Welcome!

Let Nilu and Pillu take you through the wonderful world of science, sitting right at home. They will show you how everyday things work, what lies inside your kitchen, inside you and around your home.

With this book, Physics, Chemistry and Biology will become your new favourite subjects, and you will have over 50 fun activities to do with your friends and family members. With each activity you do, make sure to check out the questions Nilu and Pillu want you to think about.

So let’s start and dive deep into the book of Aha!
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The educational crisis wrought by Covid-19 has focused global attention on the stupendous inequalities in access to learning. Millions of children with no access to technology have suffered an enormous learning loss. Every crisis, however, presents an opportunity. Agastya’s aptly titled ActiLearn 1.0 directly addresses the critical issue of a rapidly growing education deficit, by providing children an amazing and exceptional opportunity to learn joyously and actively, anywhere, any time, with or without technology.

Available in both an interactive physical and digital form, ActiLearn 1.0 provides children in Grades 6 to 8 an innovative child-centric mentor, a system of learning and improvement no matter their background. Ingeniously designed hands-on STEM to STEAM maker activities with story telling centered around key science themes adapted to the child’s context and environment help to foster critical self-learning, collaborative and peer-to-peer learning skills. Activities, with clearly stated learning objectives, range from simple to the more challenging and over 94% can be repeated. Learner-friendly cut-and-make templates help to promote children’s knowledge of science concepts and principles and build vital psychomotor, curiosity, observation, reflection, exploration and application skills. Children will learn to:

- **CREATE** self-apprenticeship and unforgettable learning experiences
- **DISCOVER** their calling and awaken their creative-active mind
- **BUILD** lifelong learning, confidence and social intelligence skills
- **EXPAND** hands-on knowledge and awareness of science in real life
- **INTEGRATE** knowledge across disciplines
- **LEARN** to collaborate, teach and mentor

ActiLearn 1.0 is an aesthetically organized and text-light, high-quality book designed in accordance with the NCERT curriculum on the experiential and joyful learning principles enunciated by NEP 2020. The Aha! Series intends further to eliminate hard separation and silos between art and science.

The simple gift of a magnetic compass to five year-old Albert Einstein revolutionized the world of Physics. Through its power to create Aah! Aha! and Ha-Ha! experiences Acti-learn 1.0 and its planned future versions, promise all children access to high quality, engaging and joyful learning.

Dr. Raghunath Mashelkar, FRS
Padmavibhushan and
Former Director General, CSIR
The human body is the physical structure of a human being. It is composed of many different types of cells that together create tissues and subsequently organ systems. It is a remarkable biological machine with many systems working together to allow for life, movement, cognitive function, growth, repair, reproduction and so much more. These systems include the central nervous system, the circulatory system, the respiratory system, the digestive system, the immune system, the reproductive system, the skeletal structure, the excretory system, and the musculature. The human body is made to stand erect, walk on two feet, use the arms to carry and lift, and has opposable thumbs (able to grasp).

Throughout this module, we will try to make our own models of various organs, test their functions, and try to learn more about our wonderful bodies with Nilu and Piliu!
Create a Skeleton!

Instructions for the activity

1. Cut the template provided on this page.
2. Stick the template on the cardboard or drawing sheet.
3. Cut the cardboard according to the outline of the template.
4. Arrange skeletal systems in their respective places.

Note: Many bones are too small and deep inside our skin, which you won’t be able to feel with your hands.

What do you think is the use of the skeletal system?

| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |

Can you think of any 5 examples of animals that don’t have vertebrae?

| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |
| ______________________________________________________________________________________________________________________________________________ |

Now that you have felt the bones in different parts of your body, let us try to feel the backbone. Call a family member and try to feel their backbone.

How did the bones feel in different places? What were the different shapes and sizes you could feel?

<table>
<thead>
<tr>
<th>Rib cage</th>
<th>Hand</th>
<th>Backbone</th>
<th>Fingers</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
<td>__________</td>
</tr>
</tbody>
</table>
Our eyes have the ability to continue seeing the image of an object, for a very short time, after the object has disappeared. This is called the persistence of vision.

Some of Nilu’s friends wear spectacles because they help them see. She has always been curious about why she doesn’t need specs while her friends and even her mom do!

Nilu often wonders about what is inside her eye. She has tried to look at it closely in the mirror so many times, but always seems to miss something. She has also seen some people with different eye colours and really wants to know why that happens?

Today we will try to make a model of the eye to help us understand its various parts.

Can you now look at your eye in the mirror and write the names of the parts that you see?

Do you think you understand your eye better after making this model? What things about your eyes surprise you the most?

Instructions for the activity

1. Cut along the solid lines and separate the parts.
2. Fold along the dotted line in the given strip.
3. Cut open the inner part seen inside the eye and remove it.
4. Cut open the slits found beside the eye with the help of a scale.
5. Fold the strip and tape along the edges as shown.
6. Pass along the strip through the slits as shown.
7. Place the strip in position and the model is complete.

Did you know?

Our eyes have the ability to continue seeing the image of an object, for a very short time, after the object has disappeared.

What’s inside your eyes?
Today in class, Nilu learned that breathing is one of the most essential functions of her body and is what keeps her alive. As always, Nilu is curious about how this happens in her body. She wonders what organs of her body take part in this life-giving process. So, let us understand how our respiratory system (the organs used for breathing) works!

Instructions for the activity

1. Cut all the outlines in the activity sheets and collect the different pieces.
2. Using a cutter, cut only the yellow solid line which is present on the boy’s head.
3. Similarly, also cut the solid line which is present below the lungs.
4. In those cuts, insert the “Breathe out – Breathe in” strip.
5. Attach rib cages for it from the two solid lines present at both sides of the lungs.
6. Pull the strip from EeloZ and it will show how the diaphragm works.

Do you now understand how your lungs work? What do you think is the role of the diaphragm in this process?

You have built a simple model of how inhalation and exhalation happen. Now to see how our chest moves when we inhale and exhale, sit on the floor and place your hands as shown in the picture.

How did your hands move when you inhale? How did your hands move when you exhale? Is the movement of your chest the same during inhalation and exhalation?

Now take deep breaths, inhale deeply and exhale deeply and observe how your hands move.
Pillu learned about the breathing rate today. He knows that it is the number of breaths that a person can take in a minute.

He learned that the average breath rate of a human is between 12 to 16 breaths per minute. He is very excited to learn what his breath rate is? Let us find out ours as well, with him.

How did you feel when you held your nose and tried to stop breathing? Why are we unable to hold our breath for more than a few minutes? What goes in and out of our bodies when we breathe?

### Instructions for the activity

1. Hold your nose with your fingers. Now hold your breath for as long as possible.

2. Ask a family member to record the time for which you were able to hold your breath.

3. Ask your family members to do this activity as well and see who can hold their breath for the longest time.

### Safety precautions -
If anyone feels weakness or has asthma or difficulty in breathing, please do not perform this activity. Ask someone else to do it and you can observe.

### Activity – Rate of breathing after work

1. You need help from one of your family members, ask him or her to partner with you in doing this activity.

2. You need to count the number of breaths per minute. Sit down comfortably and ask your partner to set one minute on a watch/mobile. Now breathe normally, count the number of breaths and record it on the table.

3. Do this experiment three times and take the average of the three readings to get the number of breaths per minute.

4. Now do some exercise for two to three minutes like jumping, jogging, etc. and then count your breaths for one minute and record your observations in the table.

5. Repeat this activity for your family members too.

6. Check if the observations are consistent and uniform.

<table>
<thead>
<tr>
<th>Trial</th>
<th>No. of breaths at rest (sitting still)</th>
<th>No. of breaths immediately after performing the exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Are there any changes in the number of breaths before and after exercising? Was this conclusion the same for all your family members who did the experiment? From this activity, can you guess what happens to our breath when we sleep at night?
Yesterday, Nilu saw this image in a magazine and was confused by it. Do you see it too?

The dots seem to be fluctuating in black and white. She wondered how this is possible. This image is an example of an optical illusion. Sometimes, the images that we see are received by our brains differently. These are known as optical illusions. Illusions use light, patterns, and colour to create images that trick your brain.

Can you guess why the above image can be considered an optical illusion? Do you see a rabbit or a duck or something entirely new?

What did you see? Can you think of why you are seeing a hole in your palm? Do the activity with other people and ask them if they see it too!

Let us make an optical illusion with Pillu, on our own!

Is there a hole in your hand? Instructions for the activity

1. Take one A4 size piece of paper and roll it up into a tube.
2. Hold the tube close to the right eye (As shown in the picture) with your right hand and look at a distant object like any picture hung on the wall or a tree.
3. Now hold the palm of your left hand about two fingers away from your left eye touching the pipe and blocking the view.
Nilu’s teacher said that Nilu is intelligent, in front of the whole class. She was really happy, but also started to wonder where does the intelligence come from? Where does she know the answers to her homework from? Most importantly, where do these questions come from?

Let us find out with an interesting activity!

Our Brain

Can you find out the different functions of the parts of our brain? Can you explain the importance of the brain? Did this activity help you in understanding why so much importance is given to wearing helmets while driving?

Instructions for the activity

1. Take the activity template (NOTE: The cutout template is attached later and consists of 2 pages.) and cut around its outside edges.
2. Cut on the dashed lines, there will be 8 lines throughout the sheet.
3. Pull the dashed line to meet the solid lines and glue or tape in place.
4. Repeat the same (Steps 1 - 3) for the second sheet.
5. Attach the two parts and stick them with the help of tape.
6. While wearing the cap, the frontal lobe should come to the front and occipital lobe should go to the backside and the temporal lobes should be on the two sides.
How Do We Move?

Pillu loves to play so many sports like football, cricket, badminton and others too. What sports do you like to play with your friends?

He uses his feet to kick the ball high up in the sky and his arms to swing the bat for a sixer! Today, when he read about body movements, he wanted to learn more about each of the parts in his body that can move. Let us observe and learn with him!

Instructions for the activity

1. Copy the following table in your book.
2. Different movements are mentioned in the table. Identify the body parts with movements as mentioned below.

<table>
<thead>
<tr>
<th>Movement</th>
<th>Name the body parts which can make this movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotate completely</td>
<td>Example- Shoulder (bowling)</td>
</tr>
<tr>
<td>Rotate partially</td>
<td></td>
</tr>
<tr>
<td>Bends forward</td>
<td></td>
</tr>
<tr>
<td>Bends backward</td>
<td></td>
</tr>
<tr>
<td>Bends forward and backward</td>
<td></td>
</tr>
<tr>
<td>Bends sideways</td>
<td></td>
</tr>
<tr>
<td>Does not move at all</td>
<td></td>
</tr>
</tbody>
</table>

Why is it that we are able to move a few parts of our body easily in various directions and some only in one direction? Have you seen someone move their body in ways very different to yours? If given a choice, which new body movement/s would you want in your body?
Nilu learned in her class today that everyone has 5 different senses - sight, sound, touch, smell, and taste. She came home and wanted to have some fun with these senses.

So, she decided to test her family members' senses. Let us try this activity with her too!

Materials required
A scale, copper wire, cloth to use as a blindfold

Instructions for the activity
1. Take the copper wire and twist it into a U shape.
2. Then select any of your body parts, like fingertips, back of the neck, forearm, thighs, etc.
3. Adjust the U-shaped copper wire edge up to 2 cm with help of scale.
4. Blindfold one of your family members, then keep the copper wire on different parts of their body.
5. Ask the person, how many edges they feel, and note their answer.
6. Repeat the same activity by decreasing the length between two edges of copper wire.

Can you imagine how it would be to live without any of your senses? Think of the times you had a cold and could not taste the food you eat. Have you heard of the ‘6th sense’? Do you think you have some other sense than the five mentioned in your books?
Instructions for the activity

1. Make a list of any 10 items you ate today and yesterday.
2. List those 10 food items in the table below and start with the main ingredients of those foods, also try to find out their sources.
3. Also include in the list, the food items which are made in your home on the important festivals.

Pillu recently went to some fields near his home and he learned about farmers practices. He wanted to understand more about where his food comes from.

Let us do an activity with Pillu to understand the sources of what we eat!

### Instructions for the activity

<table>
<thead>
<tr>
<th>S.no.</th>
<th>Name of the Food Item</th>
<th>Ingredient</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Roti</td>
<td>Atta, water</td>
<td>Wheat grains, Water, Salt</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Plant</th>
<th>Animal</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat grains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atta, water</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food made on Festivals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

What are the common ingredients used to cook in your house? What is the most common source of these ingredients? Ask any elder in your family why some particular foods are made at particular festivals?
SMALL CHILD SIZE

RIGHT SIDE

1) Cut around the outside edge.
2) Cut on the solid lines (the ones the arrows are pointing to).
3) Tuck the flaps under until the dashed line meets the solid line, and glue or tape in place.

OPTIONAL:
(not required)
Add a cerebellum if you want to.
1) Cut out CEREBELLUM.
2) Tape onto the inside of the hat, as shown.
SMALL CHILD SIZE

LEFT SIDE

1) Cut around the outside edge.
2) Cut on the solid lines (the line that the arrows are pointing to).
3) Tuck the flaps under until the dashed line meets the solid line, and glue or tape in place.

OPTIONAL: (not required)
Add a cerebellum if you want to.
1) Cut out CEREBELLUM.
2) Tape onto the inside of the hat, as shown.
Did you notice any changes in your body while you are growing? Have you grown taller in the last 2 years? Why do green leaves turn yellow? Can we get the green leaves back from the yellow ones? Have you ever made a paper boat? After making the boat sail in the water, can you get the paper back to its original form? After cooking, can we get back raw food materials to their original form? Have you ever played with ice cubes? How are ice cubes made?

With this module, we will have fun with everyday chemistry and you will see how much you can learn right at home!
Let’s Bring about Some Changes!

Nili read about physical changes in class today and immediately thought of so many examples. There are so many materials she uses in a day and she does many activities like boiling, cooking, drying, etc.

Let’s do some of these activities with her and see if they can be called physical changes! Along the way, we will also learn the meaning of physical changes.

Materials required
- Paper, cutter, knife, a fruit and a vegetable

Instructions for the activity
1. Take a piece of paper and make a aeroplane out of it.
2. While making the aeroplane, remember the steps you follow.
3. Once you have finished making the plane, take a picture of it.
4. Now unfold it and try getting back the paper into its original form.

What changes, folds etc. did you make to the paper while creating the aeroplane? Could you get the paper back to its original state by unfolding the plane?

List out the properties of the paper which remain the same after making the plane. Similarly, list out the properties which have changed in the paper before and after making the boat.

Caution: Adult supervision might be required.

Chop Chop!
Instructions for the activity
1. With your parent’s permission, take any one fruit and one vegetable.
2. Cut the vegetable or fruit into small pieces and keep them on separate plates. If you are using a lemon, keep the lemon pieces for further activities.

List out the properties (like taste, smell, colour, etc.) of the fruit and the vegetable which are the same before and after cutting the fruit and vegetable. Similarly, list out the properties which are different before and after cutting the fruit and vegetable. Compare the 2 activities on this page. Are the changes similar in both cases? Do you understand what physical changes mean?

What vegetable and fruit did you choose for the activity? How many pieces did you cut them into?

What vegetable and fruit did you choose for the activity? How many pieces did you cut them into?

List out the properties (like taste, smell, colour, etc.) of the fruit and the vegetable which are the same before and after cutting the fruit and vegetable. Similarly, list out the properties which are different before and after cutting the fruit and vegetable. Compare the 2 activities on this page. Are the changes similar in both cases? Do you understand what physical changes mean?
Visiting the Different States of Water

It’s summer season and Nilu loves to put ice in her water to make it cool. For this, she also has to fill up the ice tray and put it in the freezer to make ice.

We learned about physical changes in the last activity. Let us try to find more examples of those with Nilu!

Materials required
Candle and ice

Instructions for the activity
1. Take a candle, light it up and observe how it burns for 2-3 minutes.
2. Have you seen ice cubes? If you have a refrigerator, prepare some ice cubes (or you can borrow them from your neighbor).
3. Put them on a plate and keep them outside for a few minutes, and observe the changes carefully.

Also try!
Label a glass of water ‘A’. Mix 1 tablespoon of sugar and 1 tablespoon of salt in this glass for 2 to 3 minutes. Take another glass of water and label it as ‘B’. Keep both the glasses side-by-side and compare them.

What did you observe when the candle was burning? What is a candle made of? What happened to the wax while the candle was burning? Can you get the wax back to its original form? Are the properties of the wax same, before and after burning the candle?

How do you make ice? What happened to the ice cubes when they were placed outside? Can you make ice cubes again from the water you got? Are the properties of water before and after making ice cubes the same?

What are the similarities and differences between both glasses? Can you see the added sugar and salt in the water? If not, what happened to it? Can you get it back from the glass of water? Ask your family members if they can help you with the answer.
Pillu loves eating. He is always in awe of his mother, who spends almost all her day in the kitchen, preparing food for his family. But Pillu doesn’t know how to cook anything.

Today, with Pillu, we will visit the kitchen and learn a few things about chemistry!

Every day, there is so much food cooked in your kitchen. Try to make a list of everything that is prepared in your kitchen in a day. Select 1 dish and observe how it is cooked from beginning to end.

What raw materials were used in preparing the dish? What was done with each raw material? What was the final dish?

Do you think you can get the raw materials back from the dish?

Instructions for the activity

1. Ask any family member to give you a handful of chapathi dough.

2. Take the dough and make as many shapes as possible with it. Observe the shapes and answer the following questions.

**Note:** Keep the dough for further activities.

Ask any family member to make a chapathi for you. Observe the process from start to end.

What are the similarities between the dough and the chapathi? What are the differences between the two? Can we get raw dough back from chapathi?

How many shapes did you make? Were they all the same size? Is the dough same before and after making the shapes? What properties of the dough changed before and after making shapes?

Can you get the dough back to the original form your family member gave to you?
Nilu has always loved her art class because she can work with so many colours. Today, we will be looking at colour in fruits, vegetables, and other objects.

Let us go back into the kitchen with Nilu for some fun with colours!

### Instructions for the activity

1. Collect an apple, brinjal, a potato, and a banana.
2. Cut each item into small pieces and note its colour. (You can take photos for comparison if required)
3. Place the pieces in plates and expose them to open air for about one hour.
4. Take a nail if available and drop it in water.
5. Keep the nail in water for one to two days. Take it out, wipe off the nail and observe carefully.
6. Note down your observations in the following table
7. Based on your observations, answer the following questions.

<table>
<thead>
<tr>
<th>Material</th>
<th>Original Colour</th>
<th>Colour after exposure to air/water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brinjal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron nail</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What was the original colour of the apple, brinjal, banana and nail? Why do you think the colour changed after exposure to water/air? Do you think this change happens in all vegetables/fruits? Why?

Can you think of any ways to prevent this colour change in fruits and vegetables?
Today in class, Nilu’s teacher asked her a few questions. Can you answer them?

Why are soaps so slippery when you try to catch/hold them? Have you seen your mother cleaning copper utensils using tamarind or lemon? Have you seen advertisements for Eno or Gelusil?

Can you connect all the above questions and figure out the topic we are going to explore with this activity?

Materials required
Lemon, orange, tamarind, vinegar, bottle gourd, bitter gourd, coriander, salt, baking soda

Instructions for the activity
1. Collect the required materials.
2. Taste the items you collected and record your observations in the table below. If you are not able to collect all the items, recollect the tastes you might have experienced earlier.
3. Keep all the materials you collected for further activities.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Taste (sour/bitter/salty/any other taste)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon</td>
<td></td>
</tr>
<tr>
<td>Coriander</td>
<td></td>
</tr>
<tr>
<td>Vinegar</td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td></td>
</tr>
<tr>
<td>Tamarind</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td></td>
</tr>
<tr>
<td>Bitter gourd</td>
<td></td>
</tr>
<tr>
<td>Bottle gourd</td>
<td></td>
</tr>
<tr>
<td>Common salt</td>
<td></td>
</tr>
<tr>
<td>Baking soda</td>
<td></td>
</tr>
</tbody>
</table>

Can you categorize the items you tasted into sour and bitter categories? What do you call the items which are generally sour? What do you call the items which are generally bitter to taste? Name any 5 acids. Name any 5 bases.

Were you able to identify the acidic and basic items by taste? What properties of acids and bases did you discover from this activity?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Turmeric indicators

Instructions for the activity

1. Take two tablespoons of turmeric powder and mix with water in a bowl so as to get a turmeric paste.
2. Apply this turmeric paste on the white paper of your notebook. Allow it to dry and cut it into strips (2 cm width and 7 cm long).

The turmeric indicator strips are ready as well!

From the previous activity, we learned how to identify acids and bases by tasting. But not everything can be tasted to test if it is acidic or basic.

So, in this activity, we will learn how to find out whether something is acidic or basic, using indicators. An indicator is a substance that changes colours when an acid or base is added to it. Now, let us collect some materials and test them out with Pillu!

Materials required
Hibiscus flower, turmeric powder, white papers, bowl, water, and some substances to test: milk, tea, coffee, soap, detergent powder, curd, baking soda, lemon juice. (Refer to the table on the next page)

Instructions for the activity
1. Collect the petals of a Hibiscus flower.
2. Take a white paper from your notebook and rub the Hibiscus petals on the paper. Rub slowly to get as much colour as you can.
3. The paper may become wet; allow it to dry for a few minutes.
4. Cut the paper into small strips (2 cm width and 7 cm long).

Your Hibiscus indicator strips are ready!
Let’s do the final testing!

1. Take some lemon juice, baking soda, soap, milk, tea, coffee, honey, etc. in separate cups/bowls. You can also use the materials you used in the earlier activity of acids and bases.

2. Dip one hibiscus and one turmeric indicator strip in each of the above bowls. NOTE: Dip each strip in a different bowl for the best results!

3. Observe their changing colours.

Remember to clean the table or floor after your experiment. If not, you may attract ants or insects there.

Note down the changes that you have observed with each material, and also add more substances according to your choice.

<table>
<thead>
<tr>
<th>S.no.</th>
<th>Substance</th>
<th>Hibiscus indicator</th>
<th>Turmeric Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Original Colour</td>
<td>Colour change observed</td>
</tr>
<tr>
<td>1</td>
<td>Lemon juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tamarind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Soap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Tea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Baking soda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Honey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Orange juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Cold drink</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Can you see any trends or patterns in your observation table? Can you guess the reason for the colour change?

Categorize the above substances into acids and bases based on your knowledge.
What did you learn from this activity? Did you know all the pH values before doing the activity or did you have to look in your book or did you consult someone? Did this scale help you understand the acidity and alkalinity (basicity) of various materials?
Diffusion

Pili’s mom is making coffee in the kitchen and he can smell it all the way from his room. The same thing happens when his mom lights up the agarbatti for prayer. He finds it so interesting how his nose can smell things from so far away. This happens because of a process called diffusion. Let us find out more about how this happens with an activity!

Instructions for the activity

NOTE: Adult supervision might be required.

1. Light an incense stick (agarbathi) and keep it in the corner of a room.
2. Sit in the opposite corner of the room and try to smell the aroma of the incense stick.

Materials required
Glass or plastic transparent tumblers, ink or food colour, and water.

Instructions for the activity

1. Take a transparent glass/plastic tumbler and fill three-fourths of it with water.
2. Add 2 to 3 drops of ink/ Ujala or food colour from the top without disturbing the glass of water.
3. Observe what happens to the colour and water carefully.

Were you able to smell the incense stick sitting in the opposite corner of the room? How do you think the aroma of the incense stick traveled to you? Does this also happen with perfumes and other substances? Sometimes, you identify things through their smell like coffee, ripened mangoes, mint leaves, etc. Can you think of why and how this process takes place?

How did the colour enter the water? Do you think changing the temperature will make a difference to this process? Do you think the spread of colour in water and spread of smell in air happens in the same way?
We just observed how diffusion takes place in air and water. Now, let us make a flipbook to understand how this process happens in the air and also explain it to others easily!

Did you know? A flipbook is a paper book with drawings that look like they move when flipped back quickly.

Materials Required
Rubber band, a colour crayon/ pencil/ pen, paper, and scissors.

Instructions for the activity
1. Cut the outline of the template (provided at the end of the theme).
2. Colour the empty bubbles with any single colour as shown in the figure.
3. Cut the parts of the individual rectangle and arrange as per numbers.
4. Fix a rubber band at one end.
5. Now flip the pages.

How would you define diffusion after making this flipbook? You can try to make your own flipbook showing the spread of colour in water from the previous activity! Show this flipbook to your family and friends and explain the process of diffusion to them.
Diffusion Flipbook
Living beings have to perform several basic activities to be alive. We call such activities 'life processes'. The energy for these processes comes from food. We need energy for other activities like playing, singing, reading, writing, thinking, jumping, cycling and running. Energy is thus our capacity to do work.

Energy should be transferred to an object in order to move it. Transferring energy can be in the form of force. A push or a pull on an object is called a force. We can say that the motion is due to the action of a force used on objects. With this module, you will develop an understanding of these three physical quantities, while also doing some fun projects of your own!
Today, Nilu learned about friction. Friction is a force that acts between two objects that are in contact with one another. It slows or stops movement between the two surfaces that are touching. Friction almost acts like magic in some of its applications. For example, it allows us to skate on ice. Let us try one of them with Nilu!

Let's play with friction!

Materials required
Bottle, a thick stick/pencil, sand to fill the bottle. Alternatively, you can also use rice or wheat grains to fill up the bottle.

Instructions for the activity
1. Fill up a plastic bottle to the top with sand. Optional: You can use a funnel for easier filling.
2. Make sure you fill the bottle all the way to the top. Press on the sand to compact it tightly.
3. Insert the blunt end of the stick or pencil into the sand and press it to the bottom.
4. Lift the stick to test whether the bottle comes along with it. It will become increasingly difficult to push the pencil down.
5. Eventually, you won't be able to pull the pencil out and you can lift the bottle and the sand together with it.
6. Try using different types of grains and see what happens.
7. Try inserting it from different angles or shake the bottle a little. What is the easiest way to make the stick tightly fit into the sand?

Did you try using different materials to fill the bottle? What effect does pressing the sand have on the material? Why do you think you can pick up the whole bottle with a single pencil in the end? Can you think of other uses of friction in our daily life?
Materials required
A sheet of paper, scissors, pencil, ruler, books, or a box.

Instructions
1. Draw a rectangle that is 15 cm by 4.5 cm on a piece of paper.
2. Cut around the perimeter of the rectangle.
3. Then cut the DOTTED LINES inside the rectangle.
4. Make mountain folds on the dark lines.
5. Fold the head and tail upwards (opposite to leg direction).
6. Curl the tail and fold the head.

Try to make the horse walk on different surfaces, with different slopes. How did the horse move on the smooth surface? How did it move on a rough surface? If we increase the height of the slope, what happens to the movement of the horse?

Why does the horse move/ walk as it does? If you increase the length of the ramp/ incline what changes will you observe? What will happen if you use any other materials/different kinds of paper to make the horse? Can you think of real-life applications of friction?

Can you walk your horse?

Nilu saw some horses on the road in front of her home, the other day. She was fascinated by the constant cluck cluck while the horses moved so gracefully. Then, she remembered how her friend Rita fell while walking the other day and everyone helped her get up. She wondered if horses also fall sometimes.

Suggestions:
If you can’t get your horse to walk:
1. Make sure that the legs are nice and straight.
2. Try adjusting the height of the head.
3. Adjust the height of your slope.
4. If your horse is not rocking back and forth smoothly, try trimming the feet to make them rounded. The outside edge should be the highest point.
Every time an aeroplane zooms by outside her window, Nilu gets excited and goes to the window to greet it. Since she was small, Nilu has been fascinated by how aeroplanes fly. They are so big, even bigger than her! She often wonders about what helps them fly...

Let us find out with her how planes fly and make a ring aeroplane with her!

**Materials required**
- A4 sheet, straw pipe, scissor, tape.

**Instructions for the activity**
1. Carefully cut 2 strips of card to the sizes mentioned in the table beside.
2. Put pieces of sticky tape on one end of the strip. Roll it over to make a loop of the strip.
3. Lay a piece of tape on the table, sticky side up. Stick the straw onto the middle of the tape. Push the wing onto the tape and secure it carefully.
4. Centre both wings on the straw carefully.
5. Hold the middle of the straw and throw horizontally and gently.
6. Try with different lengths of strips.

<table>
<thead>
<tr>
<th>Small Wing Length</th>
<th>Big Wing Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>25cm</td>
<td>25cm</td>
</tr>
<tr>
<td>20cm</td>
<td>25cm</td>
</tr>
<tr>
<td>15cm</td>
<td>25cm</td>
</tr>
<tr>
<td>10cm</td>
<td>25cm</td>
</tr>
</tbody>
</table>

Does the placement of the loops on the straw affect its flight distance? Do more loops help the glider to fly better? Can the plane fly both ways - with the larger loop at the front or at the back? What if the loops were converted to a triangle or square?
Balancing Bird

Did you observe the stones as shown in adjacent pictures? Why do you think it hasn’t fallen?
One of Nilu’s favourite games is hopping on one leg and it is so hard for her to do.

In this activity, we will understand the center of gravity of irregular shapes, which might help Nilu and you to figure out how to balance your whole body on one leg.

What will happen if you add some weight to the bird template? Were you able to conclude that the center of gravity of the bird will be on the edge of its beak? How do you think people walk on a tightrope without falling?

An object’s center of gravity is the point where the weight is even on all sides. For an evenly shaped object, like a ball or ruler, the center of gravity would be in the middle of the object. What have you learned about the center of gravity of irregularly shaped objects? What do you think will be the center of gravity of your body?

Materials required
Template, Scissors, Glue.

Instructions for the activity
1. Cut the outline of the template provided. You will get two pieces.
   NOTE: The template has been provided at the end of this theme and has to be cut out from there.
2. In the template, there will be 2 types of lines - a dotted and a semi-dotted line.
3. In the template, where there is a dotted line make a mountain fold. In case there is a semi-dotted line, make a valley fold. (Example: the body of the bird will have a dotted line so it will require mountain folds, on the beak, will be the valley folds, etc.)
4. Stick the head to the body on the top of the white part with glue.
5. Now try to balance the bird with your pen.
Nilu learned about potential and kinetic energy in her physics class today.

Kinetic energy is the energy an object has due to its motion. Potential energy is the stored energy an object has because of its position or state.

In this activity, we will learn about different types of energy with simple things found around our home!

Materials required
Rubber bands and metal springs.

Instructions for the activity
1. Stand right in front of a wall at a short distance.
2. Take a rubber band and stretch the rubber band between your right-hand thumb and left-hand index finger.
3. Now release your index finger. Observe what happens to the rubber band.
4. Now take a spring and keep it on the ground.
5. Use your index finger to apply some force. Observe what happens.
6. Release the finger and observe the spring now.

What did you feel on your finger when you released the rubber band? What happened to the rubberband after it left your finger? What did you feel on your finger when you pressed the spring with the bottom of your thumb?

Can you say that potential energy was released when the rubber band was released?
Materials required
Scale (30 cm), 2 paper cups, coins/marbles, eraser/pencils

Instructions for the activity
1. Place the middle of the scale on the pencil.
2. Put 5 coins in the left paper cup.
3. Put some coins in the right cup, till it balances with the left cup.
4. Try the 3 positions shown in the diagrams beside.
5. You can also try different positions of the pencil under the scale.

In the first case, how many coins are added to the right-side cup, to raise the left-side cup? How many coins were used to balance the cups in the second case? Third case? Did you try other positions of the pencil?

What did you understand about balance from this activity? Also, what do you conclude about levers, fulcrums, and effort after trying to balance the cups?

———

Pillu loves to play on the seesaw in the parks. His teacher in physics class talked about levers and force today.

Have you observed how a scissors cuts paper? Have you used a stapler?

This activity will help us understand levers and their mechanics.
Like you, Nilu also loves to go cycling with her friends every evening. One day, she observed that cycling down a sloping road is so much easier than cycling on a flat road. What could be the reason for this? Nilu has also always been fascinated by rollercoasters in various carnivals around her town. Today, we will build a rollercoaster with her, and see what sloping roads and roller coasters have in common!

Materials required:
Provided template (at the end of theme), a small marble, paper clips and/or glue, and cardboard (optional).

Instructions for the activity
1. Cut the outline of the template. You will get four cutouts of roller coaster tracks.
2. If you have cardboard, stick each track on a piece of cardboard and cut it to size.
3. Gently fold the dotted lines.
4. Now place the second track on top of the first track, in such a way that the paper clip visuals coincide. The tracks can be fixed with paper clips or glue.
5. Similarly, fix the third track to the second track.
6. Finally, fix the fourth track.
7. Place the entire setup on the ground.
8. Place an eraser under the first track to create inclination (Measure the distance of the track from the ground).
9. Now put a marble at the starting point.
10. Using a stopwatch on your mobile phone, measure the time taken for the marble to reach the end of the track.
11. Now increase the height of the roller coaster by moving the eraser forward by 2 cm. Repeat the same experiment with different heights.

1. Maximum potential energy at start of ride.
2. Maximum kinetic energy just as car passes through bottom of a loop.
3. Each loop is slightly lower than the previous one because the car loses energy as it goes.
4. Centripetal force provided by track pushing against the car allows it to “loop the loop.”
5. Car has less energy at the end of the ride than at the start due to friction and air resistance.

<table>
<thead>
<tr>
<th>Trial no.</th>
<th>Eraser placement (in cm)</th>
<th>Time taken for the marble to reach the end of the track.</th>
<th>The total distance of the track (same for all trials)</th>
<th>Speed $s = \frac{d}{t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
One of Nili’s favorite festivals is Diwali and she loves to see crackers in her neighborhood. She remembers that the bhuchakra she used to love would move round and round as soon as she would light it.

In this activity, we will make an aeolian top with Nili, and also learn about how it applies Newton’s third law!

**Aeolian Top**

**Materials required**
Provided: template, cutter, thumb pins or oil pins, and a straw pipe.

**Instructions for the activity**
1. Cut the outline of the template.
2. Cut on the dotted lines.
3. Fold the cut parts upwards.
4. Fix a thumb pin with its lower end as shown in the diagram.
5. Take a straw and place the straw on the thumb pin.
6. Blow air into the straw and observe.

What happened when you blew air at the top?
Which direction did the Aeolian top move in?

What changes in the movement if you blow harder in the straw?
What happens to the motion if you close the slits on the top?

Did your top move in the direction as shown in the diagram? Can you try to change the direction of the movement?

**Try this!**
Blow up a balloon and release it without tying it up. Observe the motion of the balloon.
Balancing Bird

1. Cut along the thick lines.  
2. Fold 1 downwards along the dotted lines and upwards along the dashed line.  
3. Tuck in and paste the edges of the wings.  
4. Fold 2 downwards along the dotted line. Paste it onto 1.

**HOW TO PLAY**

Place the bird’s beak at the tip of your finger and balance it.

**To parents**

If your child has difficulty balancing the bird, adjust the angle of its beak.

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Find more worksheets at www.education.com/worksheets.
Light is a form of energy and travels as a particle and a wave. Humans see light in seven different colours: Violet, Indigo, Blue, Green, Yellow, Orange, and Red (VIBGYOR). You must have seen this full range of colours in a rainbow.

A shadow is created when light is blocked by an object. The object can block all or part of the light. Shadows are our forever companions. They vary in size depending on the distance between the object and light source.

In this module, we will have fun with shadows and experiment with light to learn about these topics!
Traveling light

Have you seen light from your window in the morning? Have you wondered why you cannot see a person from behind a wall? Have you seen light coming through the gaps in windows? With this activity, we will explore how light travels and try to answer these questions at the end!

Materials required
3 empty match boxes, match sticks and a candle.

Instructions for the activity
1. Take three empty matchboxes and take out their inner boxes.
2. Make a hole in each inner box. The position and size of the hole should be the same in all the boxes. Then arrange them as shown in the figure.
3. Use the outer boxes to make the three inner boxes stand.
   Light a candle in front of the first box.
   NOTE: The height of the candle flame should be at the height of the hole.
4. Adjust the boxes in such a way that you can see the candle through the hole of the last box.
5. Once you see the flame through the boxes shift the position of the middle box slightly, and now try to see the flame.

What can you conclude about the way light travels, after doing this activity?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Were you able to see the light in the first attempt? Were you able to see the candle flame through the boxes? How were the three boxes positioned finally? What happened when you shifted the middle box?
Observe different shadows formed on the wall. What different shapes did you try to make? Why do you think shadows are formed? Are there shadows in outer space too? Why are the sizes of shadows different at different times of the day?

**Materials Required**
- Torch or a candle.

**Instructions for the activity**
1. Put a torch/candle on a table and focus it on a wall.
2. Use your hands to create a shadow on the wall, similar to the ones shown in the picture.

You can also try different objects and tell stories to your friends and family members.

**Try this!**
- Take two coins of the same size and try to make shadows of different sizes with them.
- Take a steel spoon and form its shadow on the wall by varying the distance between the light source and the spoon.
- Take a glass object and try to form its shadow on the floor. Is it different from other shadows? Why?

Have you compared the size of the shadows formed in the morning and afternoon? Have you seen the shadow of an airplane or birds flying in the air?

Nitu’s grandmother often told her stories when she was small. She would also take a torch and play with her hands to add characters to her stories. Today, we will learn how we can create so many things using our hands’ shadows as well!
In the previous activity, when Pilu tried to see the shadow of a glass, he realized it was different from the shadow of his hand. When asked, his teacher explained that the glass is a transparent object, whereas our body is opaque.

Let's explore these terms more with this activity!

Materials required
Candle, water bottle, transparent sheet/polythene paper, milk, normal paper, and a coin.

Instructions for the activity
1. Light a candle and fix it on the floor in a room at a 1 meter distance from the wall.
2. Take some water in a bottle and place it in front of the candle.
3. Observe the shadow of the water bottle on the wall.
4. Now, take a polythene sheet and try to find its shadow.
5. Next, take a piece of normal paper and cover it in oil, then see its shadow on the wall. Lastly, take a coin and put it in a glass of water, and observe from the top of the glass.
6. Take the same coin and put it in a glass of milk and observe from the top.

Try this!
Take an empty bottle and put a coin in it. Pour 10 ml of milk and observe the coin. Now go on adding water slowly to it and observe the coin. Note down your observations in the space given below.

How does the shadow of the water bottle look? What about the oiled paper? Was the coin visible in both glasses with water and milk? Why not?
It is the rainy season in Pilu’s city. There is heavy rainfall almost every other day and rainbows are also a frequent occurrence.

Have you ever seen a rainbow? How many colors are there in the rainbow? Do you know what is white light? How many colors are there in white light?

Let’s answer these questions and also make a fun model in this activity!

Materials required
Cardboard sheet 10*10 cm, A4 sheet, sketch pens, a long stick or pencil, fevicol, compass, and scissors.

Instructions for the activity
1. Take an A4 sheet, cut it in the shape of a circle using a compass.
2. Divide the circular paper into three equal parts (sectors).
3. Colour the three parts of the circle using red, green, and blue sketch pens. Paste the circular paper to the cardboard and cut it in the circular shape.
4. Now take the stick or pencil and fix it at the center of the circle.
5. Now rotate the coloured circle at different speeds and observe what happens.

What do you observe when you spin the wheel faster? When the wheel is at rest, what do you see? Can you write about the colours you see at different speeds of the disk?

What do you conclude about white light, after doing this activity? You can also try to use different colours in the disk, and see what happens!

Divide the circle into 2 colours and observe them when it is spun fast.
Reflection in a Mirror

Materials required
A plane mirror, A4 sheet, sketch pen, scale, protractor, and two water bottles.

Instructions for the activity
1. Take an A4 sheet and draw a line along its length, parallel to one edge.
2. Draw another line perpendicular to the first line, called the ‘normal line’.
3. Now keep this paper close to the mirror, and place a pencil to the left of the normal. (See image below)
4. Looking through the right side, arrange another pencil so that the image of the second pencil is in a straight line with the first pencil.
5. Draw lines alongside the first and second pencils and let them meet at one point let it be called “m”.
6. Now take a protractor, center it at ‘m’, measure the angles on either side of the normal. Now, compare these two angles.

Why do you see your image in the mirror? What are the daily uses of mirrors in your life? Can any smooth surface behave as a mirror?

Mirrors are fascinating objects for us. Even babies love to see their reflections in the mirror. Nilu too, looks in the mirror every morning to dress up for school.

With this activity, let us see what makes mirrors behave the way they do!

If the first pencil image coincides with the second pencil, then what happens to the angle of incidence and the angle of reflection. Also, note down the things which use plane mirrors in your surroundings and understand the various uses of a mirror.
Stand in front of the mirror and observe your image. Now, lift your right hand and observe the image in the mirror. What difference do you see in the mirror?

We all stand in front of mirrors to look at ourselves. But do you know about the lateral inversion that happens when you look at them?

Materials required
Plane mirror, white papers, pen, scale, eraser and sharpener.

Instructions for the activity
1. Take a white paper and write "bob KICKED pop" in the middle of the paper.
2. Now hold the paper in front of the mirror and read it in the mirror.
3. Now take another sheet of paper and draw the following picture on a sheet of paper.
4. Take the sheet in front of the mirror. If you have a small mirror, place the mirror over the sheet as shown.
5. Next, take an eraser/sharpener and place it in the rectangle at the centre of the figure and start moving along the directions of A, B, C and D arrows one after one.
6. While moving, note what you see in the mirror as well.

Right to Left, Left to Right

What do you understand about lateral inversion after doing this activity? Can you find some more interesting examples of lateral inversion?

How did the text 'bob KICKED pop' appear in the mirror?

What happened when you lifted your right hand, standing in front of the mirror?

What did you notice while moving the eraser along the arrow in the figure provided?
Now that you understand lateral inversion, let us try to understand a little more about how images in mirrors appear.

Pihu will do some fun tricks for you, and you can then share them with your family and friends!

Materials required
Plane mirror, lemon, plastic ball, knife, and semicircular cardboard.

Instructions for the activity
1. Take a lemon and cut it into two equal pieces.
2. Similarly, cut the plastic ball into 2 equal pieces as well.
   NOTE: If both these items aren’t available, you can use a mediumsized semi-circular cardboard cutout.
3. Keep one piece of lemon/plastic ball or cardboard in close contact with the mirror and observe the mirror image carefully.

What was the difference between the real objects and the images in the mirror?

What can you conclude about an image’s size and distance with respect to the actual object? You can also try to select a few English letters and find out the shapes of their images in the mirror. Which letters appear in the same way as they do in real life?
Nilu learned about different kinds of mirrors in her class - concave and convex. But do you know there are so many common examples of these around your house?

Let's do a fun activity to find some of these objects!

Have you seen your face reflected in the vessels used in your house? Have you observed the size of the image in the rear-view mirrors used in vehicles?

**Materials Required**
Plain steel plate and a steel spoon.

**Instructions for the activity**
1. Take a steel spoon (try to take one with a shiny, reflective surface) and observe your face on its surface.
2. Observe your face, on the hollowed-out surface of the spoon.
3. Move the steel spoon slowly away from your face. Observe the size and nature of the image formed.
4. Now, look at your face from the bulging surface of the spoon and repeat the above activity.
5. Look at your face from the flat surface of a steel plate and observe the size of the image.

What did you observe when you moved the spoon away from your face (on the hollow surface)?
What did you observe with the spoon moving towards you?
Did you see an inverted image?

Can you think of some other common examples of concave and convex mirrors you see every day? Also, observe your image in still water and other smooth surfaces, like marbles.
What do you observe while spinning the template in front of the mirror? Can you try to make your own phenakistoscope with your favourite cartoon character?

Materials Required
Provided template, thumb pin, plane mirror, and cardboard.

Instructions for the activity
1. Stick the template on the cardboard.
2. Cut the outline of the template.
3. Cut out the slits on the template.
4. Insert a thumb pin in the center of the template and rotate in front of the mirror.
5. See the template image on the mirror, through the slits.

On a warm summer afternoon, Pillu lay on his bed and looked up at the fan. He was fascinated by its wings moving at such a high speed, that they looked like 1 full rotating circle. But when stopped, they became 3 separate wings again. Has that happened to you also?
Garden Science

Look at the trees around you. Are all the leaves of all the trees the same size, shape and colour? Are all the flowers colourful? Can you think of the different colours that you have not seen in flowers? Do you know how plants are classified? Have you ever seen a huge or big leaf? Have you wondered why there are so many insects out in the rainy season? Do you think you have any impact on your surroundings and environment? Ask your family members and friends what they think will happen if all the insects disappear from the world. In the theme, ‘Changes Around Us’, we learned about various processes in our house. Now, get ready to go out and explore!
LOOX loves to play in the park near his home. On his way, he also sees so many plants growing in people’s gardens and loves to stop by to see their leaves, flowers etc. Sometimes, he also picks up fallen leaves from the road.

Let’s see if your favourite plant matches Pillu’s with this activity!

**Draw a Plant!**

**Materials required**
Pencil, a plant around your house or from your garden and colours.

**Instructions for the activity**
1. Draw your favourite plant in the given white box and colour it accordingly.
2. Label all the parts you know.
3. Then, go to the nearest plant and observe it.
4. Compare the real plant with the picture you drew.

**Name plant parts which are found above the ground?**

**Name plant parts which are found below the ground?**

**What is the colour of the roots and what do they do?**

**What is the colour of leaves?**

**Does your favourite plant have flowers? What is the colour of the flower?**

We often see cattle eating many leaves off plants. What do you think happens to the plant after all the leaves are eaten away? What would happen to the plant if its roots were removed? How do flowers help the plant? How are leaves helpful to the plant?
Instructions for the activity

Collect as many different kinds of leaves as you can from your surroundings and home. (Don’t pluck more than one leaf from a plant/tree).

NOTE: Some leaves may have thorns, you can cut those with a scissor.

1. Wash all the leaves with water and put them on the floor. While washing, observe how water moves over each leaf.
2. Gently move your index finger over both surfaces of every leaf and observe how it feels.
3. Compare the leaves you collect with the images given, and try to answer these questions.
4. Keep the leaves you collect for further activities.

How Many Leaves Can You Find?

How many leaves from different plants did you collect? Can you name all the plants from which you got the leaves? Are all the leaves the same in size? Among the leaves collected, which is the biggest and the smallest leaf?

Are all the leaves the same in shape? Try to categorize the leaves according to their shapes. Are all the leaves the same in colour? Try to categorize the leaves according to their colour.

Do the leaves have any smell? How many leaves are giving out a smell or odour? Try to guess the reason behind this odour. Did you observe lines on some leaves? What are they called? How are they arranged in each leaf?
How many designs could you make out of the leaves? You can also ask your friends and family members to create more designs with you!

We collected so many leaves for the previous activity and now it’s time to use them to create something for yourself! Nilu will also help you with some of her own ideas.

Materials required
Leaves from the previous activity, paper, and scissors.

Instructions for the activity
1. Collect some more leaves if required. NOTE: You learned that leaves are the ‘kitchens of plants’. Hence, do not damage/waste the leaves. Collect only the required amount of leaves.
2. Arrange the leaves to make any shapes and designs you can imagine.
3. This is your artwork with leaves, preserve it and show it to your friends and family.
4. Here are some ideas for inspiration.
Nilu’s favorite part of a plant is the flowers! They are so colorful, fragrant, and look amazing. But what she is yet to learn, is that they also fulfill many functions of the plant.

Let’s learn more about flowers with her, and what they can do.

### Instructions for the activity
- Collect three to four flowers from your surroundings.
- Carefully observe the flowers and note your results.

### Parts of the Flower

<table>
<thead>
<tr>
<th>Parts of the Flower</th>
<th>Flower-1</th>
<th>Flower-2</th>
<th>Flower-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Aroma of the Flower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Stick/draw flower with parts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Colour of the Petals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Number of petals in the flower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Number of sepals in the flower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Number of Stamens in the flower</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Question

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 World’s largest flower</td>
<td></td>
</tr>
<tr>
<td>2 World’s smallest flower</td>
<td></td>
</tr>
<tr>
<td>3 National flower of India</td>
<td></td>
</tr>
<tr>
<td>4 Your state flower</td>
<td></td>
</tr>
<tr>
<td>5 Your favourite flower</td>
<td></td>
</tr>
</tbody>
</table>

Why are flowers found in different colors in nature? What can you conclude about the functions of flowers? Did you notice bees buzzing around the flowers? Why do flowers need bees and butterflies? Do all flowers have similar parts? Can you name some edible flowers?
Materials required
Life cycle template provided, scissors, glue, and a thumb pin.

Instructions for the activity
1. Cut out the 2 templates on this page.
2. Cut out the area where CUT is mentioned.
3. Place the first template on the second one (illustrated template).
4. Insert the thumb pin to the center point of both the templates and fold the pin’s backside carefully.
5. Now rotate the top wheel.
6. In the window on the top template, you will see a step-by-step version of a plant life cycle.

Once, Pillu threw a few tomato seeds in his garden and was surprised to see a sapling in its place. He then took care of it till it became big, and grew many tomatoes.

In the previous activity, you drew your favorite plant. Now, let’s learn how that plant came into being.

What did you learn about the life cycle of a plant from this model? Can you and your friends grow a plant together and observe its life cycle? Then, match it with the model you made!
In doing the previous activities, Nilu learned so many new things about plants and their parts, and so did you.

With this activity, you will learn to make a fun toy and learn some plant facts!

**Materials required**

Provided template and a scissor.

**Instructions for the activity**

1. Cut out the square template.
2. With pictures face down, fold on both diagonal lines. Unfold.
3. Fold all four corners to the center.
4. Turn paper over and fold all corners to the center.
5. Fold paper in half and unfold.
6. Fold in half from top to bottom. Do not unfold.
7. Slide thumbs and forefingers under the squares and move the fact teller back and forth to play.

What new facts did you learn from the fact teller? Did you try to play it with friends and other family members? Can you also try to make a fact teller about other facts that you know?
Materials required
Soil samples, transparent tumbler, water, and a plastic bottle

Instructions for the activity
1. Collect a soil sample from any nearby area.
2. Take some soil in your hand and add a little water to it. Follow the given flow chart to identify the type of soil you have.
3. If you have a magnifying glass, observe the soil particles through it. If you don’t have a magnifying glass, observe the soil particles using a mobile camera. Try to zoom in as much as possible and note your observations.
4. Collect some different soils and repeat the same.
5. You can put the soil back in the ground, after finishing the activity.

Pillu remembers playing outside and eating soil as a child, leading to scoldings from his mother. So, he is eager to see what components are present in the soil that make it essential for plant growth.

In the previous activities, we learned about plants. Now let us explore the soil present in and around your home area!

How many types of soils did you collect? Do all the soils look the same? Can you describe how the different soils look? How did the different soils react to water being added to them?

Can you guess how different kinds of soils are formed? What role does soil play in supporting plant life?
What is the source of water for your locality? Can you measure how much water you use every day? Do you know how much water is present on earth? Why is the rainy season immediately after the summer? How are clouds formed?

Nilu knows that three-fourths of the Earth's surface is water. But she wonders why this water does not reduce or increase, even when we use so much of it.

Then, Nilu’s teacher introduced her to the water cycle in Science class and it all fell into place. Let’s make a model of the water cycle to understand it even better!

**Materials required**
Scissors, colors, and a pin.

**Instructions for the activity**
1. Colour both wheels and cut them out.
2. Cut along the dotted lines to create the three windows in the top wheel.
3. Place the top wheel on top of the bottom wheel.
4. Insert ball pin (or) thumb pin in the center of both the wheels and fold the pin protruding from the bottom wheel’s backside.
5. Turn the wheel to see the water cycle in action.
Materials required
2 Transparent plastic cup, square piece of cardboard (a little bigger than the top of the plastic top), a small cutting of a house plant, petroleum jelly (vaseline), some water, scissors, and food colour.

Instructions for the activity
1. Using the scissors, make a small hole (just big enough for the plant stem) in the center of the piece of cardboard.
2. Pull the plant stem through the hole and seal the space in the hole with petroleum jelly.
3. Fill the bottom cup with a food colour solution and place the stem with the cardboard into the cup. Cover with the clear plastic cup as shown.
4. Put the model setup in sunlight.
5. If possible, leave the model setup in a room for several days and measure the amount of water that the leaves released.

Why are droplets of colorless water forming on the sides of the inverted cup? Do you know what role plants play in the water cycle? Can you imagine to the earth what would happen if there were no plants?
This is to certify that ________________ studying in ____ grade in _______________ School is titled a ‘curious maker’ who has successfully performed the 50+ hours of self-learning activities from Aha Series ActiLearn 1.0.

Agastya appreciates the passion and motivation that was exhibited in the self-exploration journey.

Keep Doing, keep Thinking, keep Questioning!

__________________________
Learner’s signature

__________________________
Parent/Teacher/Guardian’s signature