virtual image
Size of the image as compared to the object	Image size is reduced	Diminished
Pattern of image formed as compared to the object	Erect	Erect

Conclusion

The nature, position and size of the image formed by a concave mirror depend on the position of the object in relation to points P, F and C. The image formed is real for some positions of the object. It is found to be a virtual image for a certain other position. The image is either magnified, reduced or has the same size, depending on the position of the object. Concave mirrors can produce real and virtual images. The uses of concave mirrors were also discussed by the teachers.

A convex mirror is sometimes referred to as a diverging mirror due to the fact that incident light originating from the same point will reflect off the mirror surface and diverge. After reflection, the light rays diverge; subsequently they will never intersect on the object side of the mirror. For this reason, convex mirrors produce virtual images that are located somewhere behind the mirror.

A demonstration on the usage of optical kits was also given at the end of the session which included experiments to show laws of reflection, diverging and converging rays through convex and concave mirrors respectively. Teachers also watched some light related videos while food was served.

Feedback from Teachers

Teachers expressed their happiness to perform such light related experiments for the first time in their lives. It helped them understand in practice spherical mirror images as opposed to just looking at ray diagrams. They said that it was useful to build their confidence regarding the subject matter and they added that most aspects related to spherical mirrors were now clear. They conveyed their appreciation towards Azim Premji Foundation for creating such a platform for teachers to build a better understanding on subject matter.

Science Voluntary Teacher Forum, TLC Gurmitkal

Place: Gurmitkal TLC

Total no. of teachers present: 9 HPS teachers

Facilitators: Pralhad, Anil Angadiki and Anand

Objectives

- To motivate primary school science teachers to make thorough preparations for classroom teaching
- To develop their understanding on physical and chemical properties of metals
- To provide an opportunity for teachers to gain hands-on experience.
- To develop the spirit of inquiry among teachers

Agenda

- Welcome address by Chandrakanth Reddy, TLC Coordinator (5 mins)
- Introduction of participant teachers (15 mins)
- Activity by Prahlad (2 hrs)
- Feedback (10Mins)
- Way Forward (15 mins)

Report

Chandrakanth Reddy welcomed teachers to TCL Gurmitkal and to the voluntary science teacher forum. Then Chandrakanth Reddy shared the objectives of the session/forum meeting and handed it over to Pralhad. Pralhad started the interaction by using the periodic table to introduce the concepts.

Activity 1

Materials used: Periodic table

Introduction of matter, types and its definition

Classification: elements, compounds and mixtures

Periodic Table: Brief information about metals, non-metals and metalloids

Activity 2

Insert 3-4 wax balls in series through a metal wire. Heat one end of the wire using a spirit lamp for some time and observe the changes.

Observation of teachers:
Wax balls are melting one by one.
Due to transfer of energy, heat is transferred from one end to the other end of the metal wire. As metal is a solid in which the atoms are packed tightly heat is transferred from one atom to another easily.

Anil Angadiki added that wax balls melt one by one because metals are good conductors of heat, and asked the question whether the same kind of observation can be seen in case of other solids like wooden stick, stone etc. where too atoms are tightly arranged as in the case of metals. The question triggered deep discussion among participants. Facilitators did not provide a ready answer but requested participants to experiment and understand why it may or may not happen. The discussion made the session come alive.

Activity 3
Take an LED (Light Emitting Diode) and observe its parts. Now connect either ends of the LED to a battery using a metal wire in between. Next connect graphite of a pencil in place of metal wire, then use a plastic straw in place of lead pencil. Observe the changes in each case and explain.

Observation by teachers:
Current passes through metal wire and graphite pencil but not through plastic straw.

Pralhad explained that metals are good conductors of electricity because the outer electrons in metal atoms are not held tightly by the nucleus and are responsible for conduction. Anil Angadiki added that the presence of free electrons in the case of metal atoms and graphite lead to the conduction of electrical energy from one end to the other. The metallic bond and the electron sea model were explained.

Activity 4
Take a piece of aluminum wire and strike it with the given hammer. Observe the change in the aluminum wire.

Observation of teachers:
Metal is flattened when struck with hammer.

Facilitator: Why does this happen with metal only, why not in the case of stone or solids like charcoal?

It was explained that aluminum when hammered turns into a broad surface or a plate like structure because metals are malleable in nature. It can also be converted into a wire because they are ductile in nature. Anil Angadiki explained in detail about the arrangement of atoms in case of metals and the reason for malleability and ductility, which is not there in the case of non-metals.

The teachers were interested in the chemical properties of metals and they requested the facilitator to explain the chemical reactions of metals.

Chemical Properties of Metals

Activity 1

Take a test tube with the test tube holder. Carefully transfer approximately 3 ml of dilute hydrochloric (HCl) acid into the test tube. Take a small piece of zinc metal and carefully drop it into the test tube containing HCl. Observe the changes. Can you observe the liberation of any gas? If so, which gas is that? How can you identify that?

Observation of teachers:

Confirmed the liberation of gas in the form of brisk bubbles.

Facilitator explained that the liberated gas is hydrogen. It can be tested by bringing a burning matchstick near the mouth of the test tube. If the gas catches fire and bursts with a puff sound it indicates that the liberated gas is hydrogen (as hydrogen is flammable). The explanation was supported by showing the chemical reaction:

$$Zn_{(s)} + 2HCl_{(aq)} \longrightarrow ZnCl_2 + H_{2(g)}$$

Teachers asked whether hydrogen gas is liberated with all metals and if the acid is in concentrated condition. Anil Angadiki asked teachers to test the queries by using different chemicals like dilute

sulphuric acid and copper. Then zinc was taken with concentrated sulfuric acid. The teachers realized that hydrogen is not liberated in these metallic reactions. Anil explained in detail to the teachers why the same kind of reaction does not take place with other metals.

Activity 2

Take a piece of magnesium foil. Heat it using a spirit lamp with the help of a pair of tongs. Observe the changes carefully. How can you explain this change?

Observation of teachers:

Teachers followed the instructions. They understood that magnesium becomes an oxide after combustion in the presence of oxygen in the air.

It was discussed that magnesium reacts in the presence of air and forms magnesium oxide, which is basic in nature. To test this, take magnesium oxide and dissolve it in water, then test the solution with red litmus paper. If the litmus paper turns from red to blue it indicates that the solution is basic in nature.

$$2Mg_{(s)} + O_{2\,(g)} \longrightarrow 2MgO_{(s)}$$

Activity 3

Take a piece of sodium metal. Transfer it into a test tube containing water. Observe the changes. Is the reaction fast or slow? Is there any liberation of gas? Which gas is that? How can you test that? Name the solution in the test tube after the reaction.

Observations of Teachers:

There is rigorous reaction of sodium metal with water. As a result of the reaction a hissing sound is emitted with the liberation of gas.

It was explained that sodium metal reacts with water rigorously. As a result of this reaction hydrogen gas is released. To test this if we bring a burning match stick near the mouth of the test tube, it catches fire indicating that the liberated gas is hydrogen. The solution which is present in the test tube is sodium hydroxide, a base. To test this if we immerse a red litmus paper into the solution it changes its color to blue indicating that the solution is a base. As sodium is highly reactive with gaseous or dissolved oxygen, it cannot be preserved in water or air, so it is preserved under kerosene.

Teachers discussed with the facilitator about the properties of metals and were satisfied with the experiments performed. During the feedback session, they expressed their satisfaction with the meeting as it was helpful in understanding many aspects of metals and their unique properties. They requested that more concepts be dealt with in the forthcoming meetings related to light, acids and bases.

The Way Forward

Voluntary forum interactions are proving to be an effective way to address the academic needs of teachers. The level of enthusiasm and interest shown by teachers in using their personal time for such discussions is very encouraging. Teachers are now coming forward to seek help in fulfilling their capacity building needs, thereby strengthening the bond and relationship of trust between teachers and the District Institute. In the long run, we can consider developing volunteer resource persons among teacher who can reach out to a much larger target group.

Towards a just, equitable, humane and sustainable society