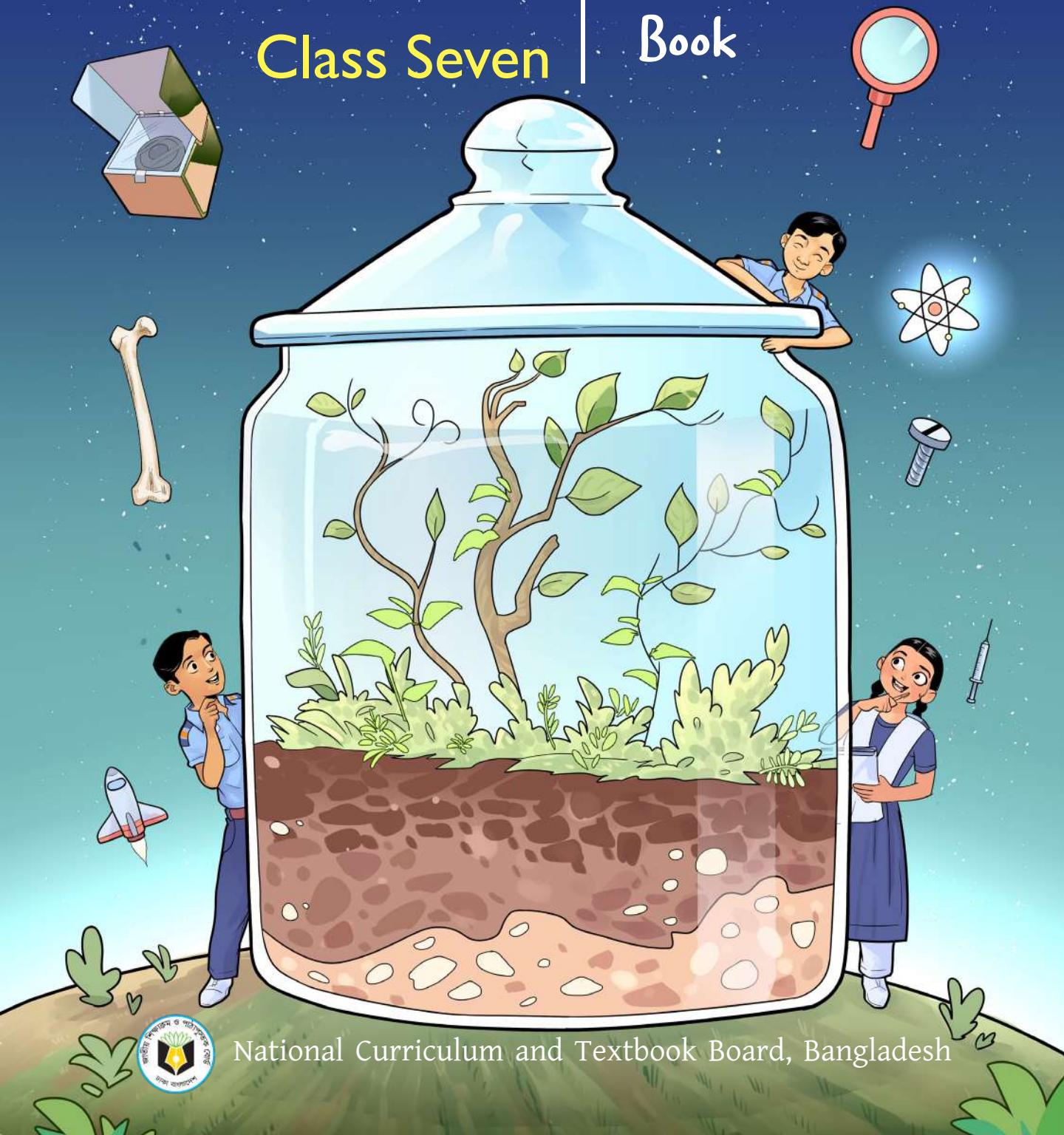


# Science

## Class Seven

Exercise  
Book



National Curriculum and Textbook Board, Bangladesh



ডিজিটাল বাংলাদেশের অর্জন

- প্রধানমন্ত্রী শেখ হাসিনার একটি স্বপ্ন ‘ডিজিটাল বাংলাদেশ’ যার ভিশন হলো তথ্য ও যোগাযোগ প্রযুক্তির বহুমুখী ব্যবহার নিশ্চিত করার মাধ্যমে জ্ঞানভিত্তিক সমাজ প্রতিষ্ঠায় সহায়তা প্রদান। ২০০৮ সালে আওয়ামী লীগের নির্বাচনী ইশতেহার ‘দিন বদলের সনদ’ এ প্রথম ঘোষণা করা হয় যে ২০২১ সালে স্বাধীনতার ৫০ বছরে বাংলাদেশ ডিজিটাল বাংলাদেশে পরিণত হবে।
- তথ্যপ্রযুক্তি খাতে বিশেষ অবদানের জন্য প্রধানমন্ত্রী শেখ হাসিনা ২০১৫ সালে ‘আইসিটি টেকসই উন্নয়ন পুরস্কার’ অর্জন করেন। প্রধানমন্ত্রীর আইসিটি বিষয়ক উপদেষ্টা সজীব আহমেদ ওয়াজেদ এক্ষেত্রে তাঁর অনন্য কৃতিত্বের জন্য ২০১৬ সালে ‘উন্নয়নে আইসিটি পুরস্কার’ অর্জন করেন।
- বিগত এক দশকে দারিদ্র্য বিমোচনসহ কৃষি, শিক্ষা, স্বাস্থ্য, মানবসম্পদ উন্নয়ন প্রত্নতি ক্ষেত্রে বাংলাদেশ এক অনুকরণীয় সাফল্যের দৃষ্টান্ত স্থাপন করেছে। এ সাফল্যের ধারাবাহিকতায় জুন ২০১৯ পর্যন্ত ইন্টারনেট সেবা নিশ্চিতে সারাদেশে ইউনিয়ন পর্যায় পর্যন্ত ১৮ হাজার ৯৭৫ কি. মি. অপটিক্যাল ফাইবার ক্যাবল স্থাপন, ২ হাজার ৪টি ইউনিয়নে ওয়াইফাই রাউটার (Wifi Router) স্থাপন এবং ১ হাজার ৪৮৩টি ইউনিয়নকে নেটওয়ার্ক মনিটরিং সিস্টেমে সংযুক্ত করা হয়েছে।
- ই-কমার্স ও ডিজিটাল প্রযুক্তির বিকাশের ফলে আইটি সেক্টরে বহুমানুষের কর্মসংস্থান নিশ্চিত হয়েছে ও প্রচুর বৈদেশিক মুদ্রা আয় হচ্ছে। ২০১০ সাল থেকে সব শ্রেণি ও পেশার মানুষকে ই-সেবার সঙ্গে পরিচিতকরণের লক্ষ্যে প্রতিবছর ডিজিটাল উদ্ঘাবনী মেলার আয়োজন করা হচ্ছে।

Developed by the National Curriculum and Textbook Board as a textbook according  
to the National Curriculum 2022 for Class Seven from the academic year 2023

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# Science

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## Exercise book

### Class Seven (Experimental Version)

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## Preface

In this ever-changing world, the concept of livelihood is altering every moment. The advancement of technology, in accordance with knowledge and skill, has accelerated the pace of change. There is no alternative to adapting to this fast changing world. The reason is, the development of technology is at its zenith compared to any time in the human history. In the fourth industrial revolution era, the advancement of artificial intelligence has brought a drastic change in our employment and lifestyles and this will make the relationship among people more and more intimate. Varied employment opportunities will be created in near future which we cannot even predict at this moment. We need to take preparation right now so that we can adapt ourselves to that upcoming future.

Although a huge economic development has taken place throughout the world, the problems of climate change, air pollution, migrations and ethnic violence have become much more intense than before. The epidemics like COVID 19 has appeared and obstructed the normal lifestyle and economic growth of the world. Different challenges and opportunities have been added to our daily life.

Standing on the verge of these challenges and possibilities, implementation of sustainable and effective solutions is required for the transformation of our large population into a resource. It entails global citizens with knowledge, skill, values, vision, positive attitude, sensitivity, capability to adapt, humanity and patriotism. Amidst all these, Bangladesh has graduated into a developing nation from the underdeveloped periphery and is continuously trying to achieve the desired goals in order to become a developed country by 2041. Education is one of the pivotal instruments to attain the goals and there is no alternative to the modernization of our education system. Developing an effective and updated curriculum has become crucial for this modernization.

Developing and revising the curriculum is a regular and vital activity of National Curriculum and Textbook Board. The last revision of the curriculum was done in 2012. Since then, a lot of time has passed. The necessity of curriculum revision and development has emerged. For this purpose, various research and technical exercises were conducted under the supervision of NCTB during the year 2017 to 2019 to analyze the prevalent situation of education and assess the learning needs. Based on the researches and technical exercises, a competency-based incessant curriculum from K-12 has been developed to create a competent generation to survive in the new world situation.

In the light of the competency based curriculum, the textbooks have been prepared for all streams (General, Madrasah and Vocational) of learners for grade VI. The authentic experience driven contents of this textbook were developed in such a way that teaching learning becomes comprehensible and full of merriment. This will connect textbooks with various life related phenomenon and events that are constantly taking place around us. We hope that learning will be profound and life-long now.

Issues like gender, ethnicity, religion, caste, the disadvantaged and students with special needs have been taken into special consideration while developing the textbook. I would like to thank all who have put their best efforts in writing, editing, illustrating and publishing the textbook.

If any one finds any errors or inconsistencies in this experimental version and has any suggestions for improving its quality, we kindly ask them to let us know.

Professor Md. Farhadul Islam  
Chairman  
National Curriculum and Textbook Board, Bangladesh

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## To the student-

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Dear students, you have been studying science in all the classes. How do you feel learning science? We are sure you enjoy doing scientific practical tasks more than reading. From now on, we will not only read science. Rather we will have some experiences that reflect the way scientists originally do their researches. Certainly you have got the textbook which is directional or reference for you. Whenever you need throughout the year, you may consult this book. And the teacher is always there to help you.

## This Book is Yours!!

This book is yours only; it is the book to jot down your tidbits of science, some sudden bright ideas and thoughts etc. All through the year, this book is going to help you like a friend!

Therefore, let us complete the introduction part right at the beginning, shall we?  
Write your name and ID in the blank space below—

.....  
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We should also strengthen our relationship a bit more, shouldn't we?

Write a few sentences informing the book more about you—

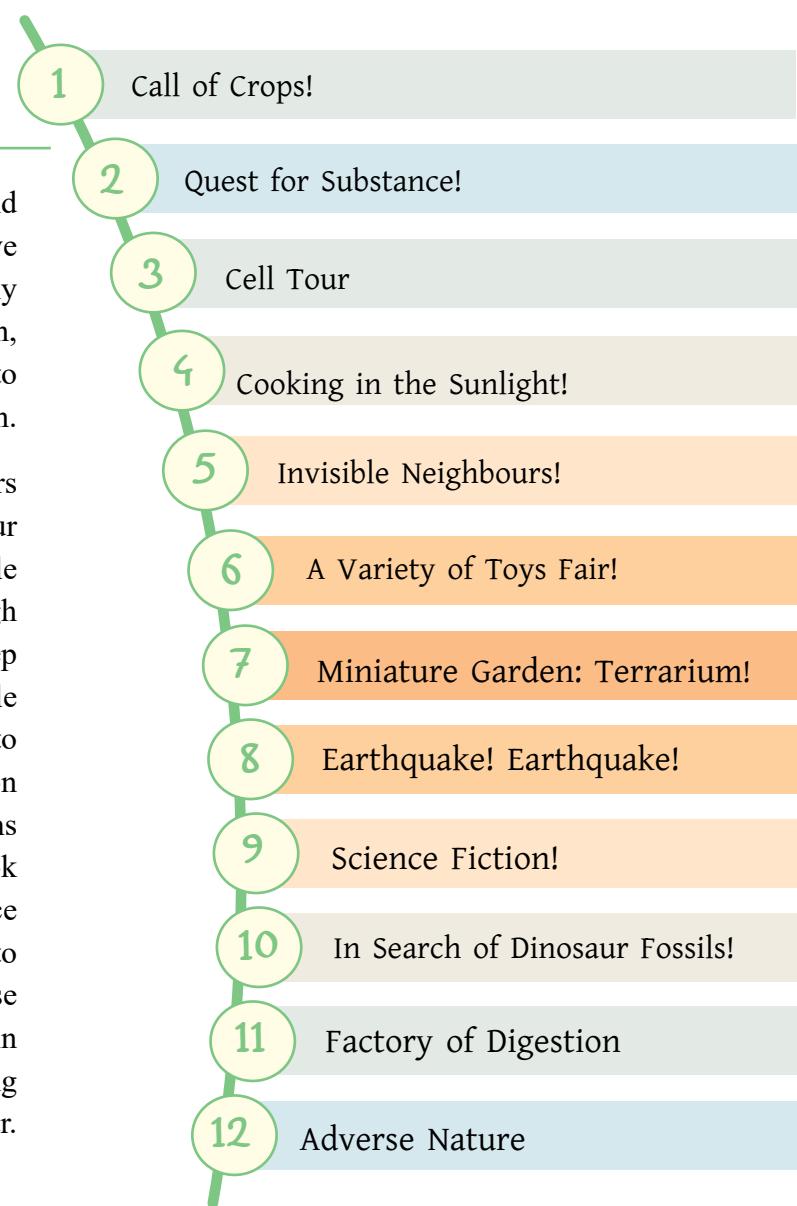
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# Introduction

Many events continue to occur around us all the time. Certainly you have many questions about these, like why do these happen, how do they happen, etc. Some of you might have tried to seek answers to these on your own.

Now we altogether will seek answers to many such questions. This is your exercise book to make that work a little more organized. How to go through the various learning experiences step by step is given here in detail. While doing these tasks, you may need to know various types of information and theories of science; new questions may arise in your mind. The book 'Investigative Study' on Science will help you find the answers to all these questions. Moreover, these two books will directly help you in different stages of achieving learning experiences throughout the year.

Your learning experiences in class Seven are given beside. Take a look at them-



## What kind of experience shall we have?

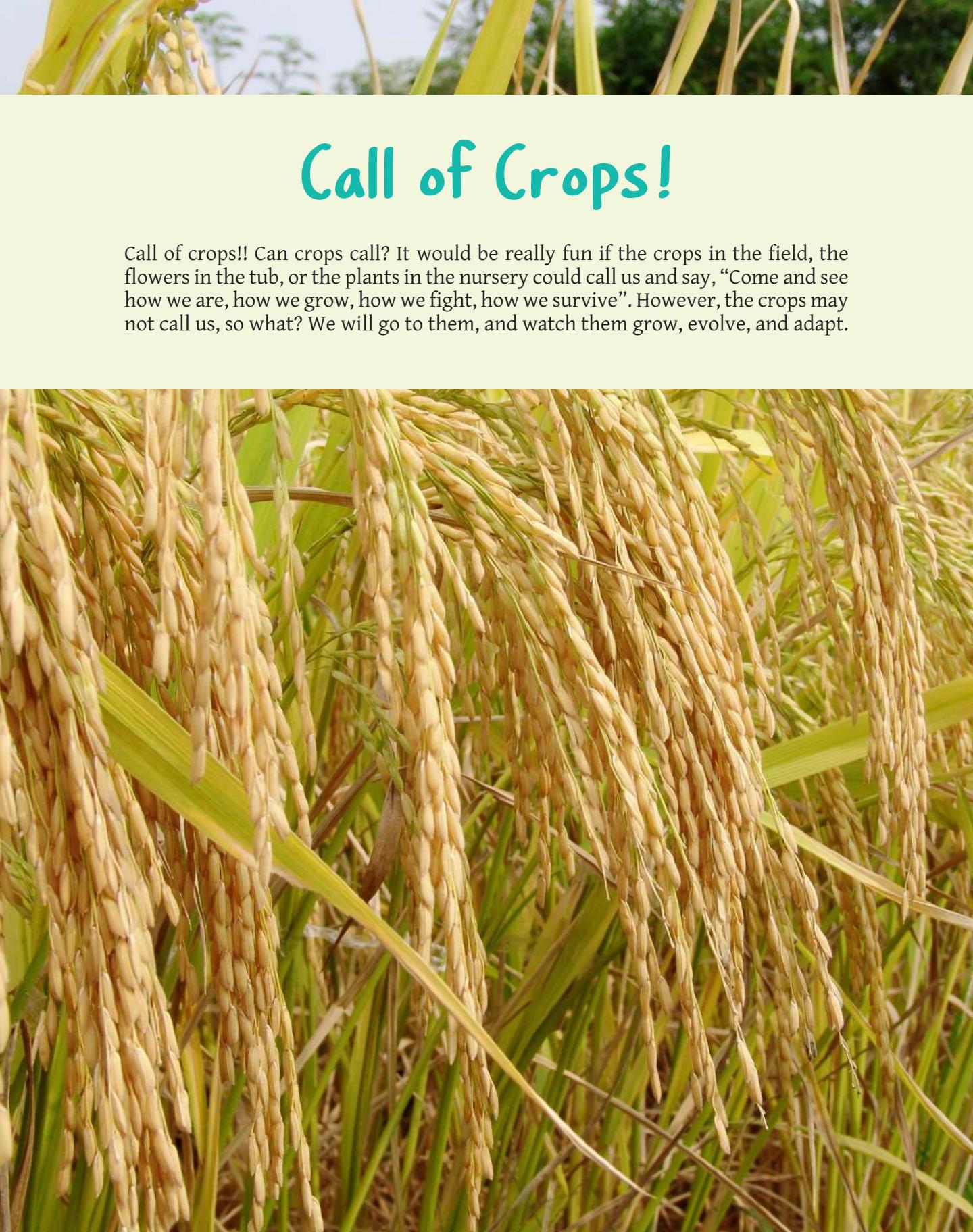
Title of Learning Experience	What we shall do
Call of Crops!	Call of crops!! Can crops call? It would be really fun if the crops in the field, the flowers in the tub, or the plants in the nursery could call us and say, "Come and see how we are, how we grow, how we fight, how we survive". However, the crops may not call us, so what? We will go to them, and watch them grow, evolve, and adapt.
Quest for Substance!	Quest for the substance! That is the search for the substance. What is the inner structure of the things that we see around us? If we continue to break down the substance, what will we actually see at its smaller levels? Why exactly do we see different properties in different substances? To look for answers to all these questions, this time, our learning experience is 'Quest for Substance!'
Cell Tour	Who does not like to travel? As we explore new places, how would it be if we could be tiny and go inside the cells of our or any other organism and see the inside of the cell? Since it is impossible, in this experience, we will make different types of cell models and travel around them...
Cooking in the Sunlight!	<p>Have you ever tried to walk barefooted on the sun-drenched bitumen roads? Better not try this. You know, how hot the road is at this time! Well, think about whether this heat from the sun can be used or not?</p> <p>In this learning experience, we will see even how the sun's heat can be used to complete cooking!</p>
Invisible Neighbours!	Those who live around us are our neighbours, aren't they? But are there neighbours we don't see? These invisible neighbours sometimes benefit us and sometimes cause us harm. In other words, they are intimately linked in our entire life. But who are these invisible neighbours? We will learn about them in this learning experience.

## What kind of experience shall we have?

Title of Learning Experience	What we shall do
A Variety of Toys Fair!	Surely there is no one who did not play with toys in their childhood. Maybe many of you still like to play with toy cars, dolls etc. How about making some toys yourselves? And if it is with the materials that are available or thrown away around you? Let's surprise everyone by designing new toys in this learning experience!
Miniature Garden: Terrarium!	Terrarium!! Surprised! It looks like almost an aquarium. A 'terrarium' is a small garden in the corner of the house. It is to create a self-contained ecosystem in a confined area. Terra means land area. Considering that it is a closed terrestrial ecosystem. How about making a terrarium? It is more fun if science can be learned by making a terrarium!
Earthquake! Earthquake!	Earthquake is a natural phenomenon. It is related to the internal structure of the Earth. In this experience we will uncover the causes of the earthquake. We will learn and practice what to do before, during and after an earthquake.
Science Fiction!	Certainly all of you like to read story books? You read so many types of books- fairy tales, realistic literature, science fiction etc. How would it be, if a book was published with your own writings and drawings, and you yourself were the publisher of the book? Since this work is part of the science subject, let's choose science fiction as subject.  Let's start then!

## What kind of experience shall we have?

Title of Learning Experience	What we shall do
In Search of Dinosaur Fossils!	No one in the world has ever seen a dinosaur. Still, we know a lot about this amazing prehistoric creature. Must you also have a lot of curiosity? Everything we know about dinosaurs comes from fossilized dinosaur bones that scientists have discovered. And these bones were found in different rock layers on the surface. So through this experience, you will learn about dinosaurs and various types of rocks and rock formations.
Factory of Digestion	Have you ever seen how different factories work? In the factory, different workers use different machines to complete the entire work step by step. In the same way, the different parts of our digestive system complete the whole process of digestion starting from eating food to excreting waste at the end of digestion step by step. Come on! Let's take a tour of the digestive factory through this learning experience.
Adverse Nature	We are the children of nature. But what to do when that nature becomes adverse? Why do disasters happen, what are the types of disasters, and what should be done during a disaster? This discussion is about these issues.



# Call of Crops!

Call of crops!! Can crops call? It would be really fun if the crops in the field, the flowers in the tub, or the plants in the nursery could call us and say, "Come and see how we are, how we grow, how we fight, how we survive". However, the crops may not call us, so what? We will go to them, and watch them grow, evolve, and adapt.



## Before the session starts-

Bangladesh is an agricultural country. Every grain of rice we eat daily contains the story of a farmer's hard work. Some of you may have been lucky enough to experience farming, or to see the whole process closely. We all will try to approach this experience as part of this learning process.

Before the session starts, you have to do some work. Not all types of crops grow in all areas of Bangladesh; the same fruit does not taste the same in the soil of all regions. Those of you who are from Rajshahi or Chapainawabganj, must be proud of the taste of mangoes in your area! Similarly, the climate and soil of every region have certain qualities that make certain plants grow well there. Your job is to find out what kind of crops or plants grow well in your area. Are you thinking about how to know? If you have a chance, you can directly go to the agriculture field; then you will get to know well from the farmers. Except this, you can get help from your parents, neighbours or anyone you know about this matter. It will be easier for rural students; city students can collect this information even from someone who works in a nursery. This information is needed to be collected before the next session starts.

Oh, not said yet! There is one more small task before the next session. As the discussion is about agriculture, it is better to get the information from those who know the best about the subject. That is why in the next session, a farmer or someone experienced in this field of your area will come as a guest teacher. In rural



areas, if you do not find any known farmer, an Agriculture Officer, a Nurseryman or anyone expert from any profession can be invited. Your guardian can also come as a guest teacher if he is involved in agriculture. Decide who to invite by discussing with the teacher. The teacher himself will help you make the necessary contacts.



## Sessions One and Two

- ✎ At the beginning of this session, discuss with the class what information you have gathered about the crops or plants that grow well in your area. Did someone mention a new plant name you didn't know about before? Jot down the information below which you have collected and heard from your friends-

Name of those plants which grow well in your locality

Information you have got-	New knowledge from friends-
.....	.....
.....	.....
.....	.....
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- ✎ After the discussion, now is the introduction part with your guest teacher. The teacher will introduce himself to everyone in your class. In today's session, you can satisfy your curiosity by asking various questions to this guest teacher. Think about what questions to be asked beforehand. You yourself will decide the questions. Some sample questions might be-

- ➲ You have a list of plants: why do those grow well in your area? What characteristics of the soil or climate cause certain crops to produce better in this area?
- ➲ Which crops grow best in which season?
- ➲ How to choose good seedlings?
- ➲ Which crop needs to be treated in which way?

 Complete the table below based on the discussion with the guest teacher-

Name of the crops/plants which yield well	For what characteristics of the soil or environment does that crop/plant grow best?	How are good seedlings of different crops/plants selected?	How to take care of these crops/plants?	Other remarks (if any)

- ✍ Apart from this, you can note down the vital information mentioned by the guest teacher.
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## Sessions Three and Four

✍ In the previous session, you learned many things from those directly involved in agriculture or experts in this field. Of course, you already know how to take care of the crops, choose good seedlings, and more related information. But, have you ever wondered where the different crops come from those we grow? In which process does a new variety of fruit or crop arise? Can you think about it yourself?

✍ Have you heard the name of scientist Haripada Kapali? If you haven't heard, you can ask your sixth-grade youngers for their



investigative study book of science. The invention of a special kind of paddy variety by him is mentioned in the first chapter. Sit in groups and discuss the story together. After the discussion, write the answers to the following questions-

- ➲ How did Haripada Kapali find a new variety of paddy? What are the steps in the process by which he invented a new variety of paddy?
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- ➲ You have already known the story of Haripada Kapali's invention of a new paddy variety. You have seen how a completely new paddy variety was discovered from the seeds of a few high-yielding varieties that grew in his fields and reached many people. Only paddy plants do not have different varieties in nature, but we see various species with diversified characteristics in different types of organisms, right? Have you ever wondered how these different species came to be? Have you



ever wondered about the numerous diverse organisms around us - why are their characteristics so different? Why does a particular species dominate a specific area while others cannot survive there? Why does a plant that yields well in your area not yield similarly in other environments?

- ✍ In the previous session, you got some ideas from the guest teacher about why certain species of plants grow well in your area. Now we will look into the matter of this biodiversity more broadly.
- ✍ Please read carefully the chapter on 'Biodiversity' given at the beginning of your investigative study book. Now sit in groups and discuss - what is the nature of biodiversity? How does this diversity among organisms arise? What kind of biodiversity is seen in different regions of Bangladesh? When is biodiversity threatened, and how can it be remedied? If the reading remains unfinished during the session, read the rest at home before the next session so that you can start discussion on the next day.



## Sessions Five and Six

- ✍ In continuation of the previous session, participate in group discussions after reading specific sections of the investigative study book.
- ✍ Based on the group discussion, think now, how is the biodiversity of your area? You have already known that evolution and adaptation lead to different characteristics in different species of organisms, and those species survive in a particular environment with the best suitable characteristics to adapt. And with those species of plants, animals, and microorganisms, the ecosystem of that area is formed.
- ✍ Now think back to the characteristics of the crops or plants you discussed earlier in your area. What characteristics of your soil or environment help these plants grow? Based on group discussion take notes on next page-





- ✍ Now it's the turn to work practically. It is best to get a chance to work directly on real agricultural field. If you have no previous experience, those who have agricultural land in your area you can volunteer there and make a plan to get hands-on farming training from experienced farmers working there. In this case, if any of you have previous experience in farming, they can take the lead and help others. Everyone in the class can be divided into several groups and set up a weekly routine. Make a plan for which group will work where on which day of the week. If there are several agricultural fields in the area, students from nearby houses can form teams, and each team should select a suitable agricultural land.
- ✍ If you don't have farmland close at hand in an urban area, you can gain a similar experience by volunteering at a local nursery. If that is not even possible, there is an opportunity to gain some experience by caring for plants in your home vegetable garden or rooftop garden. Even if that is not possible, plant a plant in a tub on the balcony of your house and take care of it according to the advice of experts and keep your observation for the next few months.
- ✍ Discussing with the teacher plan according to the context of your area and divide into groups.

Write the names of your team members below-

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- ✍ Sit together with the team members and decide on the work plan. Use the table on the next page to break down the plan's key elements. Important points to note-

- ➲ Description of the agricultural land where volunteering will take place (nursery where applicable, or other alternatives as determined)
  - ➲ Identity of the farmer or experienced professional from whom to learn the work (if applicable)
  - ➲ Work routine (set up a realistic routine keeping at least the next two months of volunteering in mind. You can set up the routine discussing your workplace. Everyone should work at least one day a week outside school hours (at least two hours on any given day). Holidays can be utilized for this purpose)
-  Once a week, make notes on the table below based on your observations and experiences. Take the signature of that experienced professional from whom you will learn the work. Exchange experiences with teachers and other group members during the session once a month-

Name of your selected crop/plant:

	After one week	After two weeks	After three weeks	After four weeks
What did you do?				
What new things have you learned?				
Growth/change of crop/plant				
Assisting farmer's signature (Or whatever professional is applicable)				



	After five week	After six weeks	After seven weeks	After eight weeks
What did you do?				
What new things have you learned?				
Growth/change of crop/plant				
Assisting farmer's signature (Or whatever professional is applicable)				

## Retrospection

✍ How do you like working in the crop field/nursery/roof garden?

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✍ What new things have you learned from this work?

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# Quest for Substance!

Quest for the substance! That is the search for the substance. What is the inner structure of the things that we see around us? If we continue to break down the substance, what will we actually see at its smaller levels? Why exactly do we see different properties in different substances? To look for answers to all these questions, this time, our learning experience is 'Quest for Substance!"



# Step 1



## Sessions One and Two

- ✍** You see many things around you; do they all look the same? Surely not? Again, not all objects can be used for all types of work. Think, what are the characteristics of different objects?
- ✍** At the beginning of the first session, list all the objects you see inside the house, kitchen, classroom, or around you and categorize them according to their characteristics.
- ✍** You will fill in Table 1 to make the list.

**Table-1**

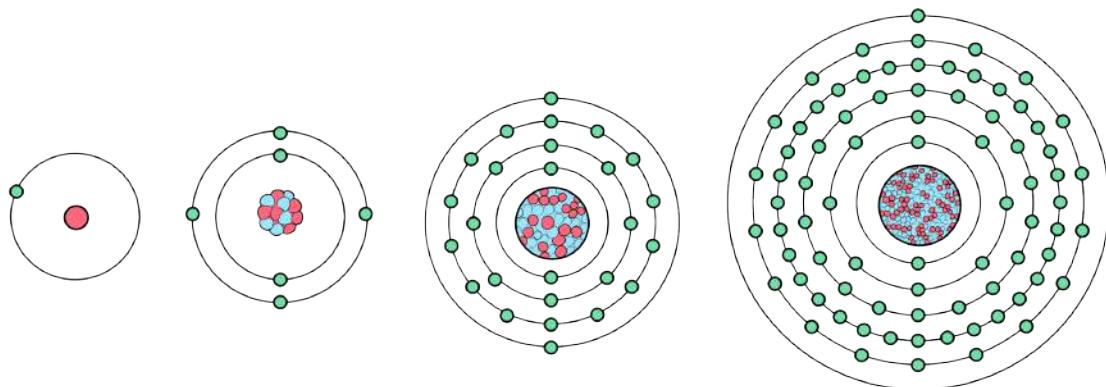
Name of the object	Substance that the object is made of	External state of the substance (solid/liquid/gas)	What are the characteristics of the object? (Is it brittle, does it rattle when hit, is it shiny, etc.)	What is the object used for?

- ✍ Discuss the information in the table in groups. Try to find out, through the discussion, what kind of characteristics an object has for a particular purpose. For example, metal pots and pans are used in cooking, but wooden or plastic pots are not. Again, a wooden handle or a cloth sheath is used to hold the hot pot. Why? Similarly, the top layer of the wire used for electricity transmission is plastic, but copper wire is used inside. Why? Why are the properties of aluminium, steel, iron, and copper different from those of wood, plastic or cloth?
- ✍ Classify the objects in the above table according to the following conditions through discussion-

Name of object	What is it made of?	Metal or non-metal?	Does it conduct heat?	Does it conduct electricity?

- ✍ Now think about the external characteristics of the substances that conduct electricity and heat. Why do some substances conduct heat while others do not? Before finding the answer to this question, it is vital to know the structure and arrangement of the substance in details. Let's know how the structure of a substance is at the smallest level.
- ✍ All in your group sit together and read the 'Molecules Atoms' chapter of the Investigative study book. Read and discuss elements, electrons, protons, neutrons, and the structure of atoms, and try to understand them. Also, read and discuss how each element's atomic number is calculated.
- ✍ You know that protons and neutrons are in the centre of the atom, and electrons revolve around them. Now in the next part of the same chapter of the book, read

about how these electrons are arranged in the atom, and that the nucleus is at the center of the atom. Discuss in groups.



- In the next session, each group should develop a model of an atom's electron arrangement and bring it to the class. Sit down with your group and plan what materials you want to use. You can use readily available things like paper, a dough of atta flour, clay, matchstick, thread etc. You can see the pictures in the book for ease of understanding.



### Sessions Three and Four

- Is your group's model of atom ready? Write in the table below what you have used to make the model, and don't forget to draw a picture of the model of an atom you made! Write down how many orbitals the electrons in your model atom have and what their atomic mass is.

List of materials used in making the model-

Picture of the model of the atom-

Atomic mass-

Number of orbitals of electron-

- ✍ Now, the students of all groups arrange the atom models made by all groups in the classroom and go around to see how everyone has made them. Looking at the models made by others, try to guess the atomic mass of that atom. Ask others if they can guess the atomic mass by seeing your model.
- ✍ After that, if you want, you can arrange a roleplay, where students from different groups will play the roles of protons, neutrons and electrons. Students playing the roles of protons and neutrons will stand together like nuclei, and students playing the roles of electrons will move around them in the specific orbitals.
- ✍ Through these activities, you can understand that these few particles are at the root of the structure of numerous objects with various characteristics that we see around us! The different characteristics of each substance are determined based on how the atom's protons, neutrons and electrons are arranged. And these electrons are not in a random way but are arranged according to a specific rule.
- ✍ Let's go back to the topic of the previous session following the discussion on the properties of the substance. In the previous session, we saw several differences between metals and non-metals. This difference is quite clear, especially in the case of heat and electricity conduct. Now that you have a fairly detailed understanding of the structure of atoms let's explore the reason for this difference between metals and non-metals.
- ✍ Sit in groups and discuss the Conductors, Nonconductors and Semiconductors sections from the Investigative study book. Find out which difference in electron arrangement causes metals to be better conductors of heat and electricity.
- ✍ Now discuss and write some examples of the work related to heat and electricity in daily life in the table below. Then decide which metal or non-metal is more suitable for which work-

(An example is given for your better understanding)

Work that requires it (example) cooking on the stove	Which one is more useful? Metals/Non-Metals? (example) Metals: e.g. Aluminum, Steel, Iron etc.

Work that requires it (example) cooking on the stove	Which one is more useful? Metals/Non-Metals? (example) Metals: e.g. Aluminum, Steel, Iron etc.

✍ In this session, you have learned about the structure of atoms, and the arrangement of particles inside atoms. You also now know that all substances or matters in the world is made up of a handful of elements. But have you thought about how these atoms stay together in the matter? Are things the same for solids, liquids or gases?

✍ In groups, read the section on 'Molecules' from the same chapter. Also, learn how particles are arranged in solids, liquids and gases. Then, try to clarify the ideas through open discussion with everyone in the class. If you have any questions, discuss them too.



## Step 2



### Sessions Five and Six

✍ You have seen many differences in the characteristics of the various objects that we see around us. Each object is used for different purposes keeping these characteristics in mind. For example, aluminium pots can be safely placed on fire while cooking, but we cannot think of using plastic pots. Plastic pots will not help to cook; the pots will melt in the fire. Well, think, what happens to any substance when it catches fire? You must have seen if it is wax or plastic, it melts, and if it is paper or wood, it burns. As many of you may know, the oxygen we breathe is highly flammable. In fact, what we see as fire is a chemical

reaction of a flammable substance with oxygen in the air. Can you tell me what we use to put out the fire? Yes, we use water the most. But more than that, we use the air released with the breath - you must have extinguished the candle or the matchstick by blowing it! You already know what gas we release through our nose and mouth with breathing - carbon dioxide, which helps to put out fires. Water molecules are formed from hydrogen and oxygen, and carbon dioxide is formed from carbon and oxygen. Notice one thing - the component that exists between these two substances is oxygen. Have you ever wondered, while oxygen is a flammable substance, how can water or carbon dioxide help put out a fire, even though oxygen is a component?

-  Carbon, oxygen, or hydrogen are elements that break down to produce only atoms of the same element. On the other hand, when carbon dioxide or water molecules are broken, atoms of several elements are found. They are called compounds because they are formed by combining more than one element. Discuss with your friends and note down the external properties of these substances (If you don't know any information, take the help of your teacher.)

Substance	Condition at normal temperature  (Solid/Liquid/Gas)	Is it flammable?	Other properties (taste/smell/ colour) if known
Water			
Hydrogen			
Oxygen			

Carbo dioxide			
Carbon			
Oxygen			

-  Notice that water and carbon dioxide are substances with entirely different characteristics. It isn't easy to find similarities with the characteristics of their constituent elements. Even after being made of multiple substances, their basic elements cannot be separated. Can you easily separate hydrogen and oxygen from water?

- ✍ Now let's think of another example. Mix a spoonful of salt or sugar with a glass of water. When you see, can you distinguish between water and sugar or salt in the mixture? Of course not. So, like the previous example, can this sherbet be called a compound?

To this question, fill in the following table as before based on your observations to find the answer:

Substance	Condition at normal temperature (Solid/Liquid/ Gas)	Is it flammable?  (You can try to extinguish the fire with both water and sherbet. But do not experiment with fire without the supervision of a teacher)	other characteristics (taste/smell/ colour)
Water			
Salt/sugar  (Tick the applicable item)			
Sherbet made from water and salt/sugar mixture			

- ✍ Now look carefully at the information in the above table and compare it with the previous table. In the water-sugar/salt mixture, are the properties of the components unchanged or wholly changed as before? Join an open discussion with everyone about your observations.
- ✍ Notice that multiple ingredients are mixed, but there is a difference between this mixture and the characteristics of a compound. Group members sit together and read the Elements, Compounds, Mixtures and Pure Substances from chapter 3 of the Investigative study book. Discuss with your friends how the molecules are arranged in these three cases. In the next session, using the same readily available materials, work with the rest of the group to make models to represent the arrangement of atoms in elements, compounds, and mixtures. You can take the help of pictures in the book. And the teacher is also there!



## Sessions Seven and Eight

- ✍ In this session, discuss with another group in the class showing the models of elements and compounds and mixtures made by your group. Discuss how molecules are arranged in these three cases and how they differ. Look at the model made by the other group and give your opinion. In this way, two or three groups per class can show their models and discuss them among themselves.
- ✍ You have known the difference between elements and compounds, i.e., pure substances and mixtures. Now let's try to identify the pure substance.



Take two similar containers. Keep some water in one container and mix some salt with the same amount of water in the other container. Another team has to test these two containers and tell which one is the pure water container (can't tell by tasting!) Your group must also identify the other group's two water containers and the mixture.

(Just a tip! Mixing something else with a pure substance changes its melting point and boiling point. By calculating the boiling point, you can solve this problem very easily! To understand better, do one thing. Quickly read the section on the identification of pure substances from your Investigative Study book.)

## Step 3

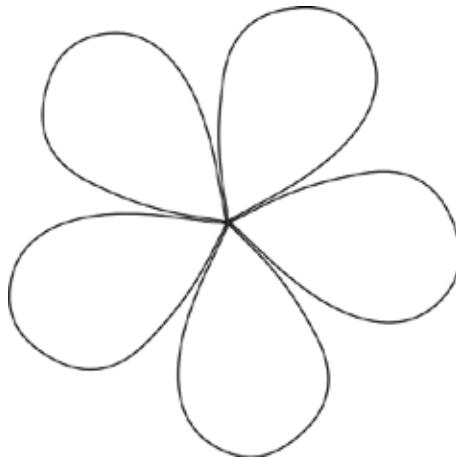


## Session Nine

- ✍ You have discussed elements, compounds, mixtures and pure substances. In previous sessions, you have also learned how molecules and atoms stay together in which one of these cases. Now we will discuss another topic: how we express elements or compounds.
- ✍ Let's do a small task first. The task is very simple. Each group of you has to cut a piece of paper and make flowers. Each flower will have five petals, and the colours of these petals will be Red, Blue and Yellow. There is no hard and fast rule regarding how many petals each colour will have, but each of the three

colours must have at least one petal. Paste five petals on a white paper with glue. Show your group's flowers to others. See the flowers of others too. Notice how many petals of which colour are in the flower of which group?

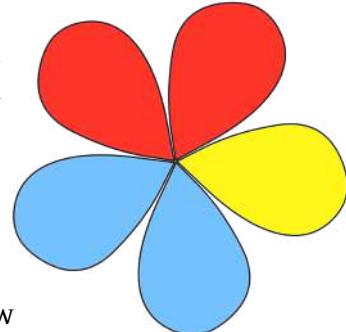
- Now colour the petals of the following flower according to the colour of your group's flower.



Write down the number of petals of these three colours in your group's flower-

- ⇒ Petals of red colour ..... pieces
- ⇒ Petals of blue colour ..... pieces
- ⇒ Petals of yellow colour ..... pieces

Now we will express such a flower through a code or a sign so that by looking at this sign, we can understand how many petals of which colour this flower has. The three colours are denoted by R, B, Y, respectively. Again, the number of petals of a specific colour can be denoted with numbers; for example, if there are two red petals, you can write  $R_2$  to denote it. Thus, if there are two red petals, two blue petals and one yellow petal, this flower will be coded as  $R_2B_2Y_1$ .



How many petals of which colour are there in the flower of your group? If you want to express this flower through the above code or sign, then how to write it? Write it in the blank space below-

.....

.....

All the other groups must have denoted their flowers with signs as well. Try to guess by looking at their signs how many petals of which colour are in that flower.

-  Do you know an exciting thing? The same technique is used to denote a substance. As above you know the colour by the initial letters of the colours, in the same way, the initial letters of the names of the elements are used to indicate the atoms of the elements in a substance. In the case of elements, only the initial letters of that element will do. But in the case of compounds, since there are atoms of more than one element, just like the petals of your different coloured flowers, you can tell by looking at the signs how many atoms of an element combine to form that substance. For example,  $C_2H_2O$  is the symbol of a compound that consists of two carbon atoms, two hydrogen atoms and one oxygen atom.
-  Read the rest of chapter 3, including Atoms, Molecules and Compounds, Symbols and Signs, etc., from your resource or Investigative study book in groups for better understanding. Discuss in groups while reading; you can take the teacher's help if necessary.
-  Now try to guess from the following signs how many atoms of which elements are in these substances. There are many symbols of elements given in your book; you can take help from them.

SYMBOLS OF ELEMENTS OR COMPOUNDS	HOW MANY ATOMS OF WHICH ELEMENTS ARE THERE?
CO	
$H_2SO_4$	
$O_3$	
$N_2O$	

-  Do you have a question in your mind, how do you know how the atoms of any element combine with whom to form new substances? Does it happen by chance, or is there a rule? Think for yourselves. But to get the answer, you have to wait for a few more days, and if you go to the upper class, you will see how wonderful things happen inside these tiny atoms!

What if you keep the questions until then?

## Retrospection

✍ How did you feel doing the activities of this learning experience?

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✍ What new things have you learned in this activity?

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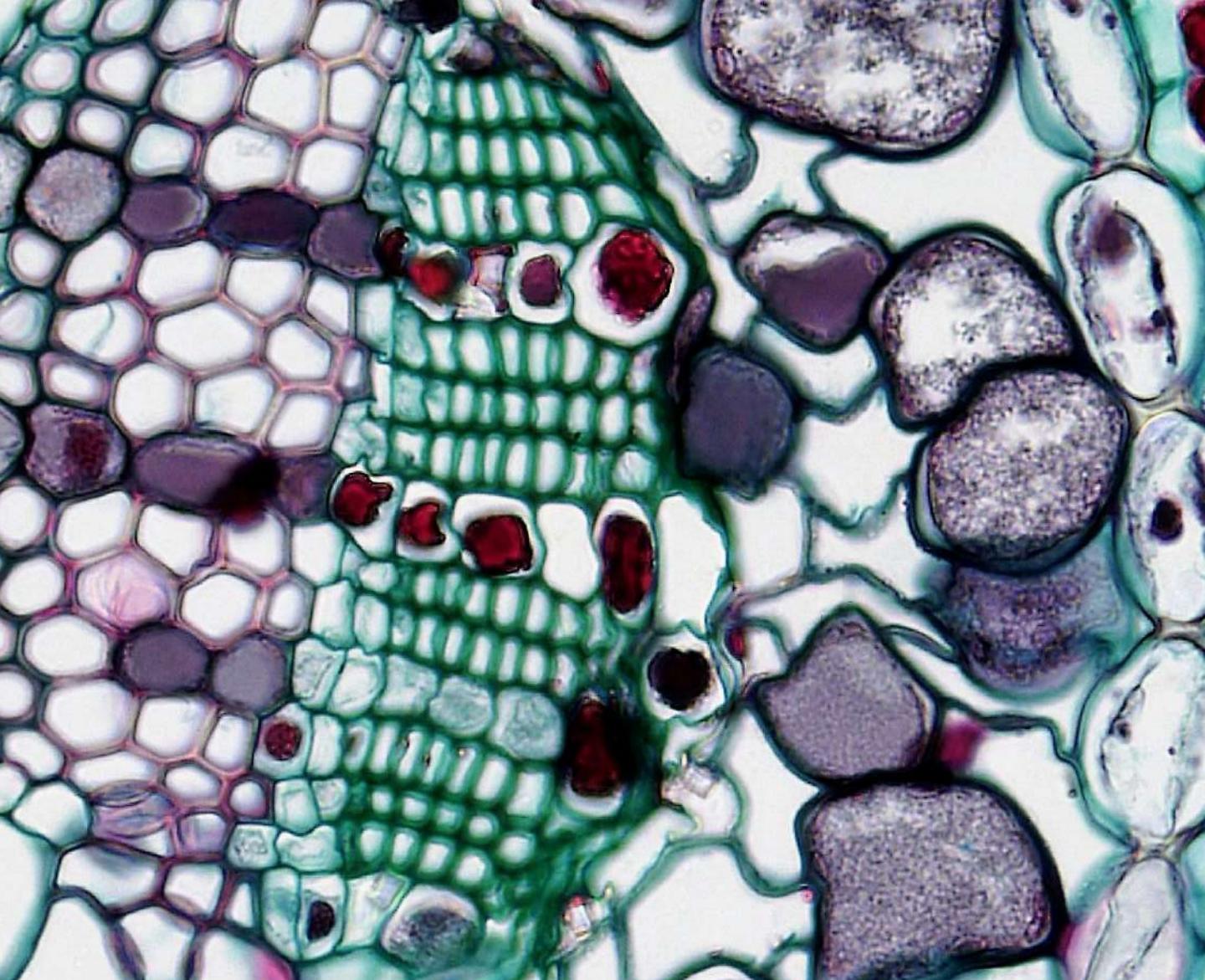
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## Cell Tour

Who does not like to travel? As we explore new places, how would it be if we could be tiny and go inside the cells of our or any other organism and see the inside of the cell? Since it is impossible, in this experience, we will make different types of cell models and travel around them...





## Session One

- ✍ You all like to travel, don't you? You have gone somewhere on a school study tour or a picnic or a major holiday of the year. Have you noticed one thing? If you have someone like a tour guide when the place you have visited is unknown, then you can quickly learn a lot about that place.
- ✍ If you have any memories, you went somewhere and took the help of a tour guide who showed you around the place and told you everything, then shared them with the class.
- ✍ You can also ask the teacher if s/he has any such experience. Ask him/her to share it.
- ✍ Now think of one thing, if you could grow smaller and smaller as you wish, you could go inside the palm of your friend's hand and move from cell to cell. Or if the magnification of our eyes were very high, then with the bare eye, you would be able to see everything from tiny organisms to parts of a cell.
- ✍ They cannot be seen without a microscope. So in this experience, you will make a model of a cell seen in a microscope, travel through that model, and learn about different cells and cell organelles.
- ✍ Each of you will be a tour guide in the cell tour. So let's start planning.

Photograph of a cross-section  
of a pine tree leaf under a  
microscope

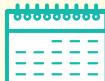
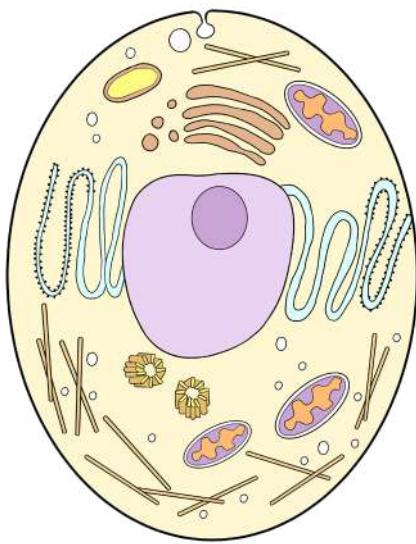
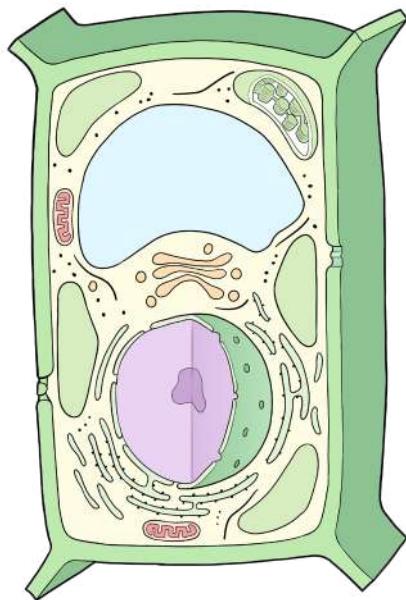


- ✍ Divide into two groups under the guidance of the teacher. One group will work on animal cells and another on plant cells. The plant cell group will divide into another sub-group and work on models of the plastid; the animal cell group will further split into two sub-groups and work on models of mitochondria and nucleus.
- ✍ After the two groups sit together, open the cell biology/cytology chapter of the Investigative Reading book and read the introduction section to get the basic idea.
- ✍ Ask the teacher to clarify the concept if you have difficulty understanding any part.
- ✍ List in groups and sub-groups what cell organelles are in plant and animal cells and what is present in plastids, mitochondria, and nucleus.
- ✍ From this list, each member of the group and sub-group will work with one organelle.
- ✍ When the group has decided which organelle you will work with, write it down in the table below.

Table-1

Name	Organelle

- ✍ After finalizing who will work on which organelle from the group and sub-group, write it down in the notebook or diary.
- ✍ Now discuss in groups and decide how to make the model. In this case, consider the following points-
  - ⌚ While making the model, remember that just as a group of tourists, under the guidance of a tour guide, explores all the places, your group model has the opportunity for each other group to visit one by one. Everyone gets introduced to all the organelles of the cell in the cell tour.
  - ⌚ As the model will be big, it can be made by removing classroom benches, on the veranda, or on an open space.
  - ⌚ Anything readily available can be used as materials. Such as chalk, rope, clay, atta flour, etc.
  - ⌚ Discuss in groups and decide who will make which part, how, and where. You can also do some modeling work at home in advance to save time in the next session.



### Home Task

- ✍ Clarify concepts by reading the texts about the structure and function of cell membranes in the Investigative Reading. If there are any understanding problems, note them in the notebook and ask the teacher questions in the next session. At the same time, proceed with the assigned group work on the cell model at home.



### Session Two

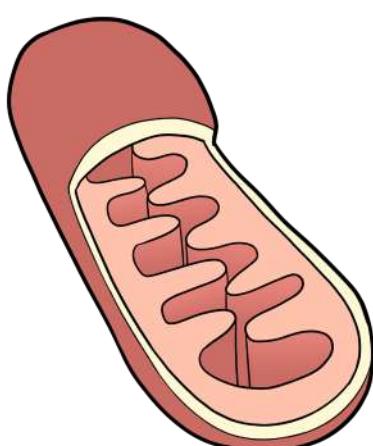
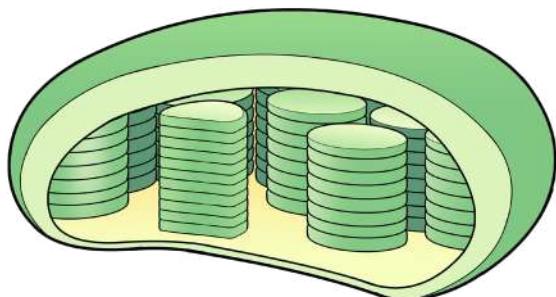
- ✍ In the last session, you planned and decided who would make the model of which cell organelle. Accordingly, you must have proceeded with some work at home. Complete 100% of the rest of the model-making in this session.
- ✍ Inform the teacher at the beginning of the session if there is any difficulty understanding the homework assigned from the previous session or if you have any questions.
- ✍ Try to answer spontaneously when the teacher asks a question.
- ✍ Now divide into groups and sub-groups and read carefully the cell organelle you are working with from the Investigative Reading book.

- ✍ Know the location of that cell organelle, how it is formed, what it does, what it looks like, etc. Inform the teacher if you have any questions or have difficulty understanding.
- ✍ In your group, you have planned the cell tour so that all students get familiar with all types of cells and cell organelles. So if any cell organelle is left, the task will not be done properly. Therefore, sitting in a group, make sure that no one is absent from the class.
- ✍ And after reading your part well, someone from the group or you should read the whole chapter well so that if someone is absent for a special reason, you can tell that part.
- ✍ Prepare for the next session in class. Be well-organized while acting as a tour guide, but don't need to memorize. You can say as much as you know and understand.



### Session Three

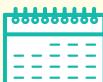
- ✍ You must have made models of cell organelles from home and brought them to the class. Place them in the designated places, and two groups will create complete forms of animal and plant cells in this session.
- ✍ In the beginning, find some open space by removing the classroom benches, or the work can be done on the veranda.
- ✍ After that, according to the previous plan, the two groups



and the members of the other groups should place the models of plant and animal cells and models of nucleus, mitochondria, and plastids on the floor.

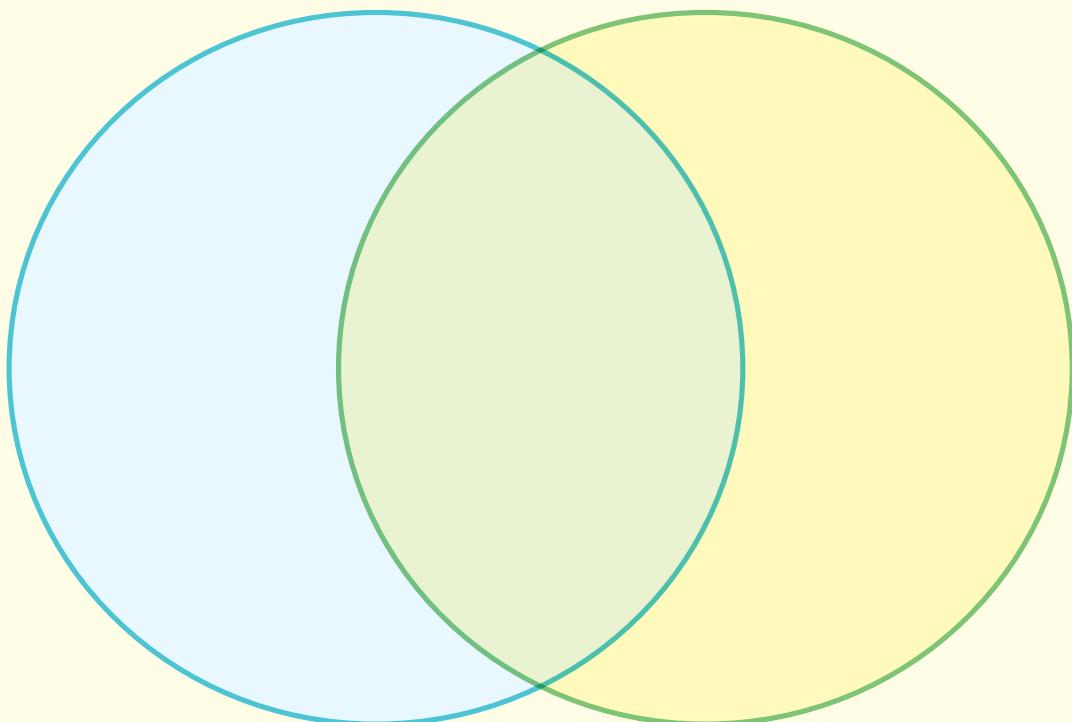
- ✍ If possible, place the model parts on the floor so that a person or two can step into the cell and act as a tour guide.

- ✍ This time one member from the plant cell group will take the role of a tour guide and help one or two people from the animal cell group to take a tour of the plant cell.
- ✍ In this way, another person will play the tour guide role and show other animal cell group members around the plant cell.
- ✍ Similarly, the animal cell group will also do the work.
- ✍ Members of the other three sub-groups as tour guides will likewise help all the students in the class tour the cell.
- ✍ Once you are familiar with the structure and function of all types of cells, come back to the group and discuss. The subject of your discussion is - the similarities and differences between other types of cells with their models, which elements are present in all cells, and which one is only present in a particular type of animal cell.



### Home Task:

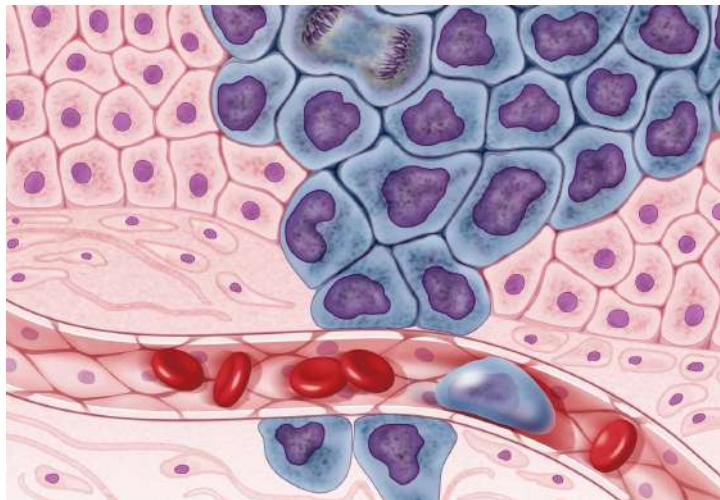
- ✍ Write the similarities and differences between the organelles of plant cells and animal cells on the Venn diagram below.





## Session Four

- ✍ The cell tour is over. You have learned a lot about the structure and function of cells in the past few sessions. But have you thought about how organisms grow? When our skin is cut, how does it heal after a few days and create new skin there? These questions will be answered in this session.
- ✍ Read the Cell Division and Multiplication section of the Investigative Reading book carefully.
- ✍ Almost everyone has heard the two words tumor and cancer. By reading the consequences of the Abnormal Cell Division section of the Investigative Reading book, understand how tumors can develop into cancer.
- ✍ What can you explain by writing or saying or in any other way - Why is normal cell division important for normal reproduction and growth of organisms?



## Retrospection

- ✍ How did you feel doing the activities with everyone in the group? What new did you learn through this learning experience?

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∅ Which aspect of the cell did you find fascinating?

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## Cooking in the Sunlight!

Have you ever tried to walk barefooted on the sun-drenched bitumen roads? Better not try this. You know, how hot the road is at this time! Well, think about whether this heat from the sun can be used or not?

In this learning experience, we will see even how the sun's heat can be used to complete cooking!



## Sessions One and Two

- ✍ Do you know how lucky we are to have sunshine all year round?, We are to use sunlight and heat for thousands of daily tasks starting from drying clothes. Yet we actually use very little of the vast energy reserves that come from the sun. Majority of our energy demands could be met with the help of solar energy, if this energy was properly utilized.
- ✍ The question is, what can you do about it? You may not be able to make such big changes overnight on your own. But, sitting in the classroom, you can find out some ways utilize this power. A good example would be solar oven. Let's all try to make a solar oven using the energy from the sun through this learning experience!
- ✍ Have you ever noticed what happens if you leave something in the blazing sun for a long time? The object gradually heats up, doesn't it? Do all objects become equally hot? Think a while and write- which objects get hotter, if kept in the sun?

- 
- ✍ Do you find any similarity among the above objects? Look at what the objects are made of, what colour they are, etc.
  - ✍ Let's do an observation for better understanding.
  - ✍ Measure the temperature of five different objects (iron object, glassware, water, white cloth and coloured cloth) with a thermometer and record it in the table below.

Name of the object	Temperature before exposure to sunlight
Iron object	
Glassware	
Water	
White cloth	
Colourful clothes	

- ✍ Leave the objects in the sun for a little longer time to see if their temperature changes when exposed to sunlight. Because this kind of observation is time consuming, if you want, you can do this observation at home before the session starts. Or coming to school today, leave the objects in the sun before the session so that temperature notes can be taken during the session.

\*\*\*\*\* After certain time \*\*\*\*\*

-  After leaving it in the sun for at least 30 minutes, re-measure the temperature of the 5 objects with the thermometer, and record the temperature data taken two different times in the table below.

Name of the object	Temperature before exposure to sunlight	Temperature after exposure to sunlight	Remarks
Iron object			
Glassware			
Water			
White cloth			
Colourful clothes			

-  Can you see any difference in temperature before and after? If there is a difference, what could be the reason? Again, is the change in temperature of each object happening in the same way? Discuss with your friends and write your explanation below-

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## Sessions Three and Four

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- ☛ You have already known about the thermal conductivity of any type of material. Now compare with the observations from the previous session- think about how heat energy is conducted in these objects, and what changes in the temperature of the objects are happening!
- ☛ Your Investigative Study book can help you understand this a little better. By reading the Heat and Temperature chapter of this book, you will learn more about how heat energy is conducted in matter, and how we can measure it by measuring temperature. Read each part of the chapter first by yourself. Then divide into groups and discuss what you have understood. Read the entire chapter like this. These ideas will help you a lot making a solar oven.



## Sessions Five and Six

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- ☛ You have already known the ways how heat is conducted. Now it is not actually possible to cook with the regular direct heat of the sun. By concentrating this heat and after a certain temperature to be reached, the solar oven will work. So, if you have to use the light and heat of the sun to make an oven, then the idea is you have to figure out how to concentrate the light and heat from the sun.
- ☛ Now it's time to make solar oven. As this work is time consuming, you can do it outside the session or after school time, if you want.
- ☛ A sample process for making a solar oven model is described below for your convenience. But you can change/modify this plan as per your convenience.

### What might be required-

- ☛ Shoe box or sweets box (It will be the best if you can get a large cardboard box)
- ☛ Aluminum foil (or shiny material that can reflect sunlight the most. Alternatively you can try tin foil/can parts, the shiny side of the back of wrapping paper, etc.)
- ☛ Steel/Aluminum Tiffin Carrier/Bowl/Saucer

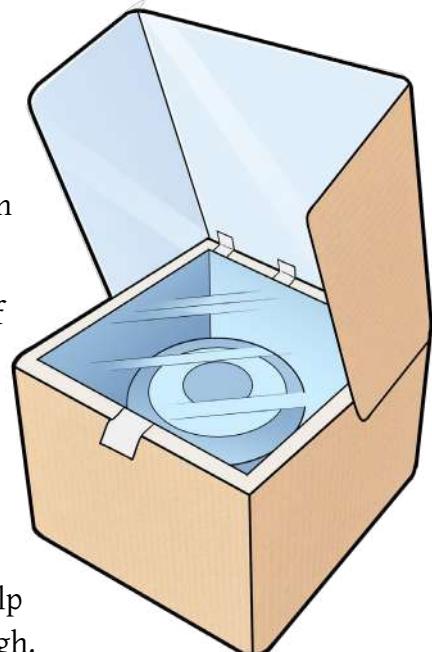
- ➲ Scotch tape
- ➲ Shola
- ➲ Glass or clear plastic wrappers
- ➲ Glue, or scotch tape etc.
- ➲ Sticks, etc.

📎 In addition, you will need a thermometer to measure the temperature of the solar oven. One thing needs to be said here. Fever thermometers are available at most pharmacies, but the maximum temperature they can measure is not very high. To measure the temperature inside the solar oven, you will need a thermometer with a range of 0 to 100 degrees Celsius which your teacher can help you get.

#### Process of Making a Solar Oven:

How to make-

- ➲ Cut off the top lid of the box that you took so that it has 5 surfaces (ତଳ) in total.
- ➲ Now measure the length and width of each surface in the inner part of the box and cut the cork sheet or shola accordingly.
- ➲ Attach the reverse side of the shiny surface of aluminum foil paper or wrapping paper on the shola with the help of glue or pin so that it is smooth enough.
- ➲ Now put the lower surface of the paper inside the box first. Then, attach the surrounding surface pieces with scotch tape or glue.
- ➲ Now, in order to make the top reflector, attach aluminum foil (or the shiny side of the wrapping paper of your choice) to the piece cut out for the upper surface of the box. Then place it on top of the box in such a way that it is tilted at about a  $60^{\circ}$  angle so that the light reflected at its surface goes into the box.



- ➲ Your solar oven is almost done. To check if the oven is working properly, take it under the sun. Crack an egg in an aluminum bowl and place the bowl inside the oven.
- ➲ Place a lid on the open surface of the box, make a lid at the size of the box. Cut out the inner part, leaving aside the cardboard part around the lid. Cover this space with glass or transparent polythene so that even after the lid is closed, sunlight can enter the box through this transparent medium. Make a hinge with scotch tape or paper to make this glass or polythene lid easy to open or close.
- ✍ You have understood the above process. Now it's your turn to make your own solar oven. Discuss with your group about what materials are readily available in your area that can be collected at no cost. Now write down the list of materials that you will use below-

#### Names of the Materials

<input checked="" type="checkbox"/>	.....

- ✍ Materials have been selected. Now it is time to decide how the materials will be collected. Collect yourselves the materials that you can collect yourselves. Team members will divide the responsibility to collect materials. Each one will collect each material.

- ✍ Draw a picture of your team's solar oven in the space below. And keep a list of what materials you have used on the side.

Materials used	Image of the solar oven



## Sessions Seven and Eight

- ✍ Now let's see how your solar oven works.
- ✍ Break eggs into an aluminum bowl and keep the bowl inside the oven and close the transparent lid. Before that place a thermometer inside the oven to measure the temperature inside the oven.
- ✍ Observe for half an hour to see if there is any change in temperature in the oven and in the eggs. Complete the table below from the observations.

Time	0 minutes	5 minutes	10 minutes	15 minutes	20 minutes	25 minutes	30 minutes
Temper- ature (° Celsius)							

- ✍ (If you open the lid again and again within a few minutes to check the state of the eggs, will it take more or less cooking time? Think about it?)
- ✍ Let's take a closer look at the whole process of cooking in a solar oven. You know about different forms of energy like light energy, heat energy, sound energy etc. What forms of energy do you see here? Can you tell what form of energy is being converted to another form? Is the transfer of energy happening during cooking in the solar oven? If so, what form of energy is being transferred, from where to where?

✍ Discuss the above questions in groups. Write your thoughts in the table below-

Which forms of energy have you noticed?	Where has the energy been transferred from and to?	In what cases has energy been converted from one form to another?

✍ Can you tell why specific materials have been used to make solar panels? Why were these materials chosen to make the solar oven work? What is your opinion on this matter? Discuss in groups and write in the table below –

Name of the material	Reason for selecting the material

Name of the material	Reason for selecting the material

- ✍ Compare your solar oven with those made by other teams. Also compare the information in others' tables. What was the maximum temperature inside the ovens of other groups? Which group's egg took longer time to boil? Make a comparative discussion, would it work better, if any change was made in your oven plan? Write your opinion below-

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## Retrospection

✍ How did you feel about doing the experience works?

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✍ How can solar ovens play a role in protecting the environment?

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✍ Did any of the tasks seem challenging? How did you deal with the challenge?

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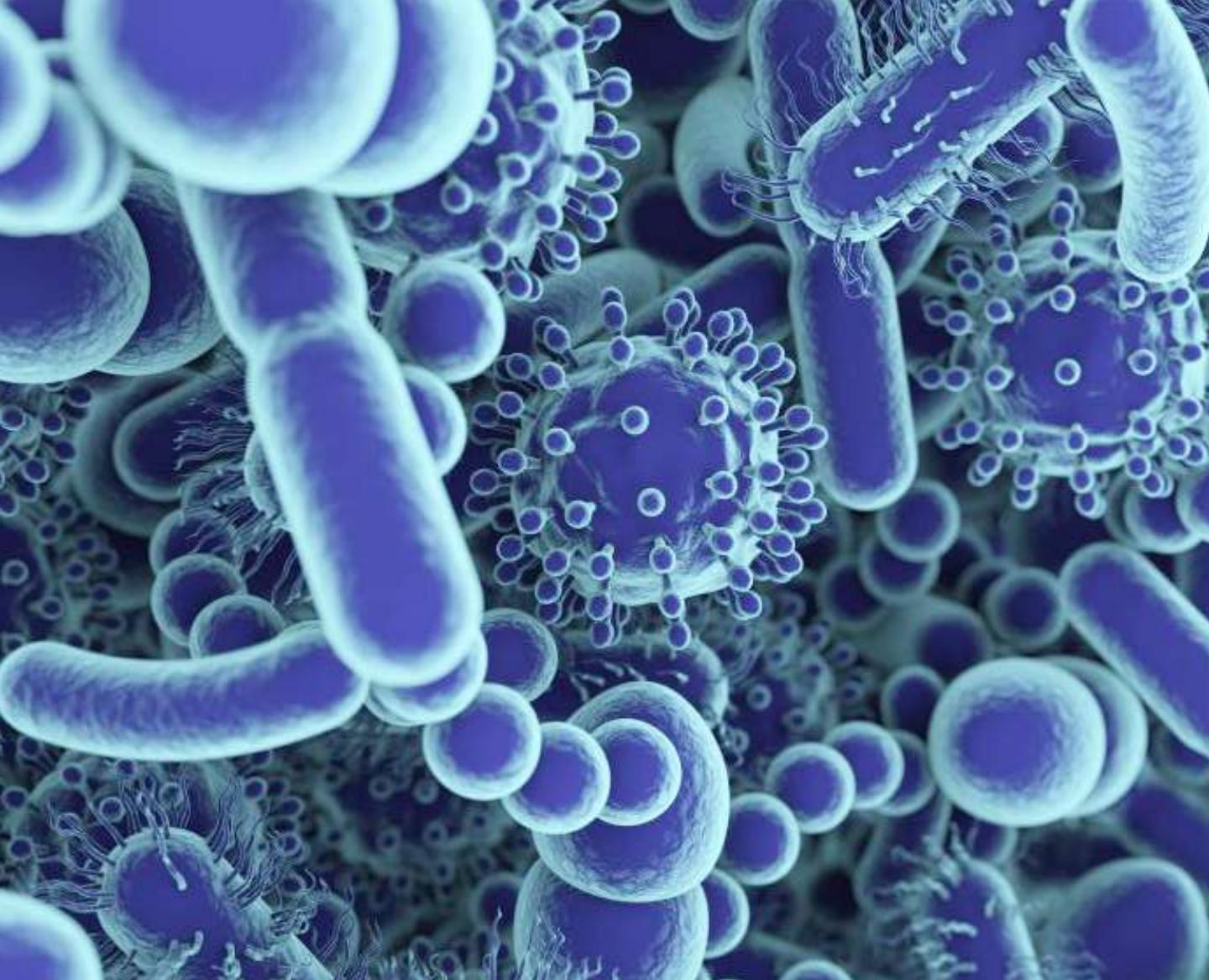
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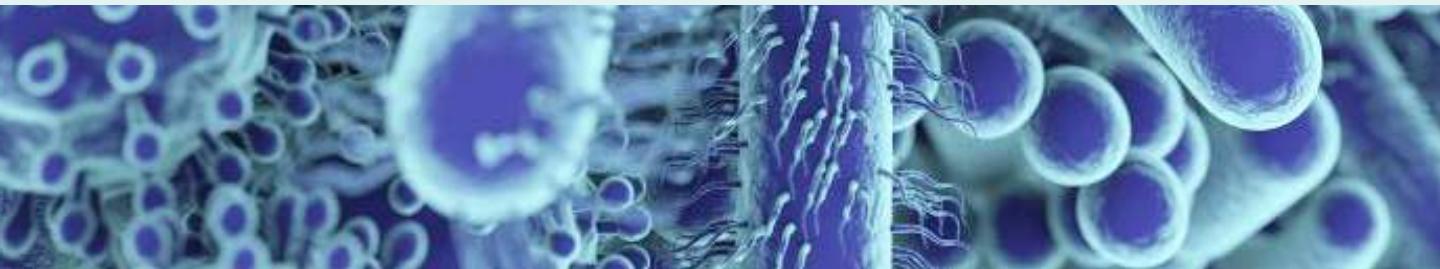
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# Invisible Neighbours!

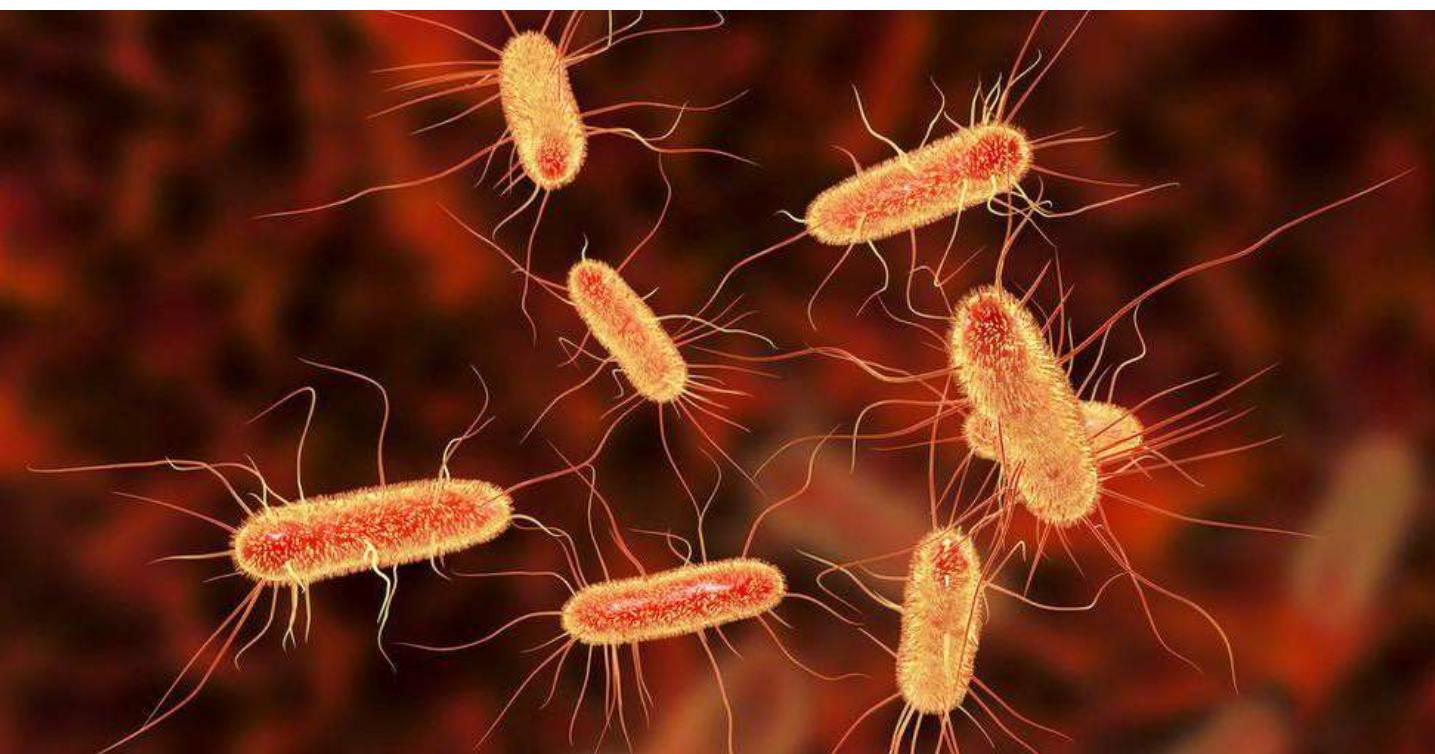
Those who live around us are our neighbours, aren't they? But are there neighbours we don't see? These invisible neighbours sometimes benefit us and sometimes cause us harm. In other words, they are intimately linked in our entire life. But who are these invisible neighbours? We will learn about them in this learning experience.





## Before the session starts

- ✍ Invisible neighbours!! What is it? They is a type of microorganism that surrounds us. For example - bacteria, viruses, fungi, algae etc. Along with many visible neighbours around us, they surround our lives. While many microorganisms harm us, some microbes also benefit us. In this learning experience, we will discover how these invisible microorganisms behave with humans and show characteristics.
- ✍ Before the first session starts, you have to do one thing. At the end of the previous session, write down your home address to be divided into area-wise pairs/groups. With the teacher's help you will be divided into pairs/groups based on area. Give one cute name to each pair/group.
- ✍ Now the task is to determine what infectious diseases are present in your area. What infectious diseases are seen in your area? What causes these diseases to spread? What can be done to stay away from these diseases? For now, you have to gather this information from your surroundings. You can collect this information from your own experience, parents, relatives, or neighbours.
- ✍ One member of each of your pairs/groups will choose an infectious disease that exists in his/her area. Infectious diseases of the selected area will be collected in pairs/groups at convenient times in the area.



- ✍ You will use data table 1 to collect data. If you have difficulty understanding the information table, take the teacher's help if necessary.

Table-1

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Pair/Group Name:

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Area Address:

Name of infectious disease	Number of people affected by the disease	Which microorganism is responsible for this disease?	What are the symptoms of this infectious disease?	How can these infectious diseases be cured and prevented?



### Sessions One and Two

- ✍ After collecting information about infectious diseases in your area, discuss in pairs/groups in the class. Those of you who have worked on similar infectious diseases will form new groups and discuss them again.
- ✍ After the group discussion, share your findings with the rest of the class. Try to learn about other diseases by joining open discussions. Did you know about any new diseases from others?

- Q Is the name of rabies in the name of so many infectious diseases? Do you know that once many people died of rabies? At that time, there was no cure for this disease; rabies meant certain death.

How did this antidote come about? Let's hear that story today-

## Louis Pasteur, Rabies, and a Joseph Meister



Louis Pasteur and Joseph Meister

One day in 1885, a nine-year-old boy named Joseph Meister was going to school in a small town in France when a huge dog came out of nowhere and jumped on him. With the help of other people, the boy survived, but another misfortune was waiting for him. This mad dog was suffering from rabies, and who does not know - if a dog with this disease bites a person, it is sure to have rabies!

Rabies or hydrophobia was the name of great fear in the whole world. There was no treatment for this disease, and no one knew it was a virus-borne disease. First, it begins with fever, then an unusual depression, then gradually terrible spasms. The chest is about to burst because of thirst, but terrible cramps occur when water is put into the mouth. The final result of this disease was death in terrible pain.

Joseph Meister could have suffered the same fate, but a scientist in Paris was researching rabies; his name was Louis Pasteur. Louis Pasteur was then old and half paralyzed from a stroke. With this body condition, he researched the cause and antidote of rabies.

Although the rabies virus could not be seen, seeing the type of disease Louis Pasteur assumed that it was a neurological disease. Thinking that the spinal

cord inside the backbone of a rabbit affected with rabies was the home of the virus, he tried to weaken it by exposing it to oxygen for quite some days in the laboratory. The virus was then injected into the body of healthy rabbits. It was seen that the old, weak virus could not overcome the rabbit. The next day, the rabbit was injected with a bit stronger and new germs than the previous day, but the rabbit survived. In this way, every day injecting some more fresh bacteria than the last day, it was once seen that the rabbit survived in good health even with the pure strong bacteria!

Joseph Meister's mother came rushing to Louis Pasteur with her son just then. Her son must be saved in any way! Louis Pasteur was in great trouble. First, this treatment was never applied to humans. Second, he conducted experiments on healthy rabbits while this boy had already been infected with rabies. Will this treatment work for him? But if nothing is done, the boy's death is certain.

After much planning, Louis Pasteur decided to take the risk. Like the rabbit, Joseph Meister was first injected with two-week-old germs. The next day, the thirteen-day-old germ, the next day, the twelve-day-old, so on the fourteenth day, he was given the most horrible fresh germ; Any normal person will die within a week if it enters the body. Louis Pasteur was worried. Will this boy live?

Joseph Meister survived. Through this, the world's first rabies patient survived; it was an unforgettable event in the history of Science!

Joseph Meister was grateful to Louis Pasteur for the rest of his life for saving his life. Growing up, he took over as a doorman at Louis Pasteur's laboratory. When Nazi Germany occupied France in World War II, Nazi forces came to occupy Louis Pasteur's laboratory. Joseph Meister stood at the gate and tried to protect the laboratory.

Before Josef Meister was shot dead by German soldiers, he did not let anyone enter the laboratory.



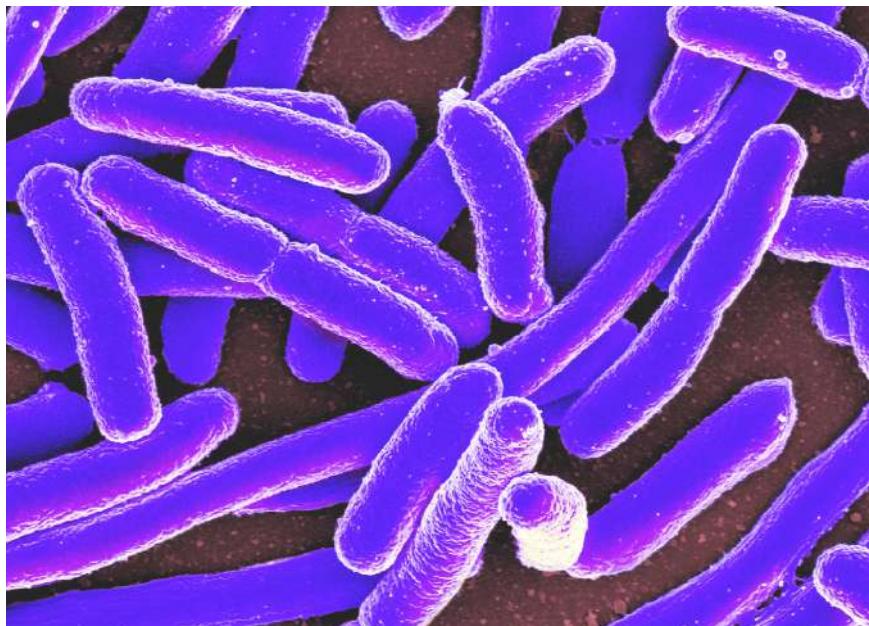
After the discovery of the rabies vaccine Louis Pasteur was depicted as a superhuman warrior in a cartoon published in Le Don Quichotte

- After everyone has read this story, discuss it. Compare what you have heard about rabies.



## Sessions Three and Four

- Remember the gist of the previous session's discussion. Again discuss the collected infectious diseases history of Louis Pasteur's discovery of Rabies antidote.
- At one stage of discussion on viral diseases like rabies, covid, etc., you will read about the structure and characteristics of viruses from the 'Investigative Study' book and form an idea about how they spread different diseases. At the same time, knowing the structure and characteristics of other microorganisms, you will search for similar patterns among them.
- Are microorganisms only the cause of our harm, or do they play a role as our friends? Yes, you are right; certain species of microorganisms (e.g., bacteria, fungi) have traits or behaviours that benefit us, such as curd, mushroom, etc.
- You will now discuss the role of microorganisms in nature and how they are useful to humans.  
Microorganisms will explore that they are as much a part of nature as humans or other animals.
- In this session, you will clarify concepts related to the structure, reproduction, and ecological importance of various microorganisms (bacteria, fungi, algae, and viruses) through Investigative Study, exercise books, and self-discussion. Take the teacher's help if necessary.





## Sessions Five and Six

- ✍ Based on the new knowledge you gained about microorganisms, reanalyze in groups the infectious diseases you have learned about in your area.
- ✍ In the analysis, try to predict which microorganism is responsible for which disease. Fill in Table 2 with the analysis data.

Table-2

Pair/Group name:

Name of infectious disease	Which microorganism is responsible for this infectious disease?	What are the symptoms of this infectious disease?	How can this infectious disease be cured and prevented?	What healthy habits should be developed to avoid this infectious disease?

- ✍ Based on the analysis data, different groups will have group discussions on different infectious diseases. Think for yourself about what can be done to avoid these infectious diseases. Plan and discuss with everyone and take the initiative

to implement it.

- ✍ You can run awareness campaigns step by step to avoid infectious diseases. In the first phase, distribute awareness leaflets and posters to all school classes. In this way, awareness news can reach the whole area through all the students. In this case, take the help of all the school's teachers.
- ✍ In the second phase, make plans to arrange rallies with awareness leaflets posters/ distribute leaflets to inform everyone in the area. Implement this program at a convenient time with the help of teachers and parents. It would be better if health awareness camps could be arranged.
- ✍ Preserve all leaflets and posters made by you in the class with the teacher's help.

## Retrospection

- ✍ What did you think after hearing the incident of Louis Pasteur and Joseph Meister?

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- ✍ What new things have you learned in this activity?

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## A Variety of Toys Fair!

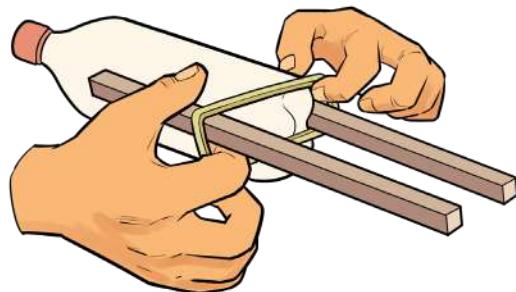
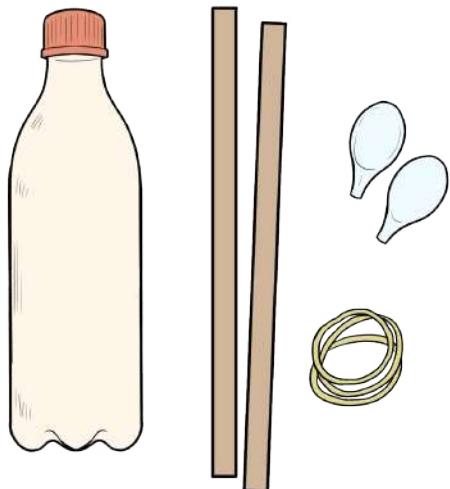
Surely there is no one who did not play with toys in their childhood. Maybe many of you still like to play with toy cars, dolls etc. How about making some toys yourselves? And if it is with the materials that are available or thrown away around you? Let's surprise everyone by designing new toys in this learning experience!



- ☛ The joy of inventing something new is different, but who said that you always have to think about something very serious? In this learning experience you will invent new toys, and that's just for fun. But the toys that you will make in your own plan should not be just for decoration, but can actually be played with. Not only that, because they will be made from everyday or discarded materials, it will not cost much to make them. Moreover, the garbage will also be used.
- ☛ Are you wondering how to make toys? First, let's try to make a toy boat together. This toy boat will not only float in the water, but will actually move like a speedboat! Let's start.

#### *Steps to make a toy boat-*

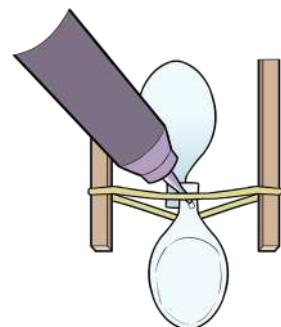
- ☛ Before this session, collect some discarded materials such as discarded plastic water bottles, several rubber bands, some jute sticks or pencils, disposable plastic-made eating spoons, super glue or good quality glue.
- ☛ At the beginning of the session, divide into some groups under the guidance of the teacher.
- ☛ Now put two jute sticks or pencils on both sides of a plastic bottle in such a way that there is an extra 2-3 inches at the bottom of the bottle.
- ☛ Tie the two sticks tightly to the bottle with a rubber band or thread.



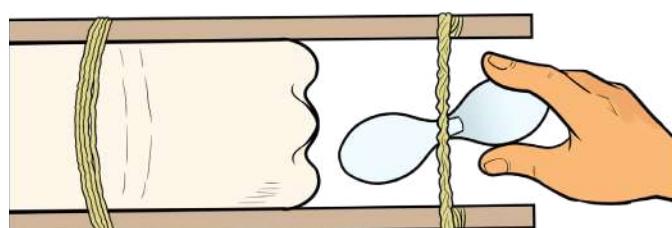
- ➲ Cut the handles of two plastic-made eating spoons equally and attach the two ends oppositely with glue.



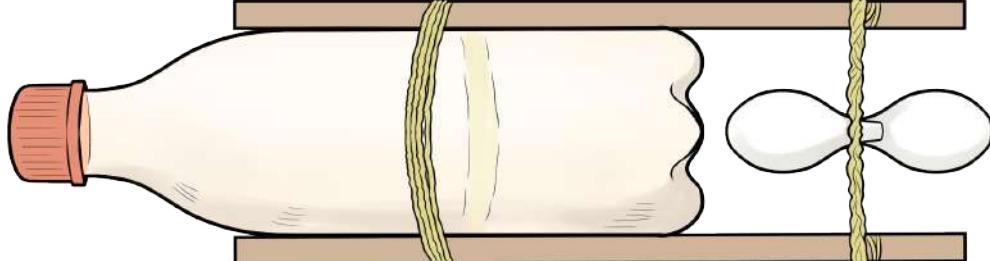
- ➲ If plastic spoon or super glue is not available, as an alternative, you can use any aluminum or tin can, and cut into a rectangular shape and make straight by beating. In that case, the metal piece can be painted to prevent rusting.



- ➲ Then attach two rubber bands to the excess part of the stick or pencil attached to the bottle.



- ➲ Insert the spoon or the rectangular piece of metal crosswise into the rubber band and twist very tightly.



- ➲ Alright, your toy is ready. Now leave it in the pond and see how it goes!

- ✍ What is actually happening to this boat? Can you tell why it started moving as soon as it was released into the water? Where did this power come from? Have you seen similar events happen anywhere else? Discuss with the group members and write your opinion in the space below-
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- ✍ Join open discussions with other groups. Listen to their thoughts, what power caused the motion of the boat?
- ✍ Read the chapter 'Work, Power, Energy' from your Investigative Study book. Read each part of the chapter by yourself, then discuss it with the rest of the group. First read the concept of 'Work' and join the discussion.
- ✍ Now think, when your boat was moving, in the term of physics, has any work been done during this time? Write down your answer.
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## Sessions Three and Four

- ✍ Now let's talk about energy. Where did the power to move the boat come from?
  - ✍ Again, sit in groups and read the rest of the same chapter, i.e., power, energy, different forms and transformations of energy, conservation of energy etc. Discuss with everyone in the group.
  - ✍ Now think again, where did the kinetic energy of the boat come from? When you twist the potential energy accumulated in the rubber band of the boat with force, then it is converted into kinetic energy of the boat.
  - ✍ Now think, in what other cases such kinetic energy and potential energy can be seen as mutual transformation?
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- ✍ Now it's time to invent our own toys. You can organize a fair of your own invented toys in the classroom, where all the groups will display their toys for others to see.
- ✍ There are two conditions for making toys-

- ➲ Don't just make something to decorate, it has to have a special surprise! i.e any toy car, boat, airplane that can be operated; Or maybe a new type of toy made with slingshots. Keep in mind, the conversion of energy from one form to another must be shown in the toy model.
- ➲ No expensive, costly materials can be used in making the toy. Use locally available materials, preferably discarded materials. Your toy design needs to have at least one material which, if you didn't use, must go to



the dustbin. As a result, the garbage will be reduced, and at the same time the environment will also be benefited.

-  First decide in the group what kind of toy you want to make. Then it's turn to plan about the toy, draft the design, make a list of materials. While planning, all team members will sit alone or in pairs to plan and design the toy. You sit down alone or with a friend to plan a design, and draw your ideas in the table below. Discuss what materials might be needed, and write their names in the appropriate space on the table.

Design	List of materials

-  The rest of your team must have planned and designed the toy. All the team members sit together, review and choose one or more ideas based on which plan would be the most effective and interesting. While choosing the idea, of course, keep in mind the two previously mentioned conditions for making toys!
-  You can use anything as materials for making toys - from discarded bottles or cans, tissue rolls, broken pens, cardboard boxes, rubber bands. Besides, various metallic/non-metallic objects can be used here.
-  When it comes to rusting metal, we throw away many things. These metals would last longer, if they were painted.

- ✍ You can use the same idea with your toys, if you use metal toys, you can paint it to prevent it from rusting.
- ✍ When the plan is finalized, draw the design in the table below and make a list of the materials needed next to it so that everything can be collected before the next session

Design	List of materials



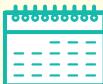
## Sessions Five and Six

- ✍ Divide into predetermined groups and start making toys. Make sure that everyone in the group actively participates.
- ✍ Keep in mind, when making toys, that there happens a transformation of potential energy into kinetic energy. Apart from these two types, if you want to show any other form of energy through your toys, you can show it.
- ✍ Has the toy been made? Organize a fair in the classroom to display the toys you have made.
- ✍ In this case, arrange the benches or tables and keep the toys neatly organized.
- ✍ Each group with all members will play the toy that they made, and explain how

potential energy is converted to kinetic energy.

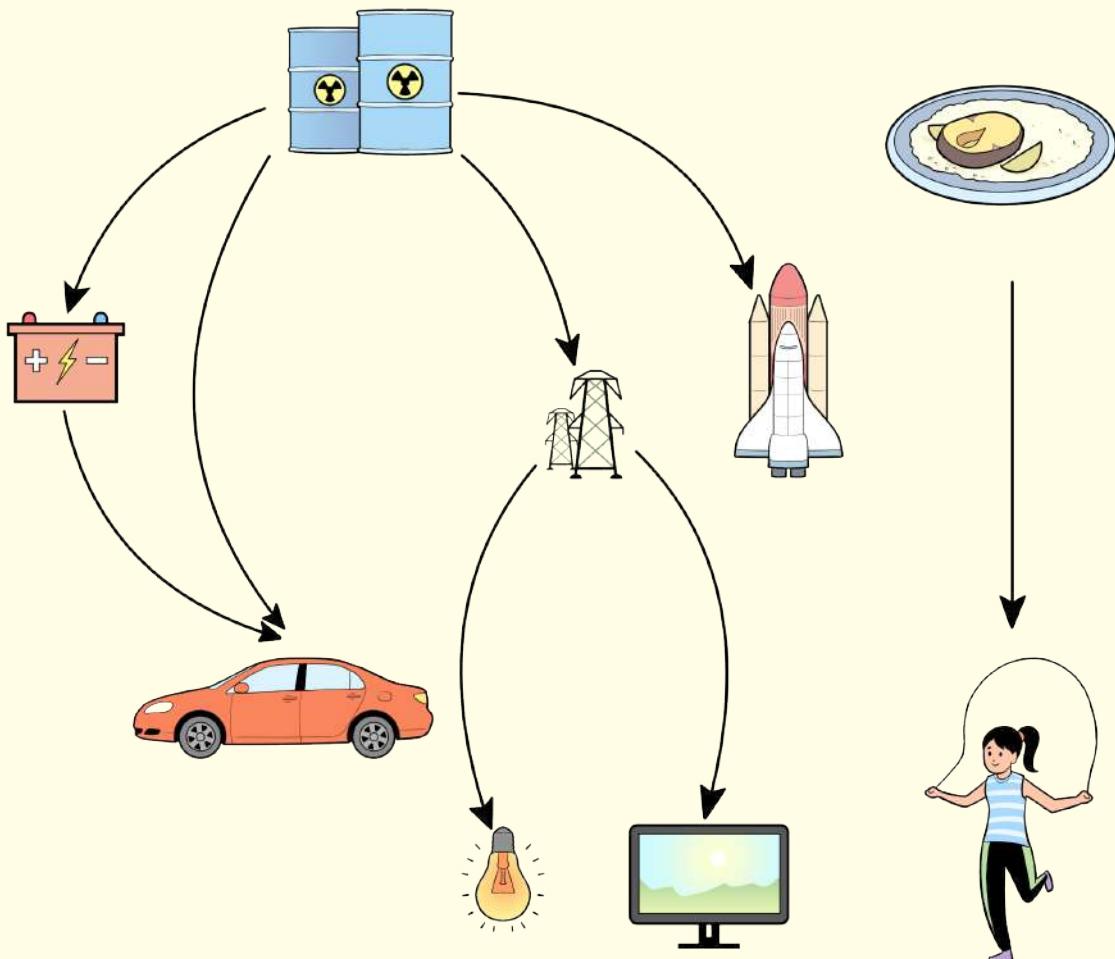
✍ Thus, one by one each group will show their toy, and explain how recycling has been done in the toy along with an explanation of energy conversion and energy conservation.

✍ You will do and bring the following homework in the next session.



### Homework

✍ In the figure below, write, next to the arrow, how the energy is being converted in each case.





# Miniature Garden: Terrarium!

Terrarium!! Surprised! It looks like almost an aquarium. A 'terrarium' is a small garden in the corner of the house. It is to create a self-contained ecosystem in a confined area. Terra means land area. Considering that it is a closed terrestrial ecosystem. How about making a terrarium? It is more fun if science can be learned by making a terrarium!





- ✍ The initial work is to be divided into several groups with the help of the teacher. Groups will observe how different animals (cows, goats, birds, lizards, insects) and plants grow and survive around the school. Decide in advance which group will observe which animals/plants.
- ✍ Any one of the team has to write down the observed information of the team in Table-1. With the help of the teacher, each group will present the observed data back to the class.

Table -1

Name of the group:					
Name of the selected organism(Any animal/plant)	How are their habitats?	How are they growing up?	What challenges do they face for their survival?	What are their foods?	How is their health?

- ✍ Now, with the help of the teacher and based on the found information, discuss your ideas about respiration and food intake of living organisms. Later, you will clarify your ideas about respiration and food intake of living organisms after reading the related chapter.
- ✍ In class, as a group, you will present the information that you have known about

the growth and survival of animals and plants.

- ☞ The presentation can be of various forms – for example, through drama. You will play the role of different animals and plants in nature. Those who want to act should write the characters' names on white paper and paste them on your chest. You will decide the dialogues after discussing them among yourselves. The dialogue will focus on the growth, survival, food intake etc. of animals and plants. If necessary, take the help of the teacher



## Sessions Three and Four

- ☞ Now, you will make a terrarium with the help of Worksheet-1 following to the previously formed groups.
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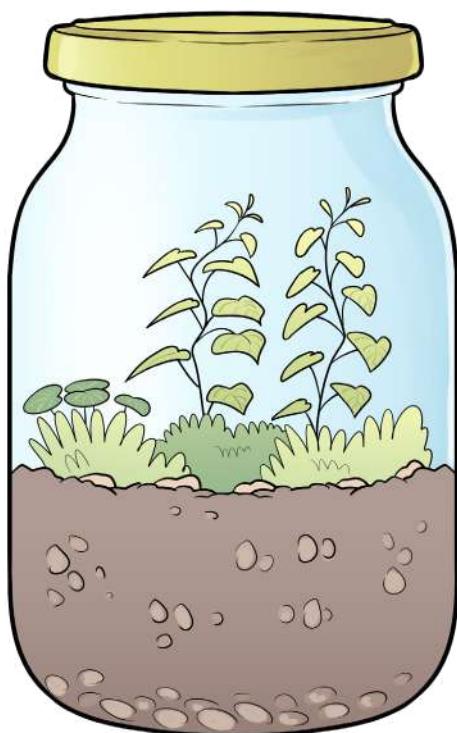
### Worksheet-1

#### Name of the project: Making a closed terrarium

Required Materials: A glass jar/ a plastic container, pebbles, soil, broken clay-pots, bone meal, coal, mosquito nets, water, moss, weedy shrubs and algae.

#### Procedures

- ☛ 1. First, collect the necessary materials and clean them well. The glass jar/plastic container should be thoroughly sterilized to prevent fungal infection.
- ☛ 2. Place some broken clay-pot pieces at the bottom of the glass jar/plastic container. Broken clay



pots can hold a good amount of water which keeps the terrarium moist.

- ➲ 3. Now, place some pebbles on the broken clay-pot pieces.
- ➲ 4. After that, lay a wired net/mosquito net on the pebbles. The advantage of the wired net/ mosquito net is that the soil cannot go downwards.
- ➲ 5. After placing more pebbles on the wired net/ mosquito net, cover it with coals to create a thin layer.
- ➲ 6. Put soil on the thin layer of coals in such a way so that the layer becomes thick.
- ➲ 7. Decorate one/two small stones, small pieces of dead wood for the beauty of the terrarium. Now plant few small Thankuni plants with soil very carefully. You can plant your favorite plants also if you want.
- ➲ 8. Carefully collect some moss layers from the old wall or soil and spread it on the remaining space on the surface of the terrarium.
- ➲ 9. Finally, it's time for watering. Spray the water carefully so that the surface of the terrarium gets wet. After 20 minutes, spray water again. Now close the lid of the glass jar/plastic container tightly.
- ➲ 10. Well! A closed terrarium is made. It should be stored in a shaded place where light can reach. But, make sure that it is not placed in direct sunlight.





## Sessions Five and Six

- ✎** In this session, gather according to previous groups. Go near to the closed terrarium you have made and observe it well. Write down the obtained information in Table-2.

Table-2

Name of The Group:			
What is the condition of preserving the terrarium?	How are the plants in your observation?	How is the colour of the leaves of the plant in your eyes?	What is the reason for the plant's survival in a closed terrarium?

- ✎** After observing the terrarium, put it in its proper place. Discuss the obtained information from the observation among yourselves in groups. In the discussion, try to find out the answers to the questions in Table-3.

## Science

Table-3

Questions	Your answers
How does photosynthesis work in a closed terrarium?	
How does the oxygen cycle work in a closed terrarium?	
How does the watercycle work in a closed terrarium?	

- ✍ Write a summary of your observations and discussions in the notebook of any group member.
- ✍ In the next session, observe the closed terrarium again in groups. Is there any new change? If so, everyone in the group should write it down in table-4.

Table-4

What new changes could you notice in the second observation?

- ✍ Summarize the observations and discussions of the first session and discuss the changes in the observations of the second session among the groups. Write down the group opinions and conclusions by any group member on poster paper. At the end of each group's writing, present to the class.
- ✍ Now, from your group opinions, conclusions and reading the related content of the textbook will clarify the concept of how plants survive through photosynthesis and respiration, the oxygen cycle and the water cycle, and how the elements within a closed system maintain the equilibrium of the system through constant changes and mutual interactions. Based on this concept, try to explain how the balance of various elements of the natural environment is maintained.
- ✍ The teacher will explain the facts in light of your presentation and the contents of the textbook. Listen to the explanation attentively and write it down if necessary.

## Retrospection

✍ How have you felt about making a terrarium?

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✍ What new things have you learned from this work?

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# Earthquake! Earthquake!

Earthquake is a natural phenomenon. It is related to the internal structure of the Earth. In this experience we will uncover the causes of the earthquake. We will learn and practice what to do before, during and after an earthquake.





## Session One

- ✍ At the beginning of this experience, the students will discuss with the elders of the family (father, mother, siblings, grandparents, and others) and try to find out why earthquakes happen, whether earthquakes can be predicted in advance, what happens when earthquakes occur, what should we do when earthquake occurs and what should we do after an earthquake?
- ✍ Make a summary of the discussion and write it in the notebook. Share your ideas with the classmate next to you in the classroom. Discuss with your classmates and write down the new ideas you have got.
- ✍ Ask the teacher if there is any ambiguity.
- ✍ Collect information from the teacher about the two earthquakes that occurred in Chile and Haiti. Complete Table-1 below. Work at home or outside the classroom to complete the table if needed.

✍ Table -1

Place of the earthquake	Reasons of the earthquake	Epicenter the earthquake	The magnitude of the earthquake	The amount of loss/ damage	If any special incident is observed

- ∅ Looking at the table above, has any thought come to your mind? Compare the magnitude of the earthquake and the damage caused by the two events. What difference do you see? What causes the difference? Write your opinion below after a group discussion.
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Devastation caused by Haiti Earthquake

- ✍ Listen to the arguments of others. Engage in open discussions with everyone, including teachers.



## Session Two

- ✍ Try to understand how earthquakes in different parts of the world relate to the earth's internal structure. Read the internal structure of the earth from the investigative study. Draw the internal structure of the Earth. A student can make a model of the internal structure instead of drawing if wishes so.
- ✍ Construct an idea about continental plate tectonics by drawing diagrams. Share your ideas with your classmate next to you. Present your opinion in front of all the students in the class.
- ✍ Think about why tectonic plates can move. To make this clear, take a container of water, place a semi-floating solid, and observe. Discuss your ideas with the classmate next to you. Read the types of movement or displacement of the plates from the investigative study. Draw the types of movement of tectonic plates.
- ✍ Cut out paper, cardboard, or cork sheet and make a model of the Earth's different interior layers, and continental plate tectonics.



## Session Three

- ✍ You have learned about the causes of earthquakes. Now think, why don't we get an earthquake forecast? Take decisions by group discussion.

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✍ Since we cannot predict earthquakes, what kind of preparations should be made in normal conditions to reduce the damage caused by earthquakes? What should we do during an earthquake, and what should we do after an earthquake? Decide by group discussion.

✍ Preparations to be taken under normal circumstances:

Handwriting practice lines for writing about preparations under normal circumstances.

✍ What should we do during an earthquake:

Handwriting practice lines for writing about actions during an earthquake.

✍ What should we do after an earthquake:

Handwriting practice lines for writing about actions after an earthquake.



- ✍ One person from each group has to present their group decision. Use poster paper for writing or drawing to present. You can present in any other way also. After the presentation of one group, take feedback from other groups.
- ✍ Read the sections from the investigative study about what to do in different stages of an earthquake. Then, compare it with your group's ideas. Check whether any of the topics given in the investigative study are missing in your group decision.



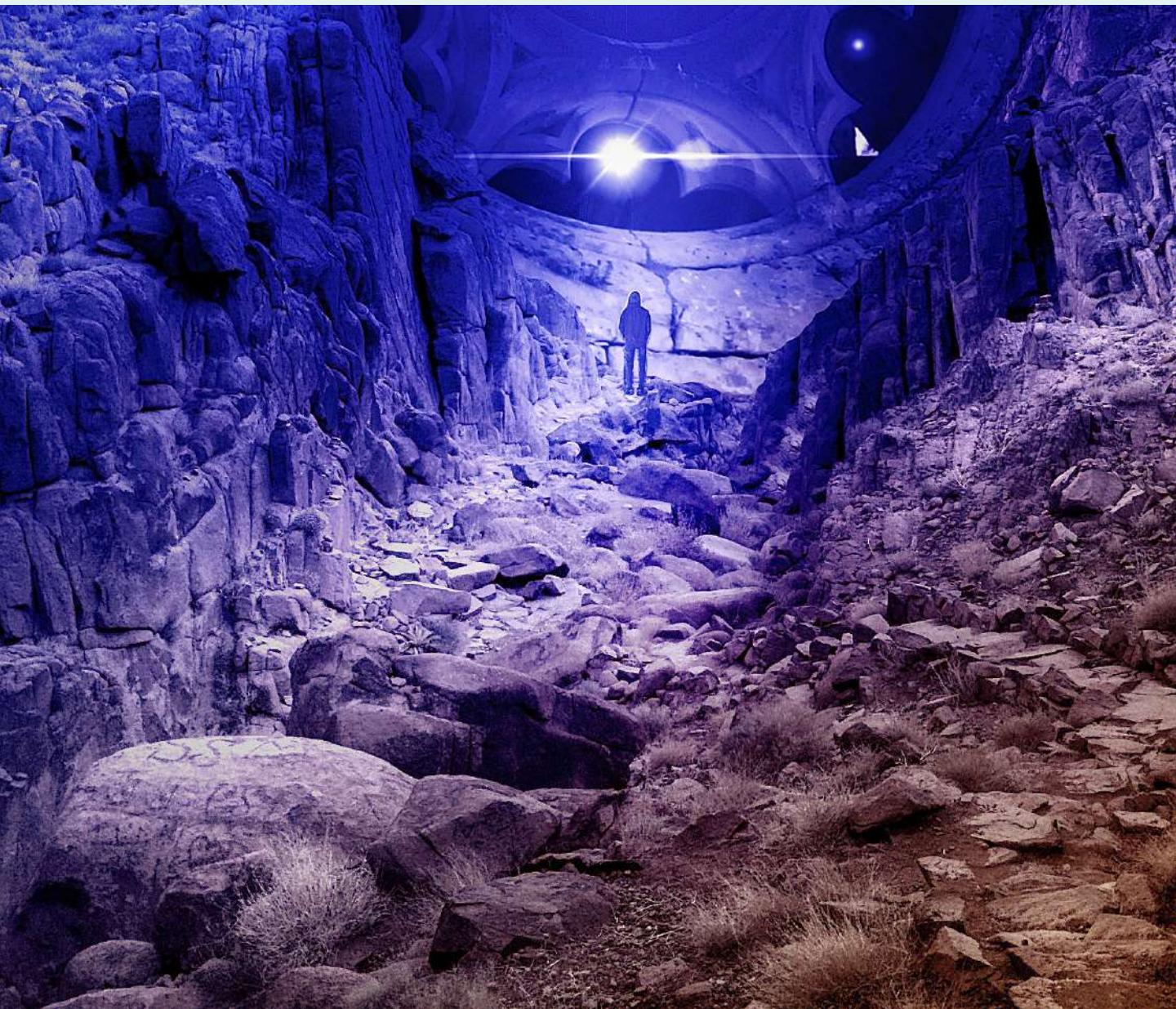
## Session Four

- ✍ We have learned what to do during the different stages of an earthquake (before, during, and after). Now, we will practice our activities by creating an artificial earthquake environment. For this, we will take permission from the head of the institution.
- ✍ For this, we will complete an earthquake drill. You can move classroom chairs, tables, benches, etc. to create an earthquake environment.
- ✍ We will follow our group decisions while practicing what to do in the different stages of an earthquake.
- ✍ We will definitely know the feelings of all the students after this earthquake drill is over. We will discuss the benefits of earthquake drill in the classroom. Here, of course, we will discuss whether there is anything left out in the drill process.

# Science Fiction!

Certainly all of you like to read story books? You read so many types of books- fairy tales, realistic literature, science fiction etc. How would it be, if a book was published with your own writings and drawings, and you yourself were the publisher of the book? Since this work is part of the science subject, let's choose science fiction as subject.

Let's start then!





## Session One

- ✍ How about organizing a small book fair before you publish your book? Taking the help of the teacher, in session one of this learning experience, you can organize a book fair in your class. You will bring the science fiction books and magazines from your homes to school on this day. Write your name beautifully and attach it on a few benches or tables placed to each other and arrange the books so that everyone can see everyone's books. Go around and look at other friends' books—what are the books about. You can talk with your friends about the books of your favourite authors that you see here.
- ✍ If possible, go to your school or district/upazila libraries with your teacher or guardian to see and read different types of books. If there are magazines, check them out as well. You will minutely check the content of the book or magazine, how it is written, how the writings and pictures are arranged.
- ✍ Now sit together in the classroom with your friends and think about the steps of publishing a book. Whenever the first page of each book is turned, a page is allocated for the 'Printer's Line' on the left hand side. Here you will see the names of the main people behind the publication of books, such as - Authors, Illustrators, Publishers, Proprietors are written. Apart from this, before it is printed, a book has to go through many other steps like proof-reading, editing, binding, etc. Make a list of the steps to follow to publish a book by looking at the printer's line of different books, or with the help of teachers and others. It will be the best if you interview someone who is involved in publication of books.

### প্লাটক তুফান (বৈজ্ঞানিক রহস্য)

আচার্য জগদীশচন্দ্র বসু, এফ. আর. এস.

বঙ্গীয় বিজ্ঞান পরিষদ—  
২৯৪১২১, আপার সারকুলার রোড,  
কলিকাতা-৯

One of the earliest science fiction stories published in Bangla language in the whole Indian subcontinent was Palatak Tufan (first published in 1896). Are you surprised to notice the name of the author? Yes, world renowned scientist Jagdish Chandra Bose is the author of this science fiction story!

- ✍ If you can find someone of such kind or a librarian who knows a lot about books, you can ask him how to write a book or magazine together, how to edit, proofread, and how to publish a book after preparing the cover and binding.
- ✍ Besides, talk to your friends about why you like a particular book or what you like about a book. Ask other friends why they like a particular book. It is important to keep these things in mind while publishing your own books.
- ✍ Now think about what kind of content is usually found in science fiction story or book; in what kind of context the story of this genre is written. Talk to your friends and see what they think.
- ✍ If you wish to read a book of another friend, then borrow the book with his permission. If someone else wants to read your book, you can also give it to him/her. In this way, in the first session, finish your activity of exchanging books and discussing the content of books.



## Session Two

- ✍ After the first session, you must have got an idea about the publication of books or magazines. Now it's time to do our own work. A book containing your own science fiction stories will be published. You must have already got some idea about what the contents or subjects of science fiction novels are like. There are many things that you can choose as the subject of your story. You can think of the ideas of stories about what the world will be like in the future, what is the future of the universe, what would it be like if you press a time machine and go to the past or the future. Even aliens can be the subject of your story. But there is one condition, that is, even if it is science fiction, it must have logic. In other words, even if your story is fictional, it cannot be presented with Pankhiraj horse or two-headed monster as done in fairy tales. Even if it is science fiction, scientific theory and data must be used correctly while writing the story.
- ✍ Since everyone in the class will publish the book together, everyone's participation



Aliens are one of the favourite subjects of science fiction writers. Numerous science fiction stories, novels, and movies have been created around the world featuring these aliens, and their spaceships

is important. To do the work in an organized way, first divide yourselves into several groups. Now write down who are the members of your team in Table-1.

- ✍ Decide a name for your team by discussing with all the team members. Fill in the work column in Table-1 based on who will do what type of work (e.g. writing, painting, decoration/illustration, etc.).

Table-1

Name of the Team	Names of the Members	Work

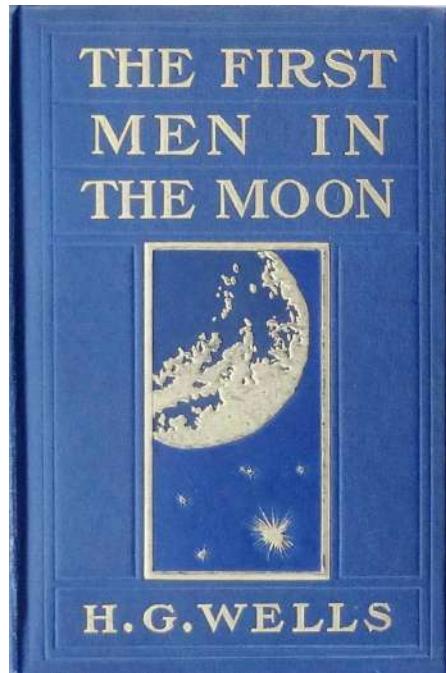
- ✍ There should again be a separate committee consisting of representatives of all teams whose task would be to edit the entire book. Have you understood the meaning of editing? After all the writings of all teams have been submitted, the task of this group will be to correct them, to arrange them in order, and to proof-read the spelling mistakes. That means, gathering the writings of all groups to form a complete book and correcting the mistakes. Similarly, there will be a publication committee who will manage the cover, drawing, printing, binding etc. to give the final shape of the book. These Editorial and Publication Committees will include one elected representative from each team.

✎ All members of your team should vote together to select the representative members from your team for the editorial and publication committees. In this way, select an editorial committee with one editor representative from each team and a publication committee with one publisher representative.

✎ This time, understand from the teacher what the task is and how to do it. The teacher will ask you to read different types of science fiction stories and novels, and to watch movies or documentaries which you will read and watch on your own initiative.

✎ Besides, you can again discuss the books that you exchanged among yourselves in the first session.

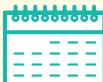
✎ The Editorial and Publication Committees will fix the deadlines for various stages of book publication by discussing with others. Take notes of the dates in table-2.



In 1901, the famous science fiction writer H. G. Wells wrote this book, 'The First Man on the Moon'. It seemed fictional then, but now we know that many years after the publication of this book, man actually set foot on the moon!

Table-2

Steps	Deadline	Remarks



## Homework

- ✍ Before starting to write a science fiction story, you need to get the idea of the story. For that purpose, the Earth and Universe chapter of the 'Investigative Study' book will help you. From this chapter, you can learn many new things—how the universe was created, what the universe is made of, stars, galaxies, black holes, big bang. And while thinking about these things, the idea of the story can also come to your mind. Moreover, since it has been said at the beginning that in the case of scientific information, wrong information cannot be given. So it is better to know some things in advance. Before the next session, you will read this chapter carefully as homework.



## Session Three

- ✍ At the beginning of this session, sit with your respective groups. Since you have already read the Earth and Universe chapter from home, now discuss it among yourselves. If you haven't read it, you can read it during the discussion.
- ✍ If you face difficulty to understand any part, take the help of the teacher. The teacher may not have the answer to some of the questions. In that case, note down the questions, so that everyone, including the teacher, can find the answer to this question later.
- ✍ Now write the answers to the following questions—
  - ⇒ Which fact about the creation of the universe do you find most surprising?

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➲ Which new words and meanings have you learnt from this chapter?

➲ On what basis has human thinking about the concept of the universe changed over time?

➲ Have you ever noticed carefully the night sky yourself? Do you find any relationship between your observation and the rotation of the earth around the sun, other planets in the solar system, constellations and galaxies, etc.?

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- ✍ Brainstorm the plot of the story from your team through discussion with the team. One story from each group will be included in the book. So decide together what kind of story it might be. After thinking about the main idea of the story, check yourself carefully to see if any deviation of scientific data has occurred. If there are multiple ideas, discuss and decide the final idea.
- ✍ When the idea is finalized, present it to the other teams. Take note of the feedback that other team members will give- it will enrich your stories. And when other teams will present their story ideas, all members from your group will check those together. During this checking, two things should be kept in mind - whether the story is original and whether there is correct and appropriate use of scientific knowledge.
- ✍ If the number of students in your class is large, instead of presenting your idea to everyone, sit together in two groups. There one group will check the ideas of the other group.
- ✍ Write the answers to the following questions based on the story ideas of the other group that you have had the opportunity to explore-
  - ➲ What is the context and main content/theme of the story?

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- ➲ What scientific knowledge has been used or what scientific facts have been mentioned in this science fiction story?

- ⌚ What scientific facts do you think are misrepresented in this story? What is it and why do you think so?

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- ✍ Discuss in your team and think whether you want to make any change in the story according to the other team's opinion; then finalize the idea. Discuss among yourselves and make a plan how you will complete the writing and drawing tasks within the allocated deadline.



#### Session Four

- ✍ You can do the story writing in the classroom or at home. Discuss and organize the story together, then one of the team members should take the responsibility and write it.
- ✍ Write down a summary of the story below as your own note-

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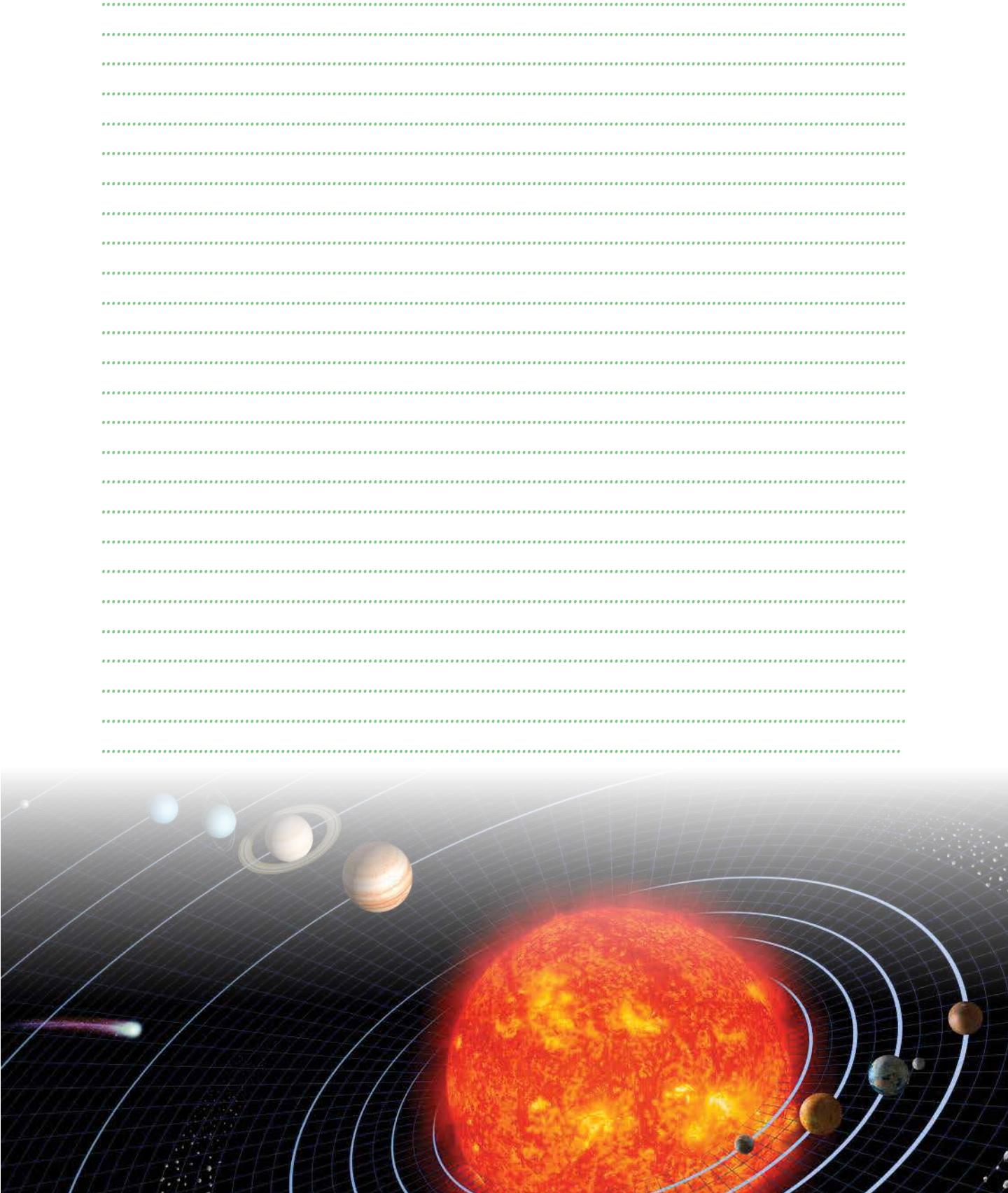
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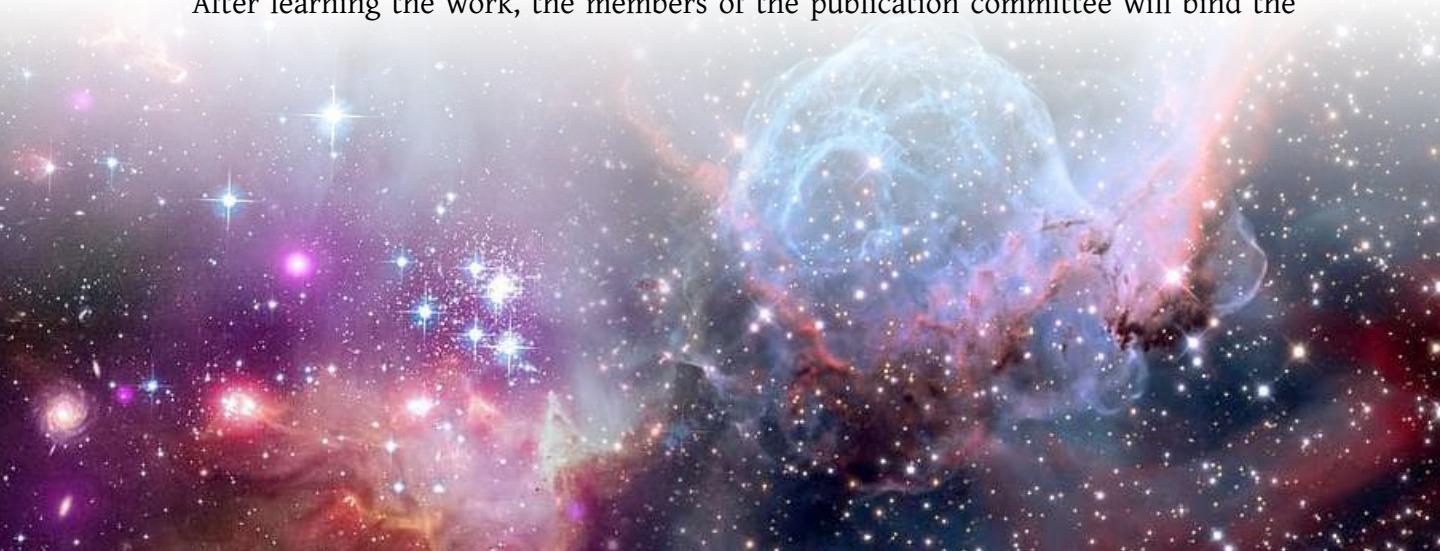
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## Science

- ✍ The one who is good at drawing in the group, must have been given the responsibility of drawing or illustration with the story? Others can help this artist with ideas of what kind of pictures can be drawn with the story.
- ✍ Complete the writing and drawing within the allocated time and submit it to the editing committee.
- ✍ The members of the editing committee will edit and finalize the writings of any other team except their own. Proofreading can be done by one or more members who are skilled at correcting spelling errors.
- ✍ After editing and proofreading the stories submitted by all groups, one of you should take the responsibility and collect all the writings and give them to the publication committee.
- ✍ The publication committee will do the necessary work for the final publication of the book. Stories can be composed, if possible. Or if that is difficult to do, the book can be finalized by hand writing. In this case, the stories can be rewritten in the book format by one or more members in your class who have neat and clean handwriting. The publication committee will also decide how the images and illustrations from all teams will be incorporated into the book. In addition, the pages at the beginning of the book including the inner cover, printer's line, index etc. will also be prepared. If necessary, take another look at the previously seen story books.
- ✍ Have you thought about what the name of the book will be? All the class discuss and suggest what the name could be; vote together and finalize a name.
- ✍ One or more students from your class can take responsibility for drawing the cover.
- ✍ Then it's time to bind the book. Does anyone in your class know how to bind books? In that case, the rest of the students can learn book binding techniques from him or them. If that is not possible, you should take the help of a parent of any of your classmate, a teacher or other staff, or a professional bookbinder. After learning the work, the members of the publication committee will bind the



book like a real book.

-  Has the binding been done? Now a real book has been published with your own stories, drawings, and it has been published by yourselves! Have you thought what an extraordinary thing it is?
-  In this session, everyone will discuss and decide on a date on which you would like to hold a book release party where your self-published book will be unveiled. Also plan how and when to organize this publication festival. But make sure that this festival is not going to be expensive in any way.
-  If you want, you can also make invitations using coloured paper, colours etc. which you can give to the guests of your event.



## Session Five

-  After unveiling your book at the publication festival with invited guests, you can read or present selected excerpts from it.
  -  The group members can give feedback to other groups by reading their writings.
  -  Finally, place the book in the school library or in your classroom, if you have a bookshelf so that students from other classes can also read it. Your teacher can scan this book and save it in ebook format so that more people can read it.
  -  Have you read all the stories in the whole book? Which story did you like best (except your own team's story, of course)? Write a summary of your favorite story below. Based on this story, write the answers to the following questions-
- ⇒ Synopsis of the story-
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## Science

- ➲ What scientific knowledge is used in this science fiction story or what scientific facts are mentioned?

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- ➲ What have you liked most about this story? Why?

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## In Search of Dinosaur Fossils!

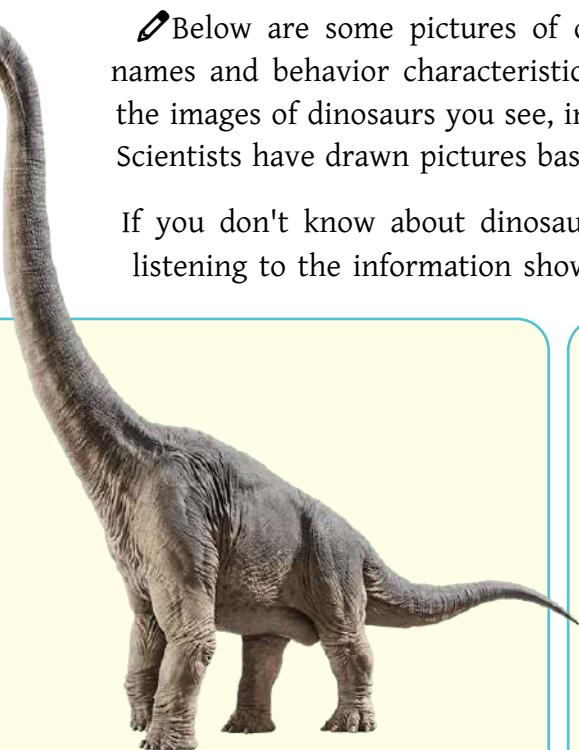
No one in the world has ever seen a dinosaur. Still, we know a lot about this amazing prehistoric creature. Must you also have a lot of curiosity? Everything we know about dinosaurs comes from fossilized dinosaur bones that scientists have discovered. And these bones were found in different rock layers on the surface. So through this experience, you will learn about dinosaurs and various types of rocks and rock formations.



- ✍ You have heard the name of dinosaurs in newspapers, movies, and various places in books. The dinosaurs that once ruled the earth became extinct six and a half billion years ago. But then, how do we know so much about dinosaurs? You know a lot about which dinosaurs were from which period, their size, what they ate, etc.! Let's refine the previous ideas.
- ✍ Try to answer when the teacher asks you what you know about dinosaurs.
- ✍ The teacher will show you pictures of different types of dinosaurs and ask you about those dinosaurs. If you already know, then share the information.

✍ Below are some pictures of dinosaurs. If you know those dinosaurs' names and behavior characteristics, write them down. Remember that all the images of dinosaurs you see, including those given here, are imaginary! Scientists have drawn pictures based on imagination observing their bones.

If you don't know about dinosaurs before, fill in the following cards by listening to the information shown or told by the teacher.



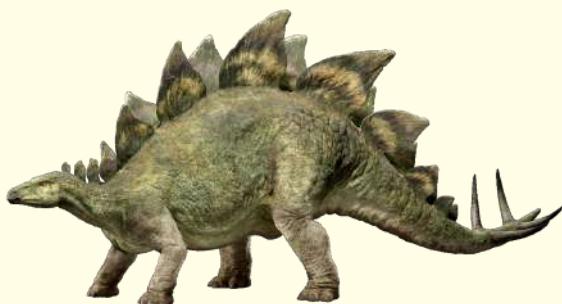
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As mentioned earlier, we know about these prehistoric animals from their bones. But how did we know so much information from bones? Present your ideas to the class.

Look closely at the next picture. It is a picture of fossils. Bones of different kinds of animals are found inside old stones or rocks, which are called fossils. By examining these fossils, scientists have



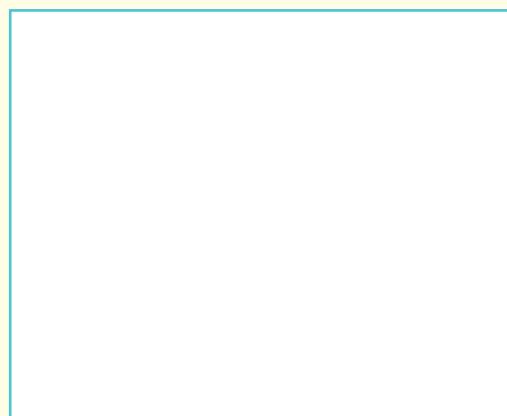
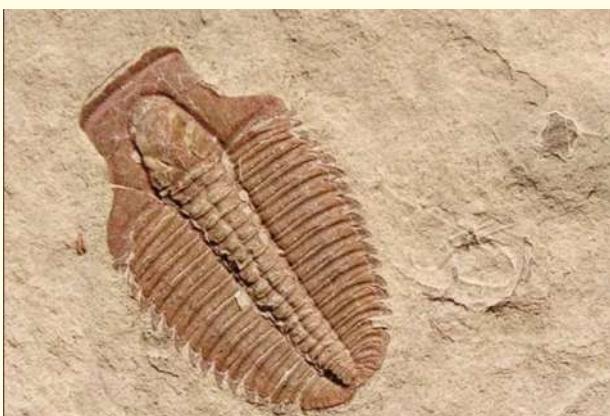
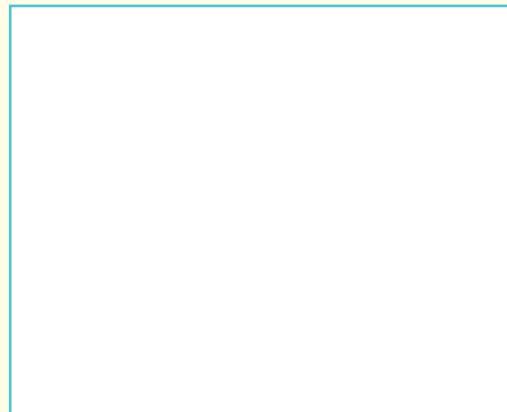
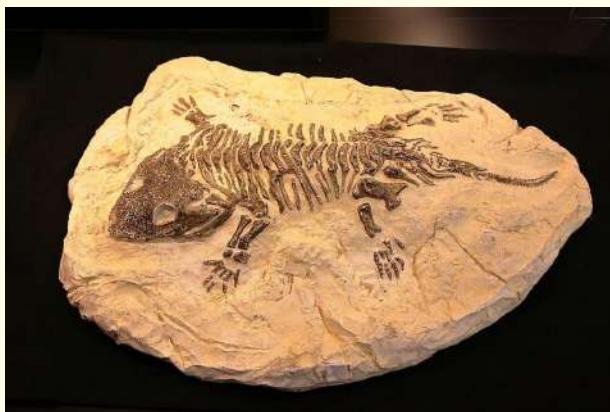
obtained information about the world and animals dating back millions of years.



### Home Task

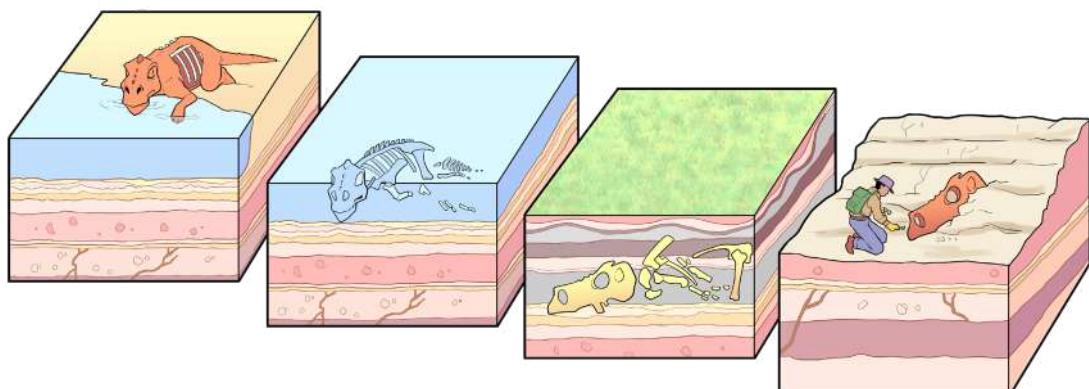
Look at the pictures of the fossils below, and by imagination, draw the image of the organism in the blank box next to it.





## Session Two

✍ In the last session, you came to know about 'Fossils'. In this session, you will learn about fossils and rock formation. In simple words, any trace of a plant or animal in a rock or stone is a fossil. Look carefully at the picture below-



- ✍ Somewhere the carcass (dead body) of prehistoric animals may have been buried in the soft alluvium. Gradually its soft flesh decomposed. But the bones did not get destroyed even after a long time. These bones were carefully covered with layers of mud. And as the soft alluvium gradually turned into hard rock, those bones or marks survived as permanent signs on the stone. These bones or marks are fossils.
- ✍ Maybe one day, an earthquake or another caused the rock to come out from under the sea, and dry soil appeared. Then the hard rock layer was washed away by river and rainwater. And that skeleton, trapped under the rock for ages, came out one day. Someone discovered that fossil one day, and by examining it, people found out how many years ago that organism was of, what its shape was, etc.
- ✍ Then you must understand that fossils have an important relationship with the type and structure of the rock. So this time, let's know about rocks.
- ✍ Now carefully read the structure and use of igneous, sedimentary, and metamorphic rocks from the chapter 'Different types of rocks' in the Investigative study book.
- ✍ If there is any difficulty in understanding or a question, ask the teacher to clarify the idea.
- ✍ Now, Tell me, what kind of rock can dinosaur fossils be found in?

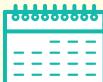


- Ø After reading, discuss in pairs with the classmate next to you and fill in the table below.

Rock type	How is it formed?	Characteristics	Usage
Igneous			
Sedimentary			
Metamorphic			



Note carefully the type of rock that you see in the picture. Can you guess what kind of rock it is by looking at the arrangement of layers on the rock?



## Home Task

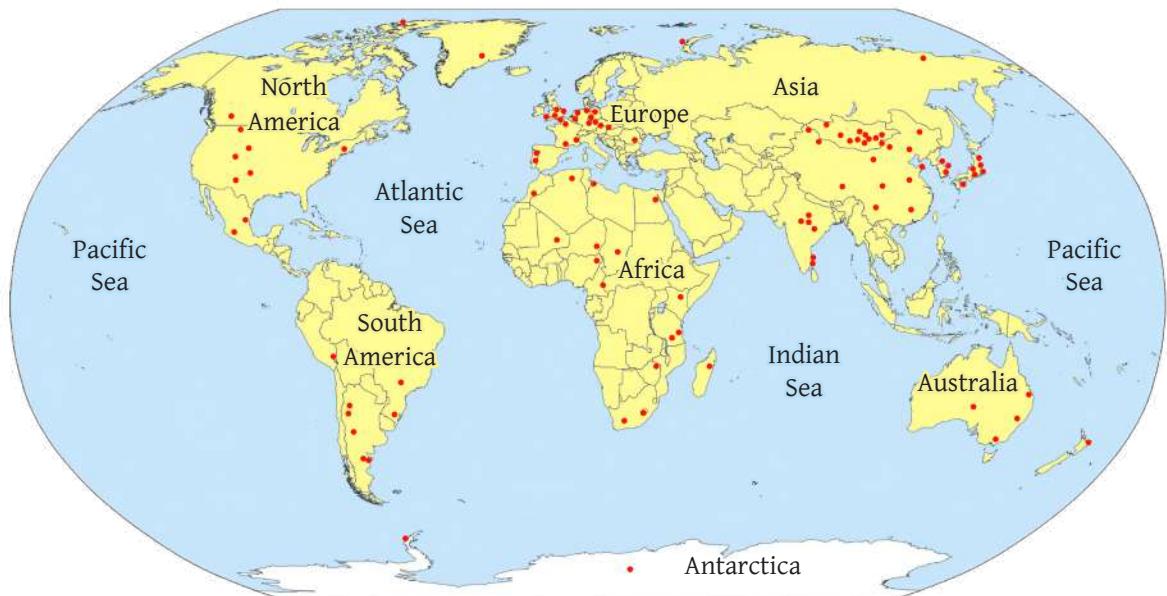
- Identify rocks based on physical and chemical properties and write the constituents of rocks in the table below.

Rock type	Identification based on physical and chemical properties	Constituents of rocks
Igneous		
Sedimentary		
Metamorphic		

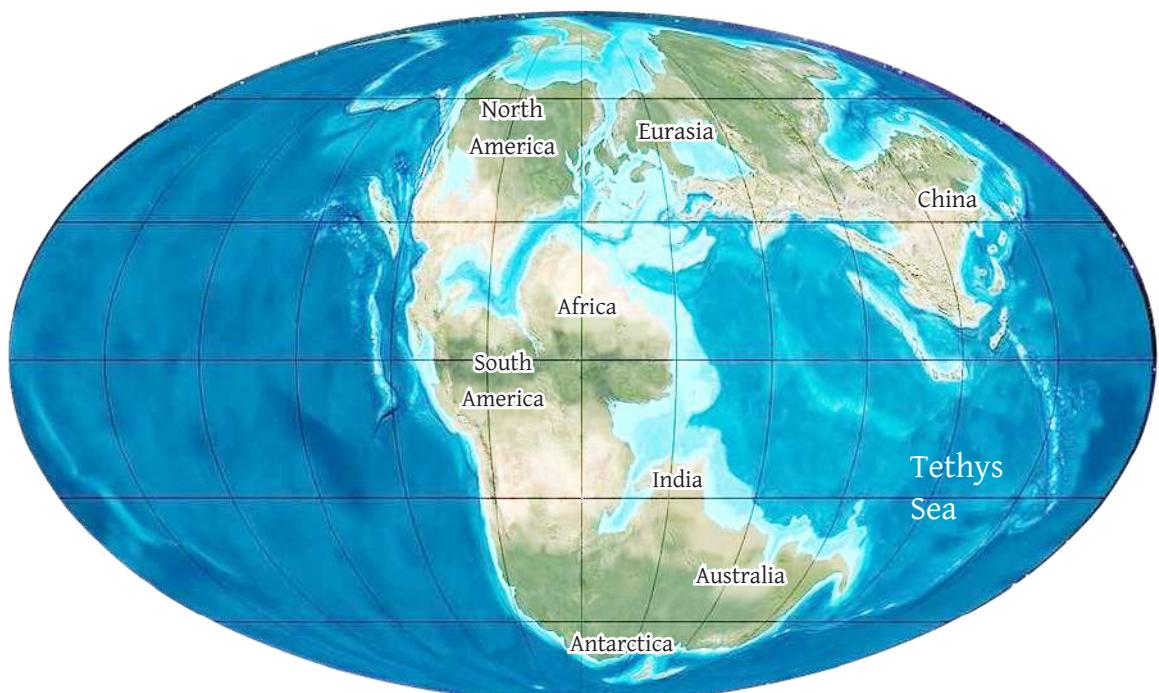


## Session Three

- You have learned a lot about rocks and fossils. What is the probability of finding dinosaur fossils in Bangladesh? Before going into that debate, let's find out where dinosaur fossils have been found in the world. And how was Bangladesh, the world's largest delta, created?
- Look closely at the map of the world on the next page. Dinosaur fossils were more abundant in the areas marked with red dots. But remember, when dinosaurs roamed the earth, the world map did not look like this at all!



- ✍ The map of the mid-Jurassic period, dated back to 170 million years, is shown below. Notice carefully where the present Indian Subcontinent was!



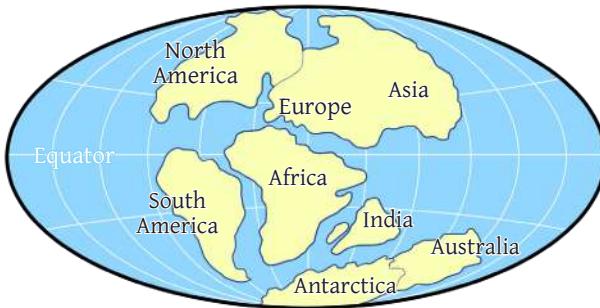
- ✍ Then the question must have come to mind, how did the Indian continent come to its present state? How was the world's largest delta, Bangladesh, created?
- ✍ In the chapter 'Earth Surface and Plate Tectonics Theory,' you have learned about continental plate movement. Some questions were answered there. Now let's know more about the creation of the Bengal delta.
- ✍ Even 50 million years ago, the Bengal delta did not exist. The northern and eastern parts of present-day Bangladesh were all under the sea. And there was no trace of South Bengal. Eighteen million years ago, the journey to the Bengal delta started from Gondwanaland. Gondwanaland began a rift among India, Antarctica, and Australia. And in these rifted plates, an ocean was created. The Bengal delta was formed over billions of years by the accumulation of sediments on the coast of the Indian Plate. On the other hand, the Indian Plate repeatedly collided with the Eurasian Plate to form the Himalayas. A large amount of water washed from the Gangotri glacier in the Himalayas flew down the Ganges and began accumulating in the Bengal basin. And this part of Bangladesh started to fill up. The modern Bengal delta took its present shape about 1.5 million years ago.



About 25 crore years ago



15 crore years ago



10 crore years ago



Present

- ✍ Now let's come to the main debate. After knowing so much information, what do

## In Search of Dinosaur Fossils!

you think? Is there a possibility of finding dinosaur fossils in Bangladesh? Write reasons in support of your answer in the space below.

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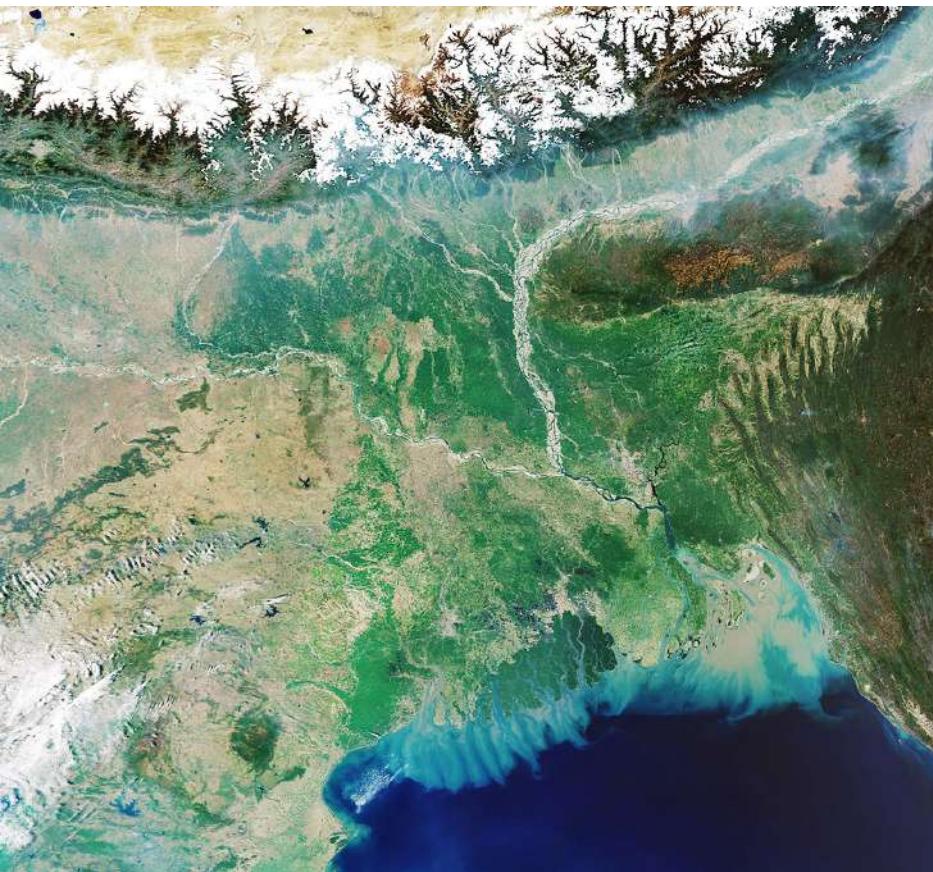
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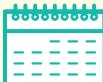
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Satellite image of the  
Bengal delta



## Home Task

- ✍ You can make your own fossil model by boiling the fish in clay or plaster of Paris (used to bandage broken hand legs. Available at drugstores) using a little water and imprinting it on the clay after removing the flesh and separating the entire bone. Apart from fish bones, animal footprints, snails, mussels, and even leaf veins can be used to make fossil models. Bring it to the next session to show it to others.



Fossils of the marks of trilobites: These animals ruled the earth long before the emergence of dinosaurs, approximately 52 to 25 million years ago.

- ✍ Collect the Investigative Study book of Science in class six and re-read the section 'Land Forms of Bangladesh'. It will help you in the next session.



## Session Four

- ✍ Arrange the fossil models you made at home and bring them to class on a bench or table so that everyone can see them.
- ✍ After watching, come to your seat and read the section on the roles of force and energy in forming rocks and minerals, various minerals and ores from the Investigative study book, and discuss with the classmate next to you.
- ✍ During the discussion, also share the part that you have read about the landforms of Bangladesh from the Investigative study book of class six.
- ✍ Now look carefully at the pictures on the next page and guess what kind of rock is most likely associated with the picture of landforms and why?
- ✍ At the end of the discussion, briefly write your thoughts and arguments in favour of the answer in the blank space.





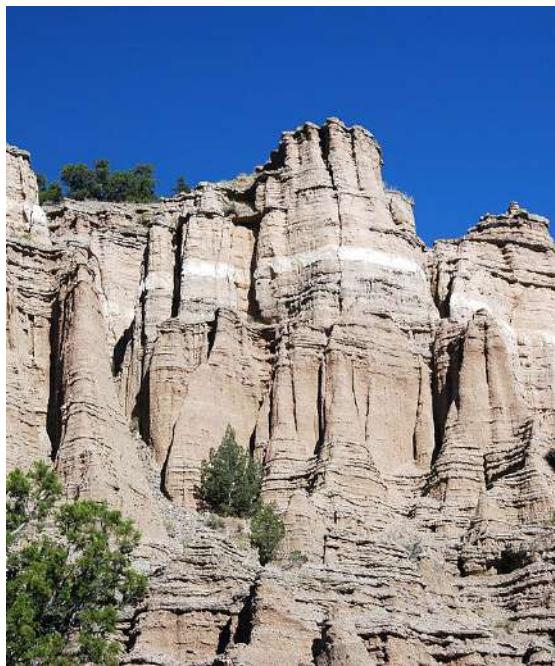
Rock type:



Rock type:



Rock type:



Rock type:

- ✍ Discuss the similarities and differences between the landforms in the pictures and the landforms of Bangladesh in pairs with your classmates and write them in the blank space below.

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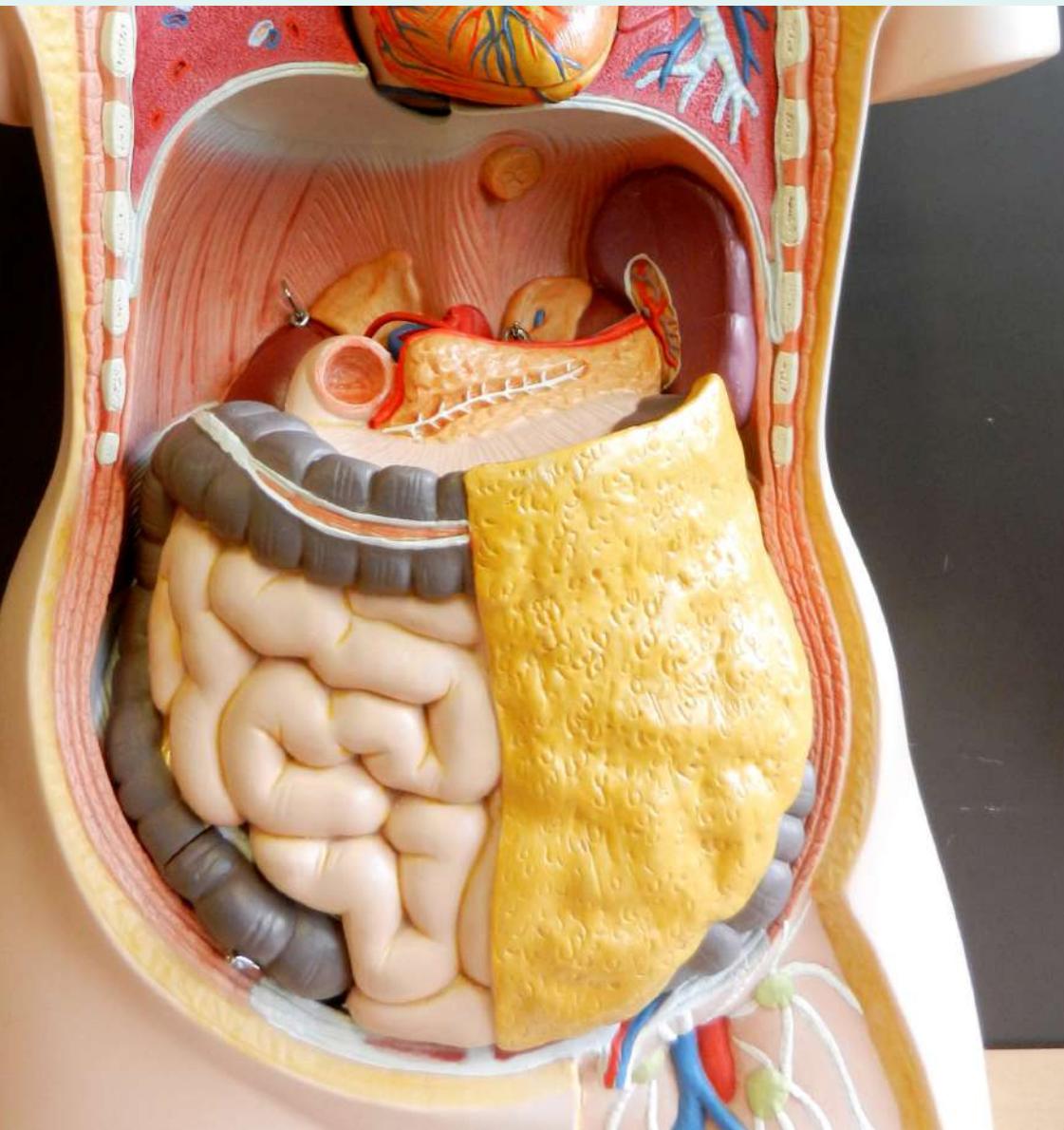
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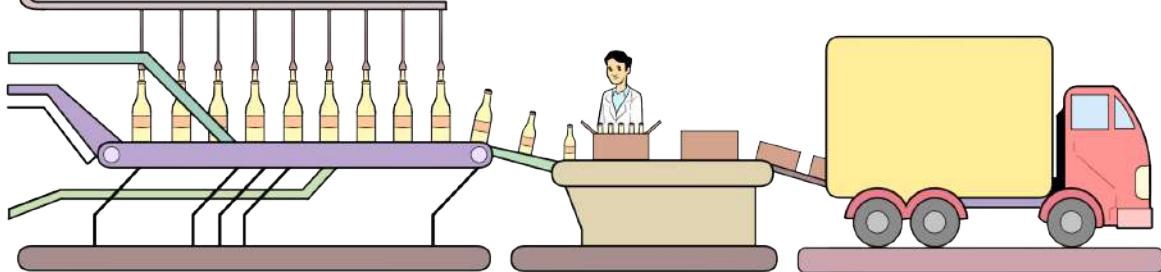
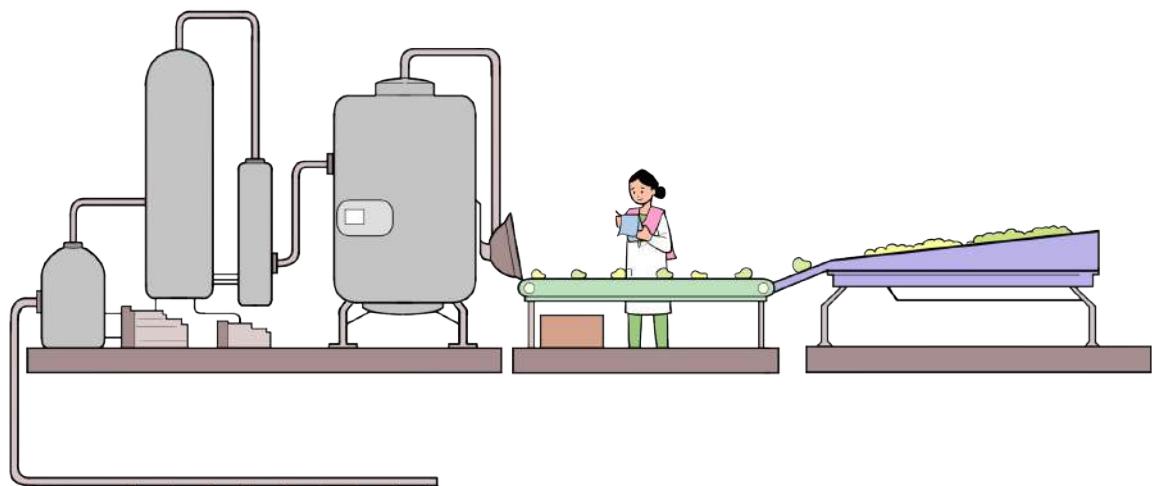
# Factory of Digestion

Have you ever seen how different factories work? In the factory, different workers use different machines to complete the entire work step by step. In the same way, the different parts of our digestive system complete the whole process of digestion starting from eating food to excreting waste at the end of digestion step by step. Come on! Let's take a tour of the digestive factory through this learning experience.





- ✍ Almost all of you have probably bought juice from shops. But have you ever wondered how juice is made in a factory? Who has contributed to make the juice? In preparing ripe mango juice, from the mango tree to the bottle, we have to go through many steps before getting it.
- ✍ Let's have a basic idea of how juice is made in a juice factory-
  - ➲ Ripe mangoes are collected from the trees and taken to the factory where they are washed and sorted.



- ➲ After these two tasks, they are made into pulp by a grinding machine.
- ➲ Juice is made by mixing various chemicals in the pulp.
- ➲ After bottling and labeling, the packaging is done by another group of people.
- ➲ Finally, another group of people take the juices out of the factory after packaging and sends them to different stores from where we buy and eat.

✍ Now, think about how does our body use different types of food we eat?

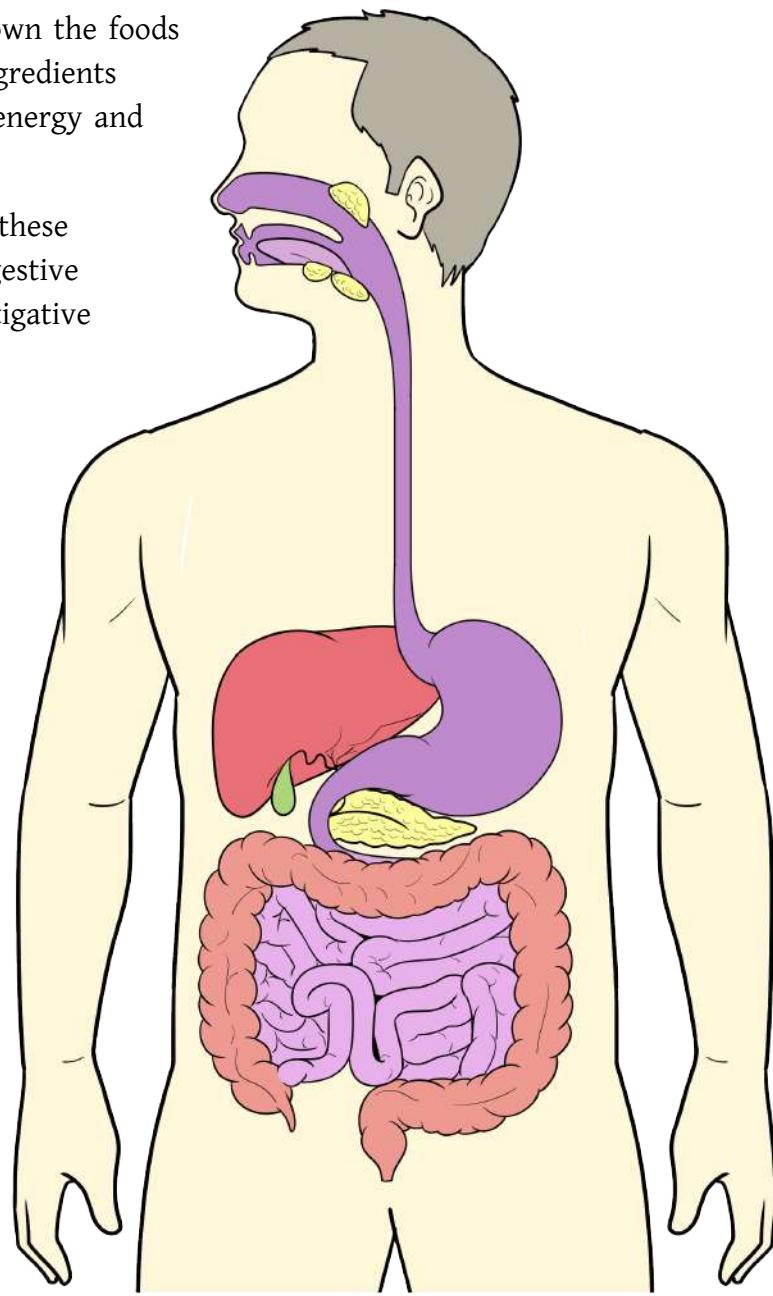
✍ Can the cells of our body use those foods directly? Or does it break down the foods and extract some of such ingredients that provide the body with energy and nutrients?

✍ Let us know the answers of these questions by reading the Digestive System chapter of the investigative study.

✍ Now, think carefully and search if you can find any similarities between the various parts of the human digestive system and the juice factory.

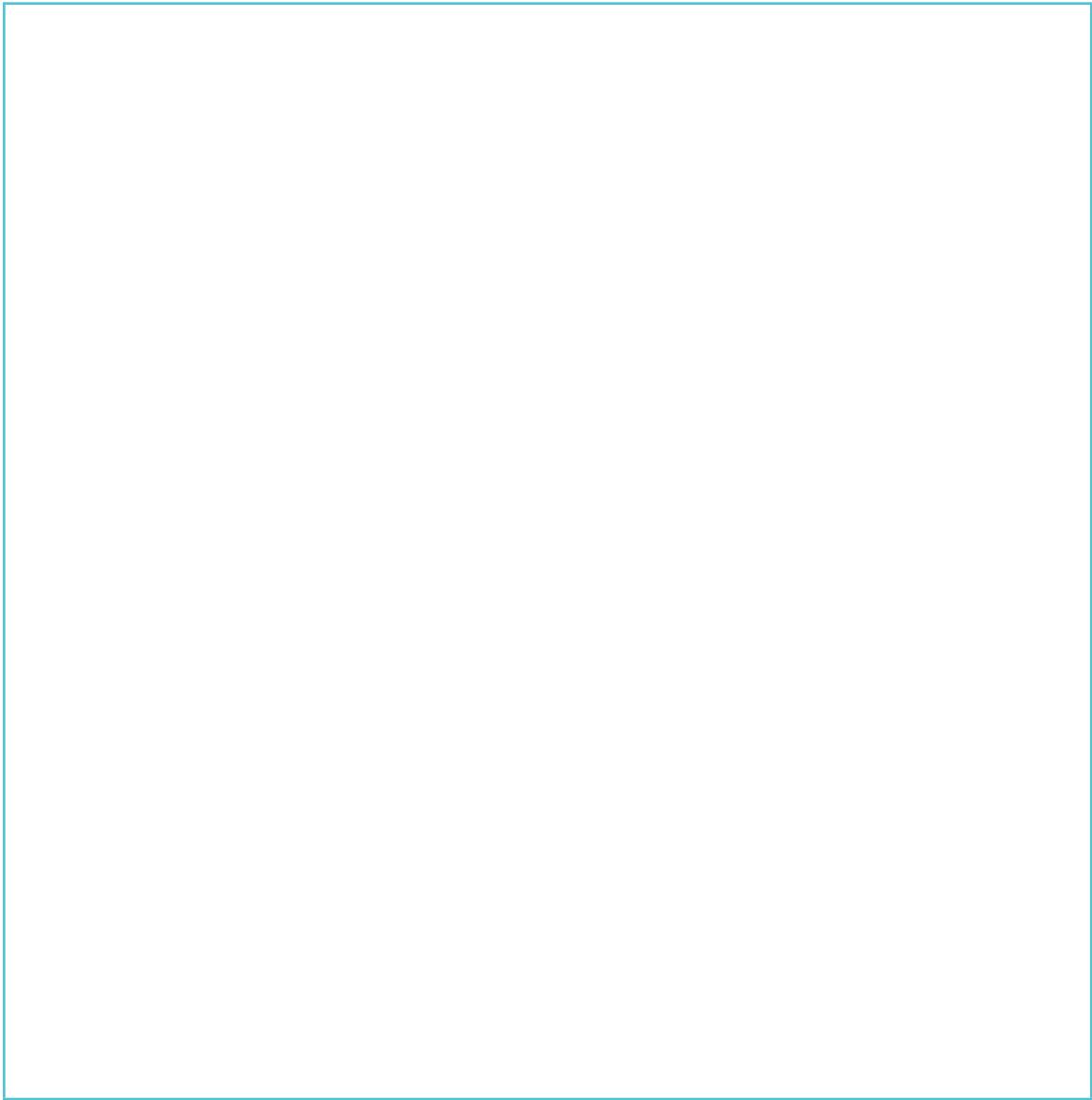
✍ Think of it, like fruits in a factory enter by a car, foods enter through the mouth; travels through the pharynx like a conveyor belt and breaks into pieces in the stomach like a crusher. Can it be thought in this way?

✍ Learn the names and



functions of the various parts and organs of the digestive system from the investigative study. If you face difficulty in understanding, ask the teacher to clarify the concept.

- ✍ Now use your imagination and draw a picture of a factory using the pictures of the organs of the digestive system.



- ✍ Re-read the investigative study's digestive system and glands section well at home before coming.



## Session Two

- ✍ You must have read the investigative study's digestive system and glands section well from home. In this session, you will prepare to act out the problems of the digestive organs and systems.
- ✍ Now divide into groups according to the teacher's instruction. Each group will have 7 students. Everyone will act out the entire digestive system. Write the names of the seven parts or organs of the digestive system on paper and choose each one by lottery. Write down who will play which role in the chart below-

Names of the seven parts or organs of the digestive system	The person who will act out from your group
Oral fissure	
Oral cavity	
Pharynx	
Esophagus	
Stomach	
Small intestine	
Large intestine	

- ✍ Well, can you tell the name of the organ which is left out? (Instead of playing the role of this organ, it is ok to use a dustbin.) Write the name of the organ below.
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- ✍ Now it's time to prepare for acting. Draw some foods on paper. Be prepared to demonstrate in a group role how an organ or part of the digestive system processes food and transports it to the next part. By lottery, any one or two from the whole class will also talk about digestive glands and their functions. So, prepare for that too.



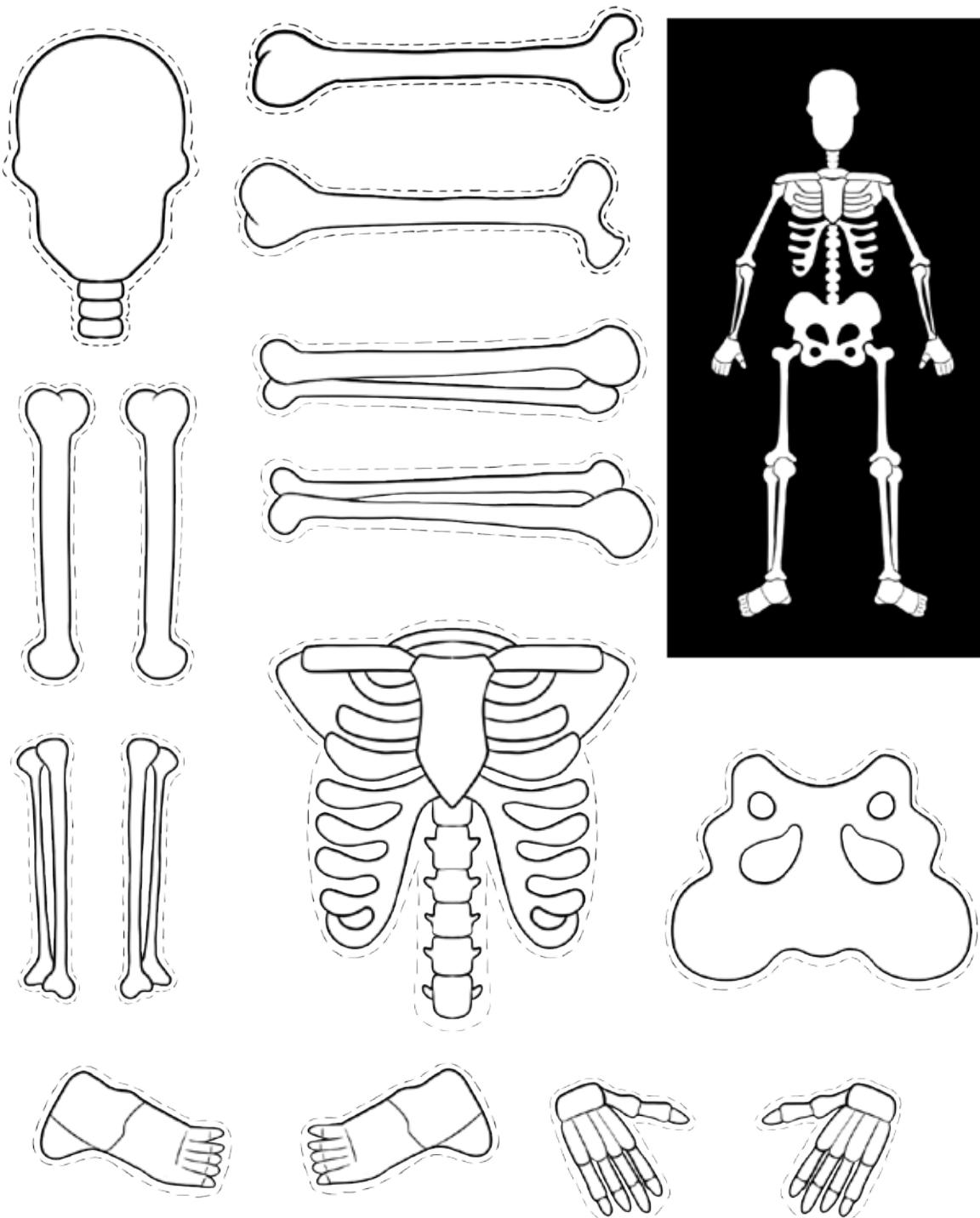
### Session Three

- ✍ You must have taken preparation for today's session.
- ✍ Now you have to act out with your group members how each part of the digestive system processes food and delivers it to the next part. Every two teams have to face each other. Both teams will act out the process of digestion by turn. The other group will watch the act and try to guess which member of the group is playing the role of which organ or part by looking at the sequence of steps in the digestion of food.
- ✍ Now, through lottery, the teacher will call one member of each category from all the groups who played the role of these 7 organs or parts. Those who have been named in the lottery for these 7 roles from mouth to large intestine, will talk about their location, structure and function in the digestive system one by one. So decide beforehand what dialogue to give by discussing with the person next to you. Finally, through lottery, any one or two from the whole class will also talk about digestive glands and their functions.
- ✍ Think about it, if a group of factory workers are absent or removed, will the factory run properly? Will the product be manufactured? In the same way, what problems can occur if any part of the digestive system does not work properly? Give your opinion after a group discussion.



### Session Four

- ✍ A structure was required in the first place to construct your school building. The structure is made of strong iron or steel rods in brick-built buildings. The structure of a thatched or semi-brick building is made of bamboo, wood, or iron poles.
- ✍ You will find the similarity of this example with our body. Like a schoolhouse, our body also has a structure. The human body has structure. In this session, we will learn about that structure today.
- ✍ So, read the skeleton section first from the investigative study.
- ✍ If you have any questions, ask the teacher to clarify the concept.
- ✍ Now divide into 7/8 groups and draw the fragmented pieces (as shown in the picture) one by one in each group on a hard board or paper.
- ✍ After drawing, cut along the edges of the parts and submit.



- ✍ A representative from each team will come and solve the puzzle to form the entire skeletal system. Note down which team is taking how much time to solve the puzzle.
- ✍ Make a model of a human skeleton at home using match sticks or jute sticks. You can also distinguish their types using different colors on different bones and junctions.

## Retrospection

- ✍ Do you have any factory experience in your area? Can you find any similarities between the various functions of this factory with the organs of the digestive system? Write your thoughts below.

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- ✍ Due to which habits or unconsciousness the work of the digestive system can be disturbed according to you?

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# Adverse Nature

We are the children of nature. But what to do when that nature becomes adverse? Why do disasters happen, what are the types of disasters, and what should be done during a disaster? This discussion is about these issues.



## Session One

- ✍ In this session, you will discuss on your own what natural disasters occur in your area. You will also discuss what natural disasters occur at what time of the year. You will do this by discussing in groups. Form groups consisting of five/six people.
- ✍ Discuss in groups and make a list of natural disasters that occur in your area. Discuss in groups and complete the table below.

Natural disasters that occur in your area	The time of year it takes place	In your opinion, the other parts of the country where these disasters are seen

- ✍ Find out if there is any folktale in your area about these disasters, their reasons, and how to survive them. For this, two of the team members will take responsibility for a single disaster. If the number of disasters in the list is long, each one of the team will take responsibility for one disaster. But remember that no disaster should be left out. If two people take responsibility together, take it in such a way that you can work together.
- ✍ If one/two take responsibility together, decide whom of the family and neighbors to go to gather information about the disaster. Information will be collected from father, mother and several elderly persons of the neighbourhood.



**✍** Collect information from family and neighbors outside of class as homework. Use the table below to collect the data. You can also make a chart on a separate sheet of paper.

Title of the natural disaster you are responsible for	Name of the information provider and relation	Why does this natural disaster happen?	If there is any folktale related to this disaster-	If there is any folktale related to the survival from of this disaster



## Session Two

- ✍ You have collected information about various natural disasters. You have received various information about natural disasters from different people. Sit in the previous group to analyze the data.
- ✍ Different members of the team collected information about different natural disasters. Discuss the information obtained about all the disasters. You have got various folktales about disasters. Put them all together and write them in the table below. Add your own opinion here. At this time, read the section 'Different geo-natural disasters in Bangladesh and Asia region' from the ninth chapter of the investigative study book.

What time of the year and  
why do disasters occur

Local folktales about disaster

Flood:

Draught:





### Session Three

- ✍ Share your decisions in group discussions with the rest of the class. Present from the investigative study book or by writing on poster paper.
- ✍ Take the opinion of other groups at the end of one group's presentation. Do so if you feel it necessary to add any new point as a cause of the natural disaster.
- ✍ In this way, present the work of all groups and gain an understanding of the cause of the disaster.



### Session Four

- ✍ In this session, you will try to guess the natural disasters that occur in different regions of the world.
- ✍ Arrange a globe with the help of the teacher.
- ✍ Observe the position of different countries of the world by looking at the globe. Observe especially the land formation and sea position. Imagine the position of the sun relative to different regions of the Earth. Consider the rotation speed and revolution speed of the Earth.
- ✍ Every one of your class altogether guess which natural disaster occurs in which part of the world and analyze the causes. Complete the following table together. At this time, read the section 'Different geo-natural disasters in Bangladesh and Asia region' from the ninth chapter of the investigative study book.

Natural Disaster	The regions where these occur	The reasons of the disasters thought by you
Flood		

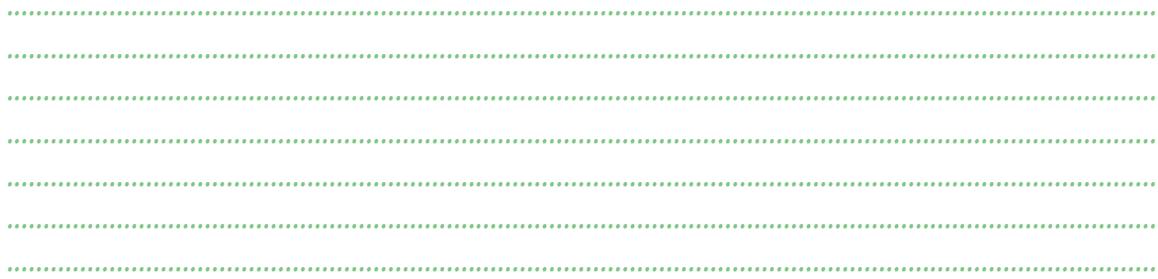
Cyclone		
Tidal Bore		
Tornado		
Draught		
Earthquake		
Eruption		

Tsunami		
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## Sessions Five and Six

- ✎ You have analyzed natural disasters and their causes in your respective areas and in different parts of the world. Now decide from group discussion what you must do to face the disasters.
- ✎ Present the group decision in front of all the other students. Get feedback from others and write what to do in the exercise book. At this time, read the section 'Different geo-natural disasters in Bangladesh and Asia region' from the ninth chapter of the investigative study book.
- ✎ Things to be done to face the disasters.



- ✍ You have figured out what to do as a team to deal with the disasters. Develop a plan to make other students in the school and community aware of this matter. You can make posters and banners with the 'things to do' and hang them in different places of the school. You can arrange a rally or take any other decision you like.
- ✍ Choose a place to hang posters and banners that can be seen by school students as well as community members.
- ✍ The plan to create awareness among other students in the school and the community must be done by all the team members. Some will make posters; some will make banners; some will select the venue etc.





- ✍ Discuss in groups how natural disasters affect living and non-living elements. At this time read the section 'Effects of geo-natural phenomena on living and non-living elements' from Chapter 9 of the investigative study book. Here you have to consider the natural disasters of your area with importance.
- ✍ Write in the form of bullet points in the table below what kind of effect a disaster has on living and non-living elements.

Natural disaster	Effects on living and non-living elements

- ✍ Share your group discussions and group decisions with other groups. Accept feedback from other groups and modify your group decisions if needed. Present the works of all groups similarly.

## Retrospection

✍ How did you feel doing these works of experiences?

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✍ How do you think awareness programs among other school students and community members can contribute to reducing natural disasters?

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✍ Did any of the tasks seem challenging? How did you deal with the challenge?

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The image shows a set of horizontal handwriting practice lines. It consists of a top solid blue line, a middle dashed green line, and a bottom solid blue line. These lines are spaced evenly across the page, providing a guide for letter height and placement.

# Appendix

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## Give Your Opinion

Learners, you do a lot of work with your classmates at different times every day in and out of your school like sports, education or any adventure. What if you are asked to comment on how your classmates participate in different activities? The method for how you will give your opinion is given in the following two tables (1.1 and 1.2). Using this you will give feedback in Table-3. Let Table- 2 be a mystery to you now. As you grow older, you will discover it for yourself.

Table-1: Your classmate working in groups or in pairs

1.1: What your classmates do in group or in pair work

	A	B	C	D	E
What he does or has done	He did it as the teacher told him.	He did it as the teacher told him. and He said what he thought.	He did it as the teacher told him. and He said what he thought. and He listened attentively to what we said.	He did it as the teacher told him. and He said what he thought. and He listened attentively to what we said. and He asked questions.	He did it as the teacher told him. and He said what he thought. and He listened attentively to what we said. and He asked questions. and He answered my or our questions.

## 1.2: Your classmate's work sharing in groups or in pairs

	A	B	C	D	E
What he does or has done	He did his part properly.	He did his part properly. and He has done the work sharing with me and all of us.	He did his part properly. and He has done the work sharing with me and all of us. and If I or we told him of his mistake, he has admitted it.	He did his part properly. and He has done the work sharing with me and all of us. and If I or we told him of his mistake, he has admitted it. and If someone else made a mistake, he stated it well.	He did his part properly. and He has done the work sharing with me and all of us. and If I or we told him of his mistake, he has admitted it. and If someone else made a mistake, he stated it well. and He explained well why he or others did something wrong.

It is very easy to complete Table-3:

First write down the roll number of the person you want to comment on. Then write down the date you want to give feedback for the work. Now look or think of his works. As you can see from the 1.1 table above, there are several options 'A', 'B', 'C', 'D', and 'E' to understand the role of the pair or the group. Think about what your classmate's role was in this case, and decide which of the five options would work best for him or her.

In column 1.1 of Table 3, place your opinion along the roll number of your classmate, i.e. which one of 'A', 'B', 'C', 'D', 'E' seems to be correct. In the same way, decide on how your classmate has worked in a group or a pair according to your decision from Table 1.2 and place it along the roll number in column 1.2. It is up to you to decide whether you will show your opinion to your classmate or not. Can you do it right?

Table-3: Your opinion about the role of your classmate in different tasks



কেন্দ্রীয় বর্জ্য পরিশোধনাগার

- বর্জ্য ব্যবস্থাপনা হলো আর্বজনা সংগ্রহ, পরিবহণ, প্রক্রিয়াজাতকরণ, পুনর্ব্যবহার ও নিষ্কাশনের সমন্বিত প্রক্রিয়া। বাংলাদেশ থি-আর (3R-Reduce, Reuse, Recycling) কৌশলে বর্জ্য ব্যবস্থাপনা কার্য সম্পাদন করে থাকে।
- বাংলাদেশে সাভারে প্রথম সিঙ্গাপুরের একটি কোম্পানির সাথে যৌথ উদ্যোগে কেন্দ্রীয়ভাবে বর্জ্য পরিশোধনাগার স্থাপন করা হয়। চামড়াশিল্প থেকে ঢাকা শহর ও বুড়িগঙ্গা নদীর পরিবেশ দূষণ রোধকল্পে কেন্দ্রীয়ভাবে বর্জ্য পরিশোধনাগার স্থাপনপূর্বক হাজারীবাগের ট্যানারিগুলো সাভারের হরিণধরা এলাকায় স্থানান্তর করা হয়েছে। আইন করে ২০২১ সালের মধ্যে সকল শিল্প-কারখানার সঙ্গে বর্জ্য পরিশোধনাগার স্থাপন করা বাধ্যতামূলক করা হয়েছে।
- পরিবেশ-থিতিবেশ, জীববৈচিত্র্য, জলজ প্রাণী সংরক্ষণ, পরিবেশ দূষণ নিয়ন্ত্রণ, জলবায়ু পরিবর্তনের ঝুঁকি মোকাবিলা এবং বনজসম্পদ উন্নয়নের মাধ্যমে টেকসই পরিবেশ ও সবুজ-শ্যামল বাংলাদেশ গড়ার লক্ষ্যে কেন্দ্রীয়ভাবে বর্জ্য পরিশোধনাগার স্থাপন করা হয়।

# Academic Year 2023 Class Seven Science

সমন্বক বাংলাদেশ গড়ে তোলার জন্য যোগ্যতা অর্জন কর

- মাননীয় প্রধানমন্ত্রী শেখ হাসিনা

## মিতব্যযী হওয়া ভালো

তথ্য, সেবা ও সামাজিক সমস্যা প্রতিকারের জন্য '৩৩৩' কলসেন্টারে ফোন করুন

নারী ও শিশু নির্যাতনের ঘটনা ঘটলে প্রতিকার ও প্রতিরোধের জন্য ন্যাশনাল হেল্পলাইন সেন্টারে  
১০৯ নম্বর-এ (টোল ফ্রি, ২৪ ঘণ্টা সার্ভিস) ফোন করুন



Education Ministry

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