

Science

Class Nine

Exercise Book





অপরাজেয় বাংলা



সাবাস বাংলাদেশ



বিজয় '৭১

মুক্তিযুদ্ধ বিষয়ক কয়েকটি ভাস্কর্য

ক. **অপরাজেয় বাংলা:** অপরাজেয় বাংলা ভাস্কর্যটি বাংলাদেশের স্বাধীনতা যুদ্ধের স্মরণে নির্মিত যাতে তিনজন মুক্তিযোদ্ধাকে চিত্রায়িত করা হয়েছে। শিল্পী সৈয়দ আব্দুল্লাহ খালিদ ১৯৭৯ সালে এটির নির্মাণ কাজ শেষ করেন। ঢাকা বিশ্ববিদ্যালয়ে কলা ভবনের সামনে এটি অবস্থিত।

খ. **সাবাস বাংলাদেশ:** সাবাস বাংলাদেশ ভাস্কর্যটি বাংলাদেশের অন্যতম বৃহৎ ভাস্কর্য যা ১৯৭১ সালে মুক্তিযুদ্ধে অংশগ্রহণকারী তরুণ মুক্তিযোদ্ধাদের প্রতীকীরূপ। ১৯৯১ সালে শিল্পী নিতুন কুণ্ড এটির নির্মাণ কাজ শেষ করেন। ভাস্কর্যটি রাজশাহী বিশ্ববিদ্যালয় চত্বরে অবস্থিত।

গ. **বিজয় '৭১:** মহান মুক্তিযুদ্ধে বাংলাদেশের সর্বস্তরের মানুষের স্বতঃস্ফূর্ত অংশগ্রহণের মূর্তপ্রতীক এই ভাস্কর্যটি। ময়মনসিংহের বাংলাদেশ কৃষি বিশ্ববিদ্যালয় ক্যাম্পাসে এটি অবস্থিত। ভাস্কর্যটির শিল্পী শ্যামল চৌধুরী, নির্মাণ কাজ শেষ হয়েছে ২০০০ সালে।

Developed by the National Curriculum and Textbook Board as a textbook according to the National Curriculum 2022 for Class Nine from the academic year 2024

Science

Exercise Book

Class Nine

(Experimental Version)

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Published by
National Curriculum and Textbook Board
69-70 Motijheel Commercial Area, Dhaka-1000

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Published: December 2023

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Printed by :

PREFACE

In this ever-changing world, the concept of life and livelihood is changing every moment. This process of change has been accelerated due to the advancement of technology. There is no alternative to adapting to this fast changing world as technology is changing rapidly ever than before. In the era of fourth industrial revolution, the advancement of artificial intelligence has brought about drastic changes in our employment and lifestyles that will make the relationship among people more and more intimate. Various 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 coming future.

Although a huge economic development has taken place throughout the world, problems like climate change, air pollution, migrations and ethnic violence have become much more intense nowadays. The breakouts of pandemics like COVID 19 have crippled the normal lifestyle and economic growth of the world. Thus, different challenges as well as opportunities, have been added to our daily life.

Standing amid the array of challenges and potentials, sustainable and effective solutions are required to transform our large population into a resource. It entails global citizens with knowledge, skill, values, vision, positive attitude, sensitivity, adaptability, humanism 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 most crucial instruments to attain the goals. Hence, there is no alternative to the transformation of our education system. This transformation calls for developing an effective and updated curriculum.

Developing and updating the curriculum is a routine and important activity of National Curriculum and Textbook Board. The curriculum was last revised in 2012. Since then, more than a decade has elapsed. Therefore, there was a need for curriculum revision and development. With this view, various research and technical studies were conducted under NCTB from 2017 to 2019 to analyze the current state of education and identify the learning needs. Based on the researches and technical studies, a competency-based and seamless curriculum from K-12 has been developed to create a competent generation capable of surviving in the new world situation.

Under the framework of this competency based curriculum, the textbooks have been prepared for all streams (General, Madrasah and Vocational) of learners for Class Nine. The authentic experience-driven contents of this textbook were developed with a view to making learning comprehensible and enjoyable. This will connect the textbooks with various life related phenomenon and events that are constantly taking place around us. It is expected that, through this, learning will be much more insightful and lifelong.

In developing the textbooks, due importance has been given to all - irrespective of gender, ethnicity, religion and caste while the needs of the disadvantaged and special children are taken into special considerations.

I would like to thank all who have put their best efforts in writing, editing, revising, illustrating and publishing the textbook.




If any errors or inconsistencies in this experimental version are found or if there is any suggestions for further improvement of this textbook, you are requested to let us know.

Professor Md. Farhadul Islam

Chairman

National Curriculum and Textbook Board, Bangladesh

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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 Investigative study book 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
Nine are given beside.
Take a look at them-

-
- 1 Science at a Playground
 - 2 Air pollution
 - 3 My Genealogy
 - 4 Many Types of Houses
 - 5 The History of Earth in a Day
 - 6 The Body as an Incredible Machine
 - 7 Agriculture and Environment
 - 8 Universe from a Dot

What kind of experience shall we have?

Title of Learning Experience	What we shall do
Science at a Playground	<p>How do you like sports? You must have many events in the school at the beginning of the year. Indeed, it will not be a bad idea if sports can be arranged in between! It would be like a killing two birds in one go, if various things about science can be learned within these gaps!</p>
Air pollution	<p>Just as water is an essential element for our living, so is air. We live in air, breathe continuously. Although we cannot see, we feel the flow of air. During a storm we feel the demonic power of invisible wind. Well, can air be polluted? Can it also spread different diseases? Let us think a little!</p>
My Genealogy	<p>We do not have similarities with all our family members while we find close similarities with others. What is the mystery when we have the same appearance as those of our fathers, mothers, and grandfathers, and even the same walking style as them? We will unfold the mystery here.</p>
Many Types of Houses	<p>Our features are not the same as those of every family member, but there are also many peculiar similarities among us. For instance, the facial features of one of us may resemble those of our parents or grandparents, or our way of walking may mirror theirs. What is the mystery behind this? This is precisely what we will attempt to uncover in this activity.</p>

What kind of experience shall we have?

Title of Learning Experience	What we shall do
The History of Earth in a Day	What would happen if we could see all these events together from the beginning of the universe till today? Suppose, if all these events had happened in a year, or in one day, then what would have happened? In this experience, let's overview the flow of the events quickly.
The Body as an Incredible Machine	Our human body can be compared to a big machine, just as the parts of a machine perform a whole by doing different things separately. Different systems or organisms of the human body keep our whole body functioning through specific functions. In this learning experience we will discuss some important organisms of the body.
Agriculture and Environment	There are thousands of species of plants, animals, microorganisms around us. Many of them evolve naturally and come up with new traits, while we consciously or unconsciously help perpetuate the lineage of many species through artificial selection. And the best example of this is agriculture. These are the topics discussed in this experience.
Universe from a Dot	Where did this universe begin? What is our physical world made of? For which invisible thread do all the particles dance? People have been looking for answers to these questions for many years. The world of creation has caught a lot of curious people, and the answers to many questions are still out of reach! The insatiable curiosity of people is the greatest capital of science, and this learning experience is to introduce you to this modern meditation concept of science.











Science at a Playground

How do you like sports? You must have many events in the school at the beginning of the year. Indeed, it will not be a bad idea if sports can be arranged in between! It would be like a killing two birds in one go, if various things about science can be learned within these gaps!





Sessions One and Two

-  How are you all? Welcome to all to this learning experience of science at the beginning of the year.
 -  Let us discuss about sports before involving ourselves into key studies. How do you feel about sports? There are many among you who are very good at different sports; some in chess, some in carrom board, some in football or cricket, some in athletics.
 -  How about organizing an event at school with the sports you like most? But for that you have to do all the tasks to organize. So, decide at the beginning what events you will include in this game. Some known events can be there like athletics, weight throw, carrom board etc. If you want to include other events besides these, then discuss among yourselves to decide.
 -  Divide all in the class into small groups of 5-6 members. Decide who is going to play in a group and which game.
 -  Count the total number of groups in the class, and one or more of your groups will be responsible for organizing and managing each event, and distribute the tasks accordingly.
 -  Fix a date for the ultimate sporting event. You can take teacher's advice in this regard. This can be done on any holidays. Or you can also arrange this after school on any day.
 -  All events require a lot of preparation before the final game. Let us prepare for the athletics, the most familiar item.
 -  The students who will be in charge of the race will observe all the learners during practice, and make a list of those who will be able to participate in the final based on their performance.
 -  Let us start the practice session.
 -  Write down the names here who have participated in the athletics practice.
-

- ✎ The practice is complete. Now, think a little that can an athlete suddenly stop while running? Notice that everyone stands with a red ribbon exactly where the running track ends; can anyone stops instantly there after reaching? Or does he/she have to run a little farther before coming to a stop?
- ✎ Why only running? While travelling on a car/bus or any fast-moving vehicle, if it brakes suddenly, can we stop immediately or lean forward. This leaning often leads to major accidents. That is why, passengers are always asked to fasten their seat belts.
- ✎ Now, think about what are the causes of this leaning? Why can't we stop suddenly while running?
- ✎ Let us do a little test before seeking answer to this question.
- ✎ Now, put a hard paper on the glass or a coin on the cardboard.
- ✎ Now quickly pull the paper away. What's happening? Has the coin dropped into the glass?
- ✎ Why? Are you getting any similarities between the two incidents in the past such as pressing brake during running and driving, and this incident?
- ✎ Write down your answers in the blank space below:

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- ✎ Now discuss with your other classmates along with the teacher and see what they have written.
- ✎ Read about Newton's first law and inertia & momentum from the chapter, 'Force, Pressure and Energy' from your science book 'Anushondhani Path.'
- ✎ The tendency of any object to stay at rest that means, have you understood the description of inertia? Can you give more examples of inertia from your

Science

daily life?

-  Now write answers to the following two questions from your own thoughts.
-  Have you ever seen the blanket being cleaned through hitting? Dust is removed by striking the mattress or blanket with a stick. Do you find any relation to inertia with this phenomenon?

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-  How do you like the game of cricket? Who among you know the difference between spin and pace bowling? Those who don't know, can find out from their friends. Now, answer by thinking a little, spin bowlers bowl almost standing from one place, while the pace bowlers do the bowling by running in from a distance. Can you tell why?

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Sessions Three and Four

-  How are you preparing for the sports? You must be preparing for the events that will be included in your game other than running.
-  Let us prepare today for the weight throw game. You must have decided from your group who wants to take part in this game. Let us go for the practice.

-  Practice session is over. Now let us discuss a little about this game. What was the mass of the object with which you did the weight throw practice? How far can you throw the weight? How far the participants of each group could throw the object? Will the distance be more or less if this mass is different, that means, if this mass increases or decreases? If so, then why? Before finding the answer to this, throw some objects in a same way having different mass.
-  If objects of different masses are thrown with the same force, do they fall at the same distance? Why not? Write your answers in the given space below.

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-  You can understand that the result of applying force on an object depends on these two factors. And to understand these two together, a formula called momentum is used. This is used to calculate the momentum of an object by multiplying the value of its mass and velocity.
-  Now the question may come to your mind, if the work is done by calculating the mass and velocity, then what is the need for a separate quantity called momentum? To get a better understanding of this topic, go through the concept of momentum section from your research textbook. After reading, discuss with your friends. Do you understand that it is not always possible to calculate time with the product of mass and velocity?
-  Write your explanation in the blank space given below.

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Science



 Discuss with the rest of the class including the teacher. Now an example of calculating momentum is given in the investigative textbook. See the example to find out if you understand. Then solve the problem given in the blank space given below.

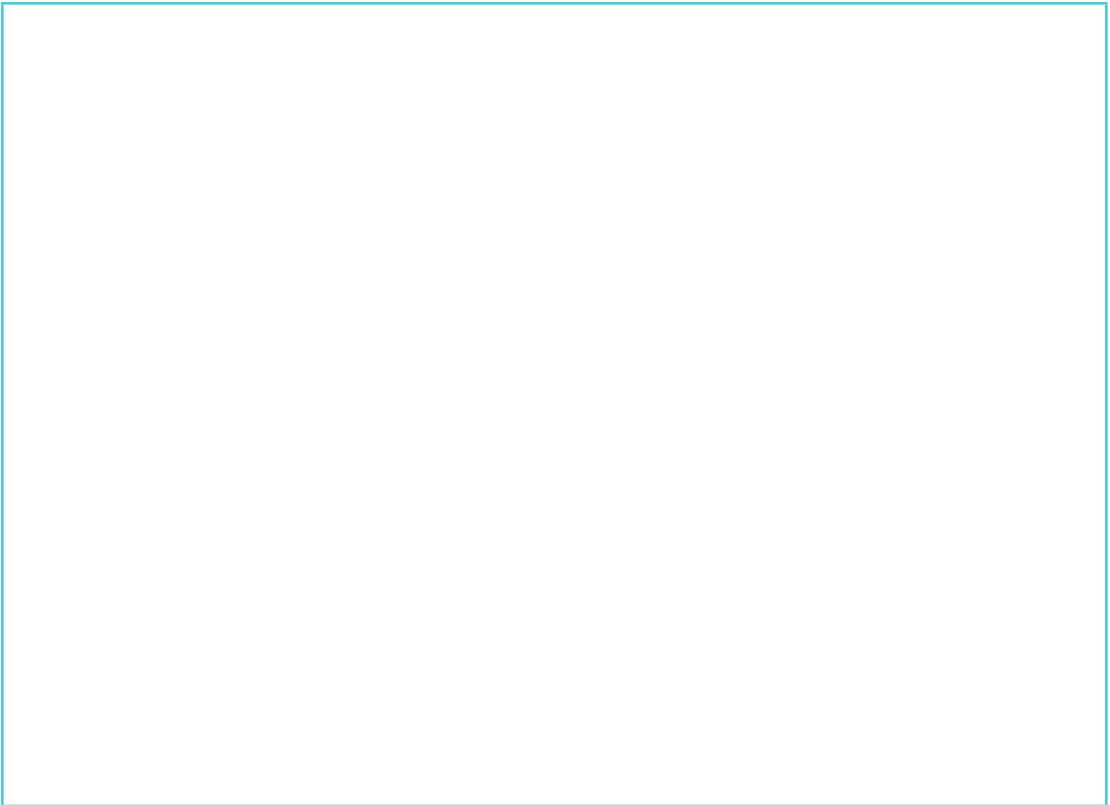
- Your friend of 50 kg is riding a motorcycle of mass 250 kg at 20 m/s. Can you figure out the momentum?



 Now let's think about another matter. While throwing a weight, you have tried to move an object from a fixed position. The harder you could throw the object at a certain time, the faster you could accelerate it, the greater the weight, the further the object will fall. Which means, at a certain point of time, the increased speed from the steady state is also a matter of consideration. This is the rate of change of velocity, which is related to the object's momentum; you must have felt it when you threw the load. Here's Newton's second law of motion, relating the momentum of the object, its rate of change over time, and the force you apply, which is how hard you throw the object.

 Read and discuss Newton's second law and its explanation with your friends in pairs from the Inquiry Textbook. Take the teacher's help if necessary. Now, through the lottery, one student from different groups should go to the

other group and try to explain the formula with examples, the other group members will try to understand the matter through questions and answers. If there is any disagreement or confusion, ask the teacher to clarify the concept.


-  Do you understand how to calculate the rate of change of momentum?
-  Then solve the problem given in the blank space below.
 - Your friend braked the motorcycle and brought it to a complete standstill within 10 seconds. Can you determine the rate of change of momentum for this? What is the amount of force applied to the motorcycle?



-  If you know about the force. You may have had some idea about force in the previous class. But do you know how many types of forces there are or how many types of forces are there in the universe?
-  Scientists have spent many years researching the total number of fundamental forces in the universe. To learn more about this, read the Basic Concepts

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section from your Inquiry Textbook along with your friends. After reading, discuss about the four types of basic forces, seek help from the teacher if necessary.

-  Among these four types of basic forces, which one is the strongest, which one is the weakest and which has the maximum range? Arrange the four elemental forces in order starting from the strongest to the weakest based on the value and range of the elemental forces in the blank space given below.

	Name of the Basic Force			
Strong to weak				
Ranging from high to low				



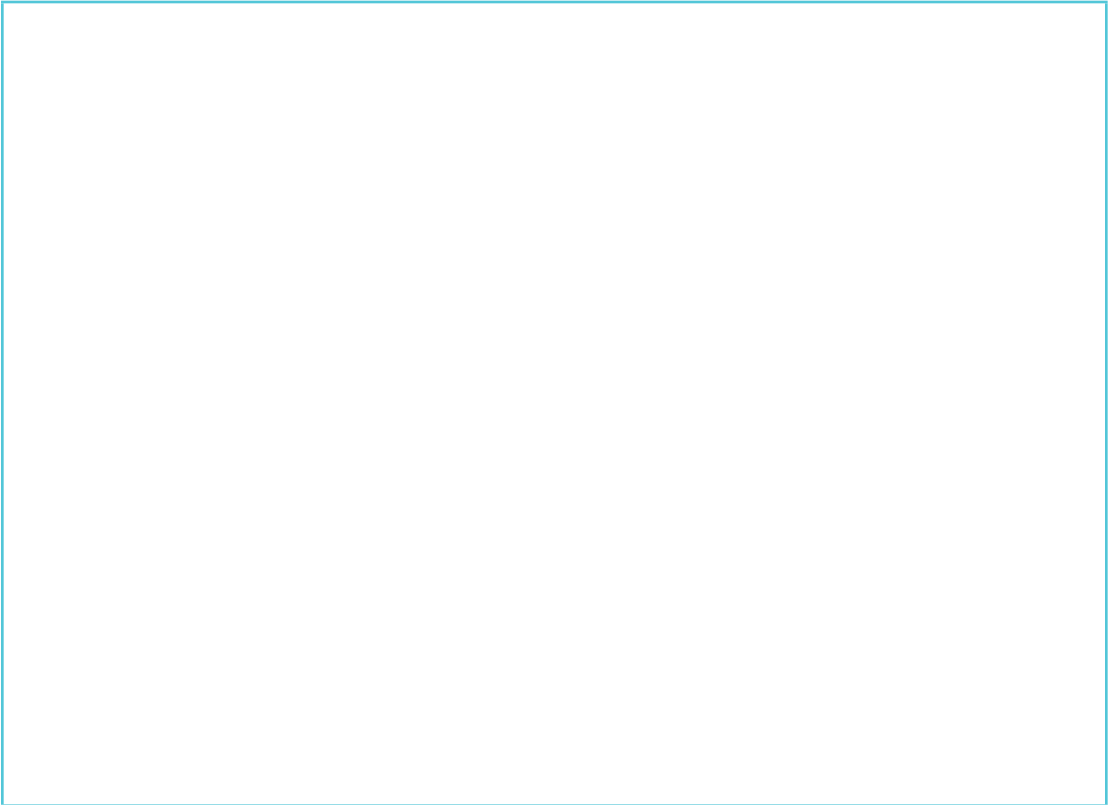
Sessions Five and Six


-  How far is your sports preparation? You have prepared for various sports including running and weight throwing. Let's practice playing carrom in this session.
-  As usual any member from each team who will participate in carrom game, will join the practice session.
-  Done with your practice? Then let's talk for a little about this game. Have you noticed while playing carrom that the harder the carrom strike is tapped, the harder it bounces back! If you want to see it twice, strike it again. Similarly, if you punch a wall or a hard surface -- the harder you punch, the more pain you will feel. Don't punch too hard to check it again! This simple formula is Newton's third law of motion. Learn more about Newton's third law from your research textbook. Discuss with the rest of the class including the teacher.
-  What kind of problems can be solved using this formula? There is one such

mathematical problem as an example in the exercise book. Take a look at it.



 Solve the problem given in the blank space below.


- A wooden platform can give a maximum reaction force of 500 N. If a bicycle has a mass of 15 kg and a scooter has a mass of 110 kg, which one can be repaired by placing it on the floor?



 Newton's three laws of motion were discussed. The information or formulas that we read in science did not come about in a day. For example, you have already known about the four basic types of forces. One of which is gravity. How is this type of gravity? Scientists have studied it for a long time. Why does the earth revolve around the sun, why does nothing fall from the round earth, how does the moon stay in a certain orbit, scientists have been thinking about these questions for many years. Much later, Sir Isaac Newton explained the force of gravity, he also explained that the same force that causes us to fall from above, causes the Earth and other planets to revolve around the Sun.

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-  Read on gravity, Newton's law of gravitation, and the concept of weight from your research textbook. Discuss with other friends of the class including the teacher. You must have seen how to solve math problems using the law of gravitation. Can you also solve such problems?
-  Solve the problem given in the blank space below.
 - You have a rope that will be torn apart when pulled at 200 N. You are given a box to hang with this rope. Could you lift a box of any mass?

-  Now think about it, when you throw the object away in the game of throwing weights, if you play the same game on the moon instead of on the earth, will the object go farther or less with the same force? Write your answer in the space below.


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 Do you understand the relationship between acceleration or the value of 'g'? Discuss with friends and write your answers below.


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 Solve the problem given in the blank below.

- If Mars has a mass of 6.4×10^{23} kg and a radius of 3390 km, can you determine the gravitational acceleration on Mars? How much would you weigh on Mars? (Everyone may calculate using your own mass. If you don't know, measure it.)






Sessions Seven, Eight and Nine




 Suppose you are returning from a store with a shopping bag. What type of handle of the bag will reduce your pain? Thick or thin? Let's think about

Science

your school bag, if the strap of the school bag is thin, will it be more or less difficult to carry the bag? Write your answers and explanations below.

-  Similarly, think of another question, when we use a knife to cut vegetables or fruits, if the knife is blunt, why is it difficult to cut?
-  Discuss among yourselves about your answers.
-  A very important quantity related to force is pressure. Go through examples of pressure and related math problems from your research textbook. Solve any two problems given in the blanks below.
 - If the surface area of each wheel of the scooter mentioned in the previous example is 10 cm^2 , could you find the pressure exerted by the scooter on each wheel? Will the pressure on that wheel remain the same if the scooter is loaded on one wheel during repair?

- ☑ Average density of air is 1.3 kg/m^3 and air pressure in normal environment is $101,325 \text{ N/m}^2$. Could you figure out the height of Earth's atmosphere from this information?

-  Many of you may have heard of the scientist Archimedes.
-  Read out the Archimedes' formula and buoyancy from your research textbook.
-  Who among you know how to swim? Think once whether we feel more or less weight during swimming? Why? Write your answer in the space given below.


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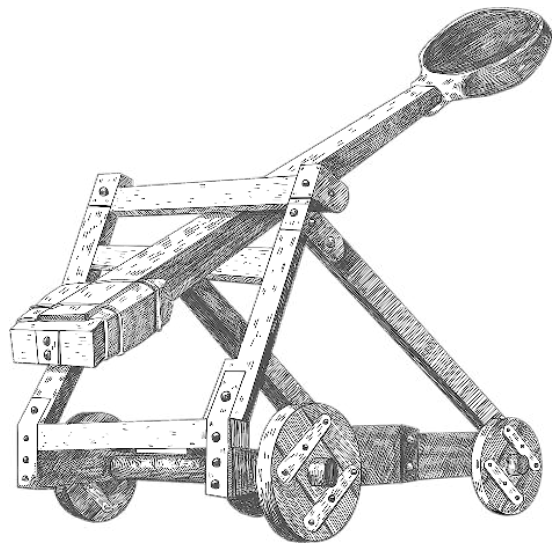
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-  Solve the given problem in the blank space below.
 - ☑ The average density of the human body is 985 kg/m^3 , density of fresh water is 1000 kg/m^3 and the density of Dead Sea water is 1240 kg/m^3 . If you step into a swimming pool filled with fresh water, what percentage of your body will be drowned? If you were to swim in the Dead Sea, what percentage of your body would float?



Sessions Ten and Eleven

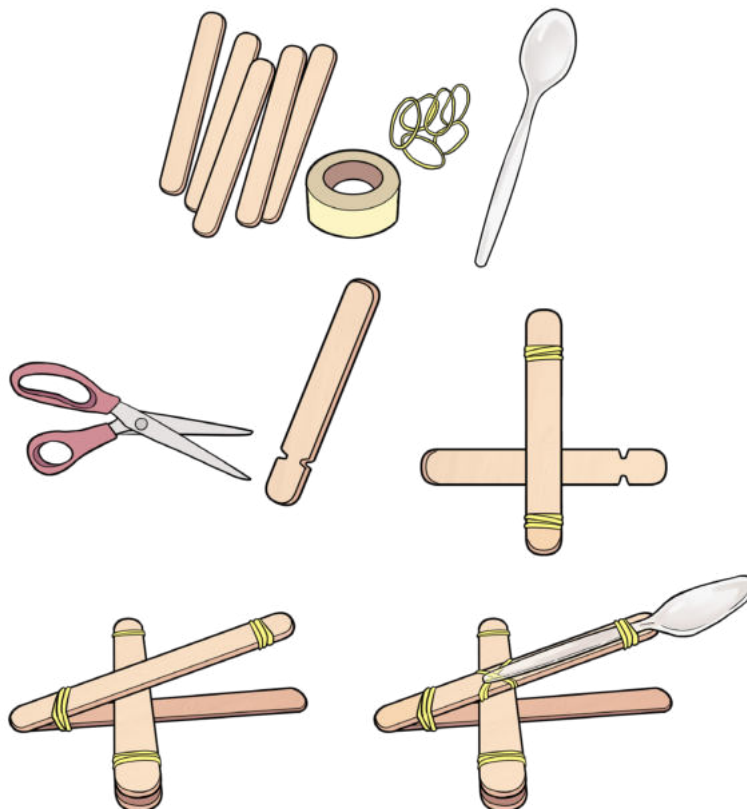
- ✎ Let's arrange a new game in this session. Many of you know the slingshot, don't you? The large form of this sling is one of the earliest weapons of human race. Don't be afraid, you don't have to make weapons. But a small game should be organized by making a very simple catapult.
- ✎ An easy way to make a catapult is given below. You can sit down with your team and plan about your own catapult and build it





accordingly. If you want, you can come up with a unique idea, but remember that no plan can be made that requires expensive materials.

 Process of making a catapult:

- ☑ Collect 10 old ice cream sticks.
- ☑ Now tie 7 sticks together with rubber bands on both sides.
- ☑ Now take another ice cream stick. Cut a hole on both sides of the bottom of the stick. Now place a stick lengthwise in the middle of the bundle of 7 sticks as shown in the picture and stick it on the other side with stick number 9. In the same way, tie the bundle of 7 with a rubber band to number 9 stick,
- ☑ One ice cream stick is left. Cut a small part on both sides in the same way at the bottom of this number 10 stick. Place the stick lengthwise over the bundle, and tie two sticks tightly with a rubber band to the cut end similar to the bottom of the number 8 stick.



Science

- Attach an old plastic spoon or something similar to the top stick with a rubber band.
- Your catapult is ready. Now roll this paper into a small ball, place it on the spoon and pull the stick with the spoon back and release it, it will throw the paper ball away. Check it out.
-  Have all your group members finished making slingshots? Now let's start the game. Each team will make five paper balls and place them next to each other. Line up all the teams' slingshots side by side. Now, each team will throw the paper ball one by one using the slingshot and keep track of how far it fell. Out of five times, count the maximum distance that the paper ball fell.
-  Now look at everyone's calculations, which group's paper ball has gone the longest distance? Why? Justify your answer, showing calculations if necessary. Discuss in groups and write your answers in the space below.

- Now think about it, if the handle of your catapult spoon was a little longer or the spoon was hanged a little higher, would the paper ball you threw go further? Why?

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- Discuss in groups and write down your group's answers.
- A lot of work has been done. Now sit down and think about all the things you have done in this whole learning experience. Now, write down the answers to the questions below.
- How are Newton's three laws of motion used in the process of using a catapult?

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- Which team's Catapult has thrown the specified object the furthest? Why?

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- How does the transfer and transformation of energy occur in this process? Explain the matter in the light of the law of constancy of energy.

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Air pollution

Just as water is an essential element for our living, so is air. We live in air, breathe continuously. Although we cannot see, we feel the flow of air. During a storm we feel the demonic power of invisible wind. Well, can air be polluted? Can it also spread different diseases? Let us think a little!





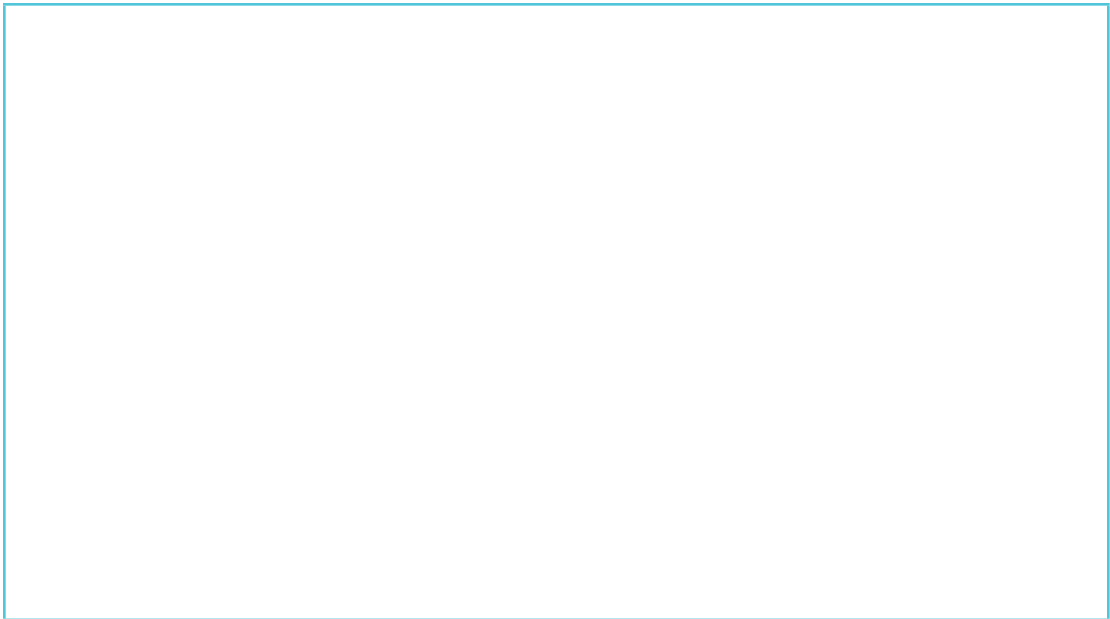
Sessions One and Two


- ✎ We live in the air. Actually, without air, more precisely without oxygen, we cannot survive for a moment. We inhale oxygen through breathing from the air. Now think about it, do you feel same relief to take a breath everywhere? Does it feel same taking breath everywhere in your locality?
- ✎ Divide into small groups of 5-6 people. Now sit in a small group and discuss who likes to breathe in which area of their locality.
- ✎ When you come to school from home, or go home from school, think about the road on the way to and from. What can you find on your way? If there is a garden or nursery, how does it feel to breathe in that air? If there is a dustbin or a factory on the way, do you experience any breathing problem? Think carefully and fill the table below according to your experience.

Serial no	Name of team member	Where in the area do you like to breathe	Where in the area does it feel bad to breathe	Any particular similarities and dissimilarities


- ✎ Can you draw a map of your area? There is no problem if you don't know the area very well. In that case, you can just mark the area around the route from home to school and draw a map. Now, color the different parts of the map. Where it is easy to breathe, you can mark it with one color where breathing was pleasant (such as green), and you can mark it with another color (such as red) where it was difficult to breathe. Then draw the 'wind map' of your area in the table below.

Science



-  See the air maps drawn by others in the group. Show them your map. Can you understand the types of air in various areas of your locality? Write down the names of the various breathing places on the way home today in the table below.

How does it like to breath	Area-1	Area-2	Area-3	Area-4	Area-5
Very good					
Good					
Normal					
Bad					
Very bad					

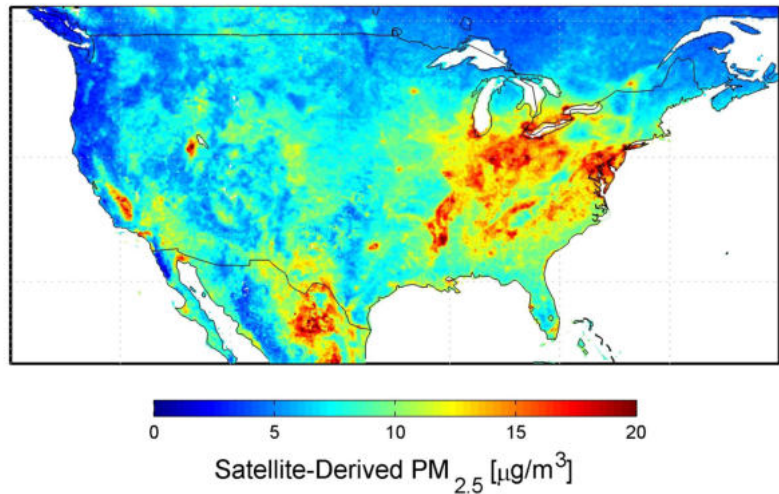
-  Now, you need to find a map of your area. You can search on the internet, and often, you may find the map of the locality on the official website of the municipality or union council. If necessary, you can seek help from the teacher. Once you have the map, take a copy for yourself and keep it in your

notebook.

- ✎ Now notice the areas where you feel comfortable breathing. What is there? Again, what are the special features in places where it is difficult to breathe? After school, those whose houses are close to you, form groups in your respective areas to find out the characteristics of those areas.

Home task

- ✎ In this session, you have drawn the 'Air Quality Map' of your respective areas, haven't you? Do you know that this map can be drawn for larger regions as well? To tell the truth, those who research about air have



already created such maps. Here, a map of North America is provided. Can you, together, find similar maps for the entire world? If you wish, you can seek assistance from newspapers, books, or utilize your school or nearby library. You can also seek help from your teachers.

- ✎ All of you have already found the 'Air Quality Maps' for various regions around the world, haven't you? Have you identified where the air is clean and where it is polluted in different continents? Take a moment to explore what exists around clean air in nature and what exists around polluted air in different continents (Asia, Europe). Notice whether there are more urban areas, industrial factories, or a larger quantity of forests around clean or polluted air. For this information, you can refer to newspapers or books. If there is a library in your area, you can explore there as well. Use the internet with the help of teachers if needed. Keep a record of the information you find.

Science

Continent	In which places there is clean air?	What is around that region?	In which places there is polluted air?	What is around that region?
Asia				
Europe				
North America				
South America				


Continent	In which places there is clean air?	What is around that region?	In which places there is polluted air?	What is around that region?
Africa				
Australia				
Antarctica				



Sessions Three, Four and Five


- ✎ We will explore today how something produces a scent or odour. For that, at the beginning of the session, open a bottle of air freshener, perfume, or any similar item and place it in a specific location in the classroom.
- ✎ You have surely brought your home work. Now, work with different groups and demonstrate and discuss the task you have brought with you. Discuss with everyone, compare the information obtained, and observe where the level of air pollution is higher or lower in different parts of the world. Also, find out the characteristics of different regions on which the amount of pollution depends.


Science

 Now, let's identify the problems caused by air pollution. What difficulties arise for humans in areas where the air is polluted? Also, consider other living beings, such as various animals and plants present there, and find out what problems they face. Alongside this, think about the impact of polluted air on nature. For collecting this information, you can refer to newspapers, books, or libraries. You can also search the internet, and if needed, seek the assistance of teachers.

 Write all the information neatly in the following table.

	Consequence of Air Pollution
Effects on Human Health	
Effects on Other Plants and Animals	
Effects on the Natural Environment	

 Now let's see how air pollutants spread from one place to another. Do you remember that at the beginning of the session, a perfume bottle was opened? At this stage, pay attention and see if you can smell it. How does this fragrance reach your nose? Think about it, even if we walk a little away from an open dustbin, how does its odour reach our nose?

 To understand this process better, let's conduct a small experiment. Take a cup of hot water and observe closely as you dip a tea bag into it. Notice how gradually the colour of the tea leaves spreads throughout the water. Record your observations below:




	Immediately after dipping the tea bag	After one minute	After two minutes	After five minutes
Colour of Water				


✎ Now let's do another experiment. Inflate a balloon well. Make a slight leak with a pencil or pin or something sharp anywhere on the surface. See how it explodes. Now put some scotch tape on the surface of the balloon. Make a leak on the scotch tape as before. Has the balloon burst as it did before? Or slowly the air is coming out? Why? Write your observation in the table below.

	Speed of air gushing out from the balloon (quickly/slowly)	Explanation
When the balloon is leaked normally		
When the balloon is leaked after putting scotch tape		

✎ Listen to the explanations of your group and listen to the explanations of other students as well. Discuss with the teacher and others.

Science

 Now, read the relevant chapter on the state of matter and the principles of motion and diffusion of particles in the chemistry section of your investigative textbook. After reading, discuss with your classmates sitting nearby. Can you find any connection between these two incidents and the two previous experiments?

 Now, let's see if there is any correlation between spreading fragrance or odour in the air and these two incidents. Write your answer in the space below.

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 Discuss your answer with the teacher and other classmates in the class.


 Now, think about how the air gets polluted. How do pollutants spread, not only in the air but also in water and soil? Is pollution caused in the same way in both liquid and solid substances?

 We have talked about the solid, liquid and gaseous substances. How does the transition occur from one state to another? How are they transformed from one state to another? To understand these topics, read about processes such as evaporation, condensation, precipitation, and sublimation from your investigative textbook. If possible, perform the experiments given in the investigative textbook in the laboratory at your school.



Session Six

 The discussion has been done about how pollutants spread in the air. But what are the causes of air pollution? Which substances, when present in the air, lead to air pollution? How are these substances generated?

 Look at the names of some substances written in the chart. Research indicates that these substances play a significant role in air pollution in Bangladesh. Now, think about how these substances are produced. What is their composition like?

Air Pollutants	Type of Matter
Matter Particles (PM)	One of the major contributors to air pollution, associated with various health risks. These substances include compounds such as sulfate and nitrate, ammonia, sodium chloride, carbon, dirt particles and water vapour.
Carbon monoxide (CO)	Colourless, tasteless, and odourless toxic gases, primarily derived from carbon-based fuels (such as wood, petrol, coal, natural gas, kerosene, etc.), are released due to combustion.
Nitrogen dioxide (NO ₂)	This harmful gas is primarily produced from vehicle exhaust and industrial factories.
Sulfur dioxide (SO ₂)	Colourless gas but with a strong odour. Usually produced by burning fossil fuels.

- ✎ Before delving into this discussion, let's shed some light on the structure of matter as a brief introduction. You already know that the fundamental elements of the structure of matter are electrons, protons, and neutrons. Now, do you know how these particles are arranged within an atom?
- ✎ To tell the truth, scientists have extensively researched the arrangement of particles within an atom, and over time, our understanding of atomic structure has become clearer. Explore the chapter on atomic structure in your investigative textbook to learn more about what is mentioned regarding the arrangement of particles within an atom. There are two models for the structure of an atom – the Rutherford model and the Bohr model. Discuss these two models in detail within your group. If you encounter any difficulties in understanding, don't hesitate to seek assistance from your teacher.
- ✎ At the end of the discussion, answer the questions in your own words.



<p>What is the basic idea of the Rutherford model about the arrangement of particles within an atom?</p>	
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Science

<p>What is the basic idea of the Bohr model about the arrangement of particles within an atom?</p>	
<p>What is the basic difference between these two models?</p>	







Home Task

-  Over the next three weeks, your task will be to gather detailed information about the air pollution in your area. Collect information on the causes of air pollution in the area, the sources of pollutants affecting the air, and the impact they have on nature and human life, considering whether these pollutants are of natural or anthropogenic origin. For example, if there is a brick kiln in the area, find out which pollutants are emitted from there, the sources of all these gases, and under which processes these gases are generated. You can seek assistance from teachers or any other specialist in this regard.
-  During this data collection task, in the sessions of these three weeks in the classroom, you will read and discuss relevant topics from the investigative textbook on the structure of matter, the periodic table, and the chapter on chemical bonding. Understand why and how different molecules combine to form various compounds.





Sessions Seven and Eight

-  Earlier you learned about Rutherford and Bohr model of atom. Your task is to develop a clear concept of the electron arrangement of atoms and the principles of electron arrangement. Get into groups and read these topics from your investigative books. After reading each part, discuss with the rest of the class including your teacher. If you find anything difficult to understand, take the help your teacher.
-  Now the task is to find out the electron arrangement of the atoms of the element. Each group should know the atomic numbers of some elements according to the number of members of the group, and find out the electron arrangement of its atoms. For example, a group of 5 members will work on 5 elements and each member will work out the electron configuration of at least one element. The teacher will specify the electron configuration of the five elements to be determined.
-  Did you show how the electrons in sub-levels are arranged at each energy level? Check in the group if the electron arrangement of each element is correct or not. Review the principle of electron arrangement again if necessary.
-  After the discussion, compare your work with other groups. Check again if there is a difference in the electron arrangement of a particular element. Get feedback from the rest of the class including your teacher.



Sessions Nine and Ten

-  Atoms are the building blocks of any matter. You already came to know how electrons, protons and neutrons are arranged in that atom. Now think about what it means when we say the mass of an object. We can assume that each atom of the matter has a certain mass. Now is this mass the sum of the masses of the electrons, protons and neutrons of this atom? To answer this question, read about atomic mass and relative atomic mass in your investigative book. After reading each part, discuss with your classmates. If you have any problem to understand, take help from your teacher.
-  Now write the answers to the following questions.
 - What is the difference between atomic mass and relative atomic mass?

Science

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Copper has two isotopes in nature, ^{63}Cu and ^{65}Cu , and has an average relative atomic mass of 63.5. Can you find the percentage of ^{63}Cu and ^{65}Cu found in nature?

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If you know the average relative atomic mass of an element that has three isotopes, can you calculate the percentages of their occurring in nature?

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Sessions Eleven and Twelve

- ✎ Discuss atomic mass and relative atomic mass of various elements in continuation of the previous session. Similarly, discuss how to calculate relative molecular mass. Read the investigating book and try to understand the topics with the help of your teacher.



Sessions Thirteen, Fourteen, Fifteen and Sixteen



- ✎ Certainly, you have not forgot the main purposes of this learning experience containing the detailed discussion about molecules. We worked on air pollution. Now what are air pollutants and why a particular substance behaves in a particular way depends largely on the composition of the substance. These substances are composed of one or more elements. Now, how will we know the characteristics of these elements?
- ✎ Actually, the characteristics of the element and the combination of elements to form new matter entirely depends on its atomic structure. According to this structure and characteristics, all the elements found so far have been arranged in a table called the periodic table.
- ✎ Read and discuss the concepts, background, purpose, significance, uses, etc. of periodic table from your investigative book. As mentioned earlier, the characteristics of the element mainly depend on the electron arrangement of the atom. Therefore, knowing the atomic number and electron arrangement of the element, it is possible to determine its position in the periodic table. Again go through the properties of the periodic table and the rules on how to determine the position of an element in the periodic table from the investigative book. Discuss with other team members. Now if you know the atomic number of an element, can you determine its position in the periodic table?
- ✎ Determine the position of the following elements. Now find the exact position of these elements in the periodic table given in the book. Match with your own answer.

K, Rb, Au, Zn, Ba, Sb

- ✎ Each stage in the periodic table has a sort of continuum containing the characteristics of elements. Read from the Investigative Textbook and discuss how the increase and decrease of different periodic trends occur in the periodic table from left to right and from top to bottom. Take help from your teacher if needed. If the teacher asks to explain any periodic trend through




Science

lottery, explain the specific trend discussing with all the group members if needed.

-  Also notice, which direction of the periodic table increases the size of the atom.
-  Atomic size of which element is comparatively larger? Arrange the following elements from the larger to the smaller according to the atomic size.

Ca, Br, Ds, O, Xe, Mg, Cr, Au, Ni, Si, Fr, F

Compare your answers with others.

-  Before discussing the rules of how different elements of the periodic table combine to form compounds, it is necessary to discuss one more property of elements, that is compatibility.
-  Read about compounds and compatibilities from the chapter on chemical bonds and discuss with others including your teacher.
-  Let's play a game of the periodic table. Start the game by following the rules below.
 - Four/five others sit around one person. In this way several groups can be formed.
 - Everyone should have the periodic table open in the book. Now, ask the first person (sitting in the middle) to choose any element in their mind.
 - The remaining five will now continue to ask him questions, such questions that can be answered with yes or no. The same person will not ask twice in a row.
 - Each question should be such that the answer gives a clue as to the position of the element in the periodic table. (For example, you can ask, is the element's valence four? Or, are the electrons in the atom of the element arranged in three levels? etc. But don't ask the name of the element directly.)
 - Try to identify the element by asking ten questions like this. Try to find the element in as few questions as possible.
 - When one round is over, put another person in the middle. If necessary, decide by lottery - who will sit in the middle? Then as before.....



Sessions Seventeen and Eighteen

- Read and discuss about compounds, chemical signals of compounds, inert gases and stability, rule of octaves, etc. from investigative book. As before, try to understand things with the help of your teacher if necessary.



Sessions Nineteen and Twenty

- In class VIII you have learned about various chemical reactions. Why does one substance associate with another substance? Which element will combine with which element to form a compound and what does it depend on?
- Read different types of chemical bonds section from investigative book to understand these topics. Read and discuss with friends how ionic, covalent and metallic bonding happens and what occurs when.
- You know which compounds are responsible for air pollution. Now discuss in groups which of these compounds maintain which type of bond. Don't forget to mention the reasons behind your decision.

Name of air pollutant	Composed of which elements	Which type of chemical bond	Reasons
Carbon monoxide (CO)			
Ozone (O ₃)			
Nitrogen Dioxide (NO ₂)			
Sulfur Dioxide (SO ₂)			

- Give examples to develop everyone's ideas. Do the tasks as given in the exercise book. You may have an open discussion to allow students to develop their own ideas, if needed.

Science

- ✎ When learning about ionic and covalent bonds, you also came to know about metallic bonds. In that context, you may study metal extraction and ore, how different alloys are made, what they are used for, etc. from your investigative book. Discuss among yourselves.



Sessions Twenty one and Twenty two

- ✎ How is the progress of the data collection group task given to you? Share the information with the class. Don't forget to mention the source of the information.
- ✎ What can be the solution to the factor of air pollution you have learned? Where are those pollutants produced? What kind of chemical reaction is formed as a product? What kind of technology or techniques can be used to stop the release of these harmful substances?
- ✎ Discuss in groups to find the probable solution. Write or draw your plan in the space below.

- ✎ Prepare and present your team plan in this session neatly. All groups will present the data they have collected and explain how air pollution is affecting people's life and nature in the area. Then present your proposed solution in

a diagram or flow chart, and explain how it will improve the situation. The teacher will assist you throughout the process.

- ✎ Invited people will also give their opinions. You can change your plan if necessary according to their opinions.
- ✎ Do you have anything else to do as a next step in this work?

💡 Think : Energy can also be generated from the wind through windmills. Well, in this way, if the energy is produced from the air, will the air pollution increase or decrease?







My Genealogy

We do not have similarities with all our family members while we find close similarities with others. What is the mystery when we have the same appearance as those of our fathers, mothers, and grandfathers, and even the same walking style as them? We will unfold the mystery here.




Session One

- ✎ How many members are there in your family? Who are they?
- ✎ Let's do an interesting thing at the beginning of this learning experience. That is everyone should make their own family tree at the beginning. Do you know what a family tree is? If you do not know, ask the teacher or other students.
- ✎ Now make your genealogy in the form of a family tree. It is good to have at least three generations in the family tree, from your grandparents to you.
- ✎ Observe the family trees of others in the class, show your own family tree to everyone.
- ✎ Think about, what are the facial features of these three generations of family members? Make a chart of the characteristics of different organs of all family members, from grandparents to yourself and your siblings, as shown in the table below. Table can mention different physical trends of the family members. For example, eye shape, eye color, nose shape, throat tone, foot shape, hair style and type, hair color, etc. The chart below is just a sample, you can create the chart in other ways if you want.


Table1- Characteristics of various organs of family members

Member Name	Relationship with you	Eye shape (doe eye, cat eye, etc.)	Eye color (black, white, brown, etc.)	Finger shape (long, short)	Tone of voice (thick, thin, etc.)	Foot shape (long, short, thin, flat, etc.)	Hair type (straight, curly, etc.)

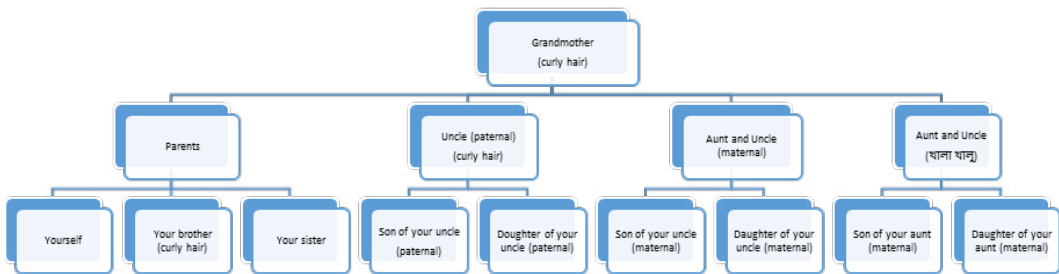
 Ask the students to discuss the information they have found about their family members with the classmate next to them. Ask the student to share the next classmate regarding the similarities between his own organs and the same organs of family members.



Sessions Two and Three

 For those members of your family who share a particular organ trait, separate them from the organ trait chart created in the first session and create a separate chart. A sample is given below.






1. curly hair





Science

2. straight hair

3. Black eyes




-  A separate chart can be prepared for different such traits. When the chart is done, show it to the class. See other's and give your opinion.
-  Now think about it, why are the trends of a certain organ of different members of the family the same? And why are none of us exactly alike our father or mother?
-  Study in small group Mendel's research and selection of traits from the Genetics and Heredity chapter of the investigative book to learn how traits are passed from one generation to the next. After reading, discuss with group members. Discuss with the rest of the class including your teacher.
-  Why is it that a particular organ has the same trait in several members of a family but there are many other organs that do not have the same trait? To understand this, read the observation of manifest and latent traits in organisms and Mendel's theorem (Mendel's two formulas) from the genetics and heredity chapter of the investigative book. After reading, discuss with group members.
-  Can you explain Mendel's two formulae to your friends with pictures? On behalf of your team, present the whole topic through a series of pictures on

a large piece of paper or a poster. Remember that the person who sees the picture should understand it without any verbal explanation.

-  Have all groups hang their work on different walls of the classroom. Go around, observe and give feedback, whether the other team's posters make the point clear.
-  Mendel performed his experiment on beans. You already know the reasons for choosing beans. Now think, if a scientist in Bangladesh wanted to do the same experiment, what other plant would it be convenient to experiment with beans?






Sessions Four, Five and Six

-  In the previous sessions you have learned about genetics and heredity. Now explain, how do your physical traits that came from your grandfather, mother, or grandmother pass from one generation to the next? These traits of organisms are carried through what kind of substance? What biochemical substances develop the traits of life in organisms, and carry these traits through generations?
-  Read the different parts of the Biomolecules chapter of the investigative book one by one. After reading, discuss in groups. If there is any difficulty in understanding, take your teacher's help.
-  If you know about different types of biomolecules, their structure and role, protein synthesis process, interrelationship of biomolecules, etc. You already know about plant and animal cells. Draw a diagram of a plant or animal cell in the blank space below and identify the possible locations of biomolecules. If you want to draw a picture of a cell, you can look at your younger sibling's science book.

Science

Plant cells	Animal cells


-  While learning about different organic molecules, have you noticed the role of carbon in their formation? Did you understand that carbon is the basis of life on earth?
-  Now think, if the origin of life happens on a planet without any carbon, what other elements could serve as the basis of life? Discuss this question with other members of your group. Keep in mind here, what type of chemical bond does carbon form? Review the Periodic Table and Chemical Bonding sections again if necessary.
-  Write your answer below.

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-  You have learned about different types of organic molecules. All these participate in various physiological functions of the organism and sustain the body. But the specific biomolecule through which our traits are passed down is nucleic acid, more specifically DNA or deoxyribonucleic acid. DNA or deoxyribonucleic acid is the most important permanent chemical molecule in

the cell. It contains and controls all the biological functions and hereditary traits of the cell or the organism as a whole. All living cells except a few viruses contain DNA.

- ✎ Sit with your group and learn a bit more about the structure of DNA.
- ✎ You might think that to truly see DNA or conduct tests, you need sophisticated research laboratories. To tell the truth, for those of you who aspire to conduct significant biological research in the field of biology, that statement holds true. However, do you know that you can truly explore DNA right at your fingertips, even without sophisticated equipment like microscopes?
- ✎ A description of one such method is given below:

Activity: DNA- Replication

In this experiment, we will try to extract and observe the DNA of a banana. (Don't be disappointed to hear that you will be observing the DNA of a banana instead of a human or other large animals! Do you know that about %60 of banana DNA is identical to that of humans?)

Materials required:

- Two clean glass containers
- A sealed plastic bag or container
- Banana
- Knife and spoon
- Strainer, thin cotton cloth
- Common hand sanitizer or any alcohol
- 4 teaspoons of salt
- 2 teaspoons of liquid dishwashing soap
- Lukewarm water
- Stick

Science

Procedure:

- ☑ First, mash the banana until it is a smooth paste.
- ☑ In half a glass of lukewarm water, dissolve the salt and mix well.
- ☑ In the same water, add the liquid dishwashing soap and mix well.
- ☑ In a plastic bag or large container, mix the banana paste with the water mixture well.
- ☑ Filter the mixture well through a thin cotton cloth. The liquid part will take some time to filter out from the heavy mixture, so let it sit for a while.
- ☑ Pour the filtered liquid into a glass. It is better to place the glass in front of a black background (such as a chalkboard) to make it easier to observe.
- ☑ Slowly pour the hand sanitizer into the glass from one edge. Do you see any changes inside the glass? Is there anything white and stringy? Try to carefully pick up the DNA with a stick.
- ☑ Yes, this string-like object is the banana's DNA! And within this delicate object, all the formulas for how the banana will be are hidden!

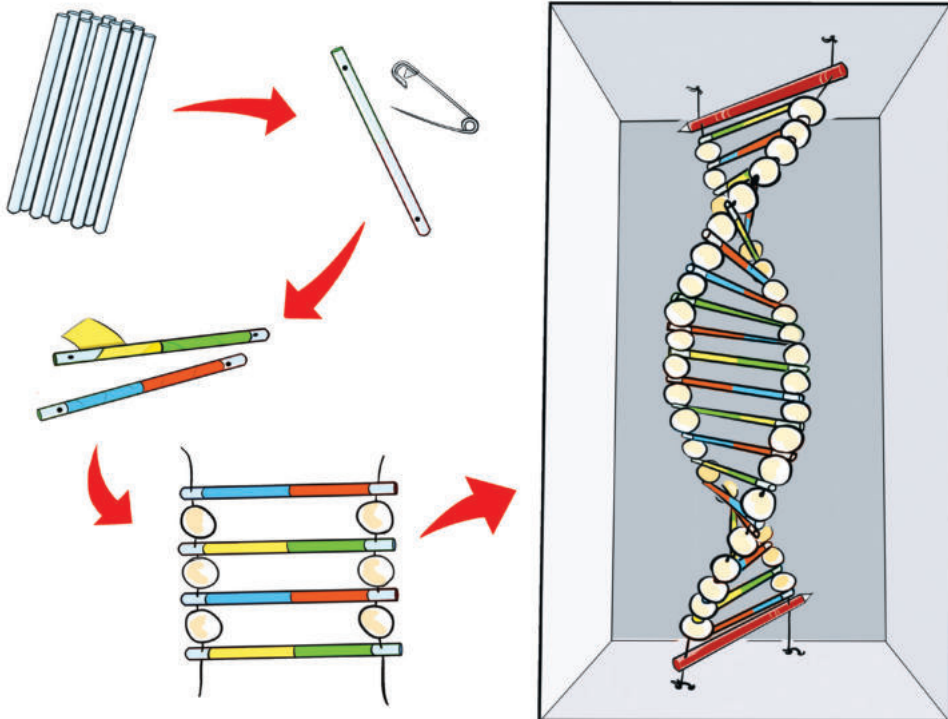
- ✍ DNA synthesis is done. How about making a model of DNA now?
- ✍ A description of how to make a simple DNA model is given below. However, this is just a sample, you can also plan in a different way using other materials if you want.

Activity: Construction of a DNA Model

Materials Required: 1m common iron wire, 2 old ballpoint pens, 40 pieces of 1.5 cm diameter beads, 8/7 plastic straws (for drinking liquid), red, blue, yellow, and green coloured papers, adhesive tape, scissors, and an empty shoebox.

Procedure:

- ☑ This model requires 40 beads with a diameter of 1.5 cm. If it is difficult to find, mix half a cup of salt in one cup of flour and knead with a little water to make 40 to 50 round balls with a diameter of 1-1.5 cm. Then, poke a hole in the middle of each ball using a toothpick. After these balls dry, they can be used as beads. In the DNA model, these beads will represent phosphate.
- ☑ Cut each drinking straw into equal three parts, making 20 to 25 segments. Each segment should be 8 to 9 cm long. These will represent nucleotides in the DNA model.
- ☑ Make parallel holes on both sides of the straw pieces with a thick safety pin.
- ☑ Cut the coloured papers into 2 cm wide strips.
- ☑ Now, cut 3 cm pieces of the coloured paper that have been cut into strips. Glue the green paper onto the straw in such a way that 2 cm of the green paper is covered on one side from the exact centre of the straw. Now, glue



Science

the yellow paper onto the other side of the straw in the same way. In this way, wrap green and yellow coloured paper in the middle of each half of the straw pieces (10/12). If you assume the green part to be the A nucleotide and the yellow part to be the T nucleotide, then each piece of the straw will be a base pair.

☑ Similarly, wrap the middle part of the remaining half (12/10) pieces of the strand with blue and red paper. If we assume that the blue part is the C nucleotide and the red part is the G nucleotide, then each piece of the strand will be a CG base pair. Remember that only green paper should be used with green and only red paper should be used with blue. There can be no exceptions.

☑ Cut a 1 m wire into two pieces and tie it to the sides of an old ballpoint pen, leaving 7-8 cm of space.

☑ Attach a piece of string with a ballpoint pen by passing both ends of the string through a hole in the middle of a straw.

☑ Hold the straw close to the ballpoint pen and pass both ends of the string (or your handmade ball) through two beads.

☑ Once, put a piece of straw and then keep passing two beads on both sides. Try to create a beautiful coordination of different colours of base pairs while inserting.

☑ After inserting all pieces of straw and beads, attach the other end of the string to the second ballpoint pen. Cut off the excess string.

☑ In the actual DNA, there is a rotation once in every ten base pairs. As there are around 20 base pairs here, it should rotate twice. Therefore, hold both hands with two ballpoint pens on both sides and give two full twists. You will see it has become a wonderful model of DNA.

☑ Imagine the yellow part of the straw as A, so the green becomes T. Similarly, the blue part is C, and the red part is G nucleotide. The beads or your handmade balls are phosphate. The remaining part of the straw between the two beads is sugar!

☑ To protect the model securely, place both ballpoint pens on top and bottom (with two full twists) inside an empty shoebox.

Remark

☑ The model of DNA has about 22/20 base pairs. Turn it around and notice it in different directions. See how the light casts shadows on the model

at different angles. This is important because Rosalind Franklin (1958–1920) photographed the shadow of the DNA molecule by throwing X-rays at different angles and analyzing the images, James Watson (1928–present) and Francis Crick (1916–) discovered the structure of DNA. 2004). That’s why, these two Scientist received the Nobel Prize in 1962.

Remember:

Although this model resembles real DNA, the proportional arrangement of various chemical groups of atoms is not preserved here.

- ✎ Based on the description of the model above, plan what kind of model your group will create and also decide on the materials required. We would like you to bring the materials for experimentation before the next session.




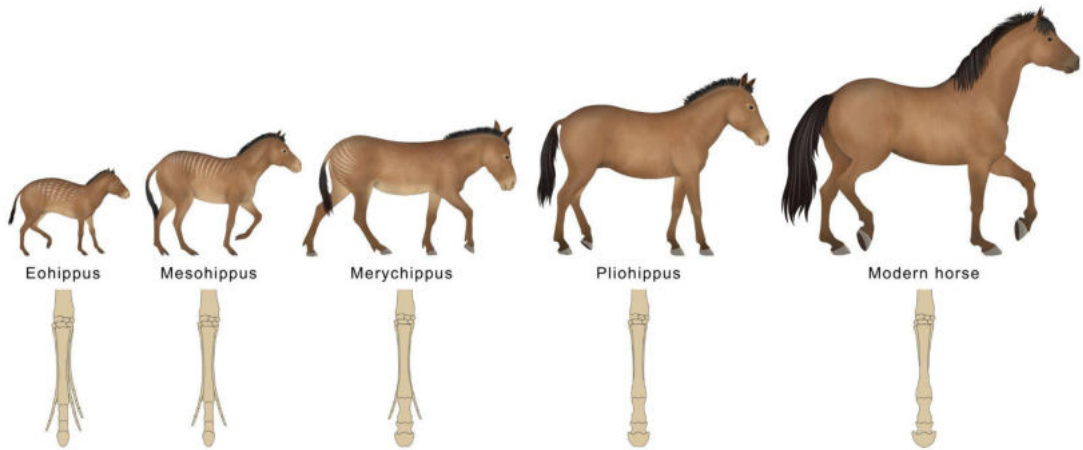
Session Seven

- ✎ In this session, you will work in teams to create a model of DNA according to the plan. Once your model is ready, present it to other teams and share your opinions after observing their models.
- ✎ Now, organize a guessing game. Take note of the names of various organisms including humans that come to mind. Then, consider whether they share different characteristics among themselves. Identify similarities in traits among similar organisms, meaning which organisms have similar patterns in their genes. Make your estimations and record them in the table below.

Name of the Organism:						
Characteristics						
List of organisms based on similar characteristics						

Science

 An example of how the characteristics of horses have changed over time is given below.



 Guess what other changes might occur in horses many generations later.

Many Types of Houses

Our features are not the same as those of every family member, but there are also many peculiar similarities among us. For instance, the facial features of one of us may resemble those of our parents or grandparents, or our way of walking may mirror theirs. What is the mystery behind this? This is precisely what we will attempt to uncover in this activity.







 **Session One**

- ✎ Let's consider the various types of households we live in. Are all the houses in your city or village the same? Are all homes in different regions of Bangladesh alike?
- ✎ Let's start this learning experience by exploring the diverse designs of houses we actually see.
- ✎ Form groups of 5 or 6 people. Together, discuss and observe the different types of houses you've encountered. Each person can depict and show various designs through individual discussions within the group.
- ✎ Now, present the house designs drawn by your group in class and share your opinions after observing the work of other groups.
- ✎ Examine the pictures below. Can you identify which house belongs to which area? Discuss this within your groups.



- ✎ Well, have you ever pondered why there is so much diversity in the layout of houses in different countries and varied environments? On what specific

Science

-  Now, think and observe, which aspects does the environment of an area depend on? What are the fundamental elements of an environment? Ponder on it yourselves.
-  The topography and nature of an environment often depend significantly on its water availability. Retrieve the chapter on topography from the Exploratory textbook. Study the section on water and discuss it within your group.
-  After studying, discuss it with the teacher and other classmates during the class. Write answers to the following questions based on your discussions.
-  Why is there more waterlogging in the urban areas?

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Session Three


-  Let us begin following the previous session. The discussion was centred around the environment and landforms. Can you tell why there is so much diversity in landforms on Earth? Moreover, it's not always the case that landforms in the same place remain the same. What are the reasons for the changes in landforms?
-  Just like before, refer to the Exploratory lessons and discuss among yourselves in groups about the process of creating different types of landforms. Understand why different types of landforms are created, both surface and subsurface, and how they change.
-  After reading, engage in discussions with your classmates and the teacher. Seek the teacher's help if you face difficulties in understanding the processes of landform changes.

 Sessions Four and Five

 Now that we know the processes of creating various landforms, do you know




how the landforms of Bangladesh were created? Try to estimate by looking at the map of Bangladesh and its surrounding areas.

 Look carefully at the map of Bangladesh and its surrounding areas from Google Earth in the above picture. Notice how many rivers flow through Bangladesh.

Science

Read from the Exploratory textbook how the landforms of Bangladesh were created through deposition and discuss among yourselves.

-  Now think, is there any connection between the process of land formation and the design of houses in local technology in Bangladesh, such as mud and thatched houses, tin houses? Discuss in the group and write down your answers below.

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-  There have been discussions about human habitats. Now, think and see if all animals choose the same type of habitat. Are the habitats of all creatures in the area the same? Do the same types of plants grow in all areas? Discuss in groups.

-  It's evident that habitats of other beings besides humans are closely related to their environment and the nature of the land.



-  Earlier, there was a discussion about local technology. According to the

characteristics of each area, specific technologies are developed for building houses. Let's explore the local technologies of Bangladesh. Traditional mud or thatched houses have a long history in this country. Do any of you have experience living in a mud house? If so, surely you know that mud houses tend to be comparatively cooler. But have you ever thought why? Conversely, why are houses covered in glass warmer in urban areas?

-  Managing temperature is crucial in constructing houses. Therefore, it is necessary to delve a bit deeper into understanding heat and temperature to comprehend the house's layout better.
-  From the chapter on heat and temperature in the Exploratory textbook, discuss topics such as how heat is managed, how much heat is conserved in different substances, how their flow occurs, and similar topics within your group. After reading, engage in discussions with your classmates and teacher as before.
-  What form does heat energy take? Learn about the relationship between heat energy and kinetic energy to understand this topic.
-  We are more accustomed to measuring temperature than measuring heat. Explore from the Exploratory textbook how temperature measurement is conducted, what units are used, and similar topics. Discuss with everyone after reading in the same manner as before.



Session Six

-  It's time to create a house layout. Discuss in groups and make decisions about the following question.
-  Which materials will be used for constructing the house?

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Sessions Seven and Eight

- ✎ To understand the basics of thermodynamics initially, learn about the scientist Joule's experiment.
- ✎ Attempt to solve mathematical problems related to this topic. Discuss with others after solving.
- ✎ Now, read and discuss the three principles of thermodynamics from the exploratory textbook.
- ✎ Let's return to the blueprint of our house. Carefully reconsider the environmentally friendly house layout you've created and decide what kind of tools and instruments you'll use to create its model. The final decision about this matter will be made in the last session. Remember, regardless of how the design looks, the model must be constructed using old or free tools and instruments.
- ✎ In the final session, create the model. Once everyone has completed their models, display them in various corners of the classroom. Explain to others why you made different decisions regarding your layout.





The History of Earth in a Day



What would happen if we could see all these events together from the beginning of the universe till today? Suppose, if all these events had happened in a year, $\approx 0.987654 \times 10^{10}$ years in one day, then what would have happened? In this experience, let's overview the flow of the events quickly.

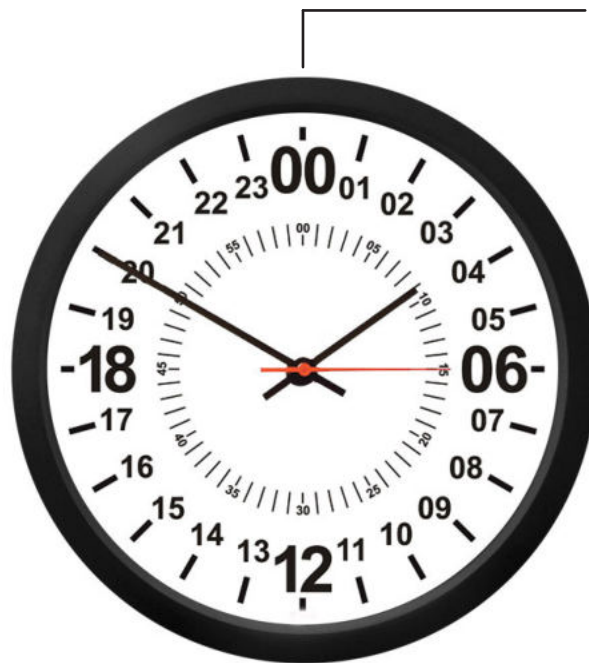


Session One

-  What important events have happened since your birth that you know or can remember? You can talk about many events in this case; For example: birth, first teething, first admission to school, first moving to another city, birth of a younger brother or sister, etc.
-  Now write the events of your life in the chart below and mention at what age what event happened.

Name :		
Date	Age (Year/ Month/Day)	Important Events (Description/Photo)

-  Now you will arrange all the events of your life in a 24 hours timeline. That is, if you are 15, then the very beginning of the 24-hour period will be the time of your birth and today will be the last part of 24 hours timeline. That means if you are enrolled in school at the age of 6, the 24-hour clock should show your enrollment at 9:36 AM.
-  Show your life events of different stages in the clock below. For example, the event of your birth is shown in the picture.



When I was born

✎ The important events of your own life have been discussed. What are the most important events of the universe since the beginning? Many of you may have already heard about the Big Bang, the creation of the earth, the creation of the moon, etc. Listen it from other students also. Discuss in pairs, write the information received from different students and arrange them sequentially.

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- ✍ Tell the chronological events to others; listen to the events of others and make comments.



Sessions Two and Three

- ✍ In continuation of the previous session, let's discuss the important events of the universe in this session.
- ✍ Well, the way we count time by years, months, days and weeks; how is the huge timespan of universe calculated? As human life is divided into several stages such as childhood, adolescence, youth, old age; could the entire duration of the universe be divided into several units?
- ✍ Get into small groups, read the topics such as the age of the earth compared to the universe, geological time range, geological time units, etc. from the 'Earth and Universe' chapter of the investigative text book.
- ✍ After reading discuss and think about it. Are all the eras equal? Based on what are these different Mahayuga, Upayuga, etc. divided?
- ✍ Look up and discuss from the Investigative Textbook how all these ages are proportioned in a 12-hour period. Notice the important events of different times. Have you noticed how recent the emergence of humans is?
- ✍ The question may appear in your mind, how did people come to know the events happened so long ago? To find the answer to this question, read about the formation and change of the geologic time periods from the same chapter as discussed earlier.
- ✍ Among the important events, the origin of life must have been discussed. Just as life has evolved over time, there is also history of mass extinctions where millions of living beings have gone extinct in a short span of time. You may know about the extinction of the dinosaurs, but there have been more such mass extinctions in the world; a little more detail is given in your investigative text book; so you may read it.

Science

-  The question may arise, how did we come to know about what kind of life was on earth at any time? Write your ideas about this in the space below.

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-  In this context let's discuss about fossils. Read about the types of fossils, how to determine their age, etc. from your investigating textbook.



Session Four

-  Which of the changes that have occurred since the birth of the earth, you think, are the most important? Read about the changes on the surface of the Earth and atmospheric changes from investigative textbook, and discuss among yourself.
-  Apart from these two changes, another major change has taken place in the world. The third change is the change in animalia (animal kingdom). Do the changes in this Animalia somehow dependent on the previous two types of changes? Think about it and discuss with your team members. After the discussion, write your answer below.

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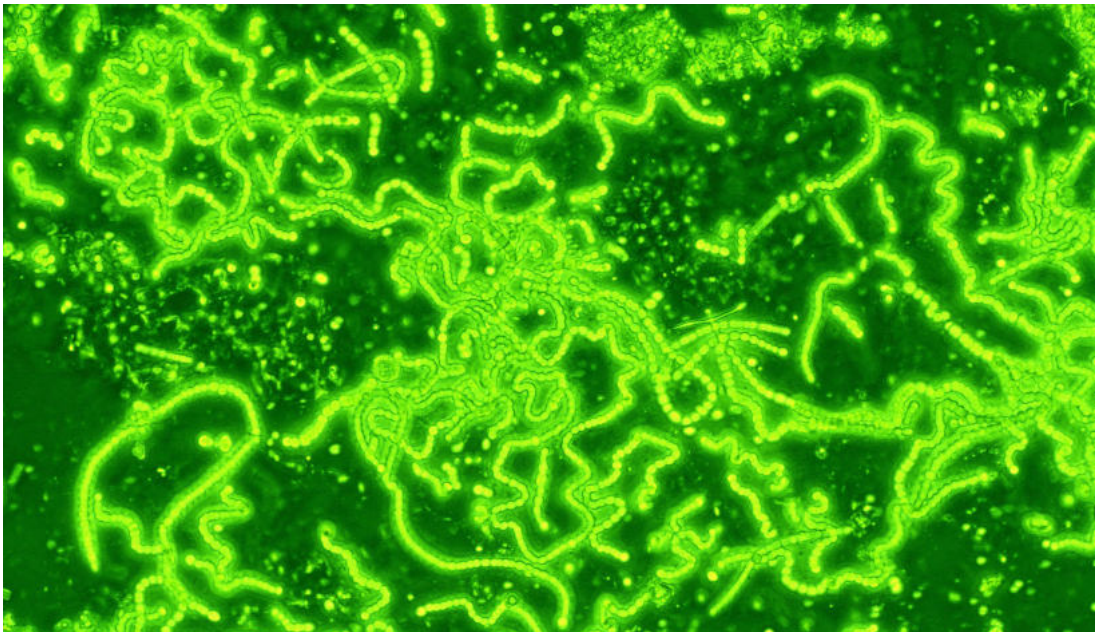
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✎ As you already know, the Earth's atmosphere as you see it now was not from the beginning. In absence of oxygen, no animal could breathe in the air. Even after the creation of the atmosphere, when the first micro-organisms were born in the sea, there was no oxygen in the air, meaning that plants and animals had no way to breathe. The question is, how is oxygen produced in the air?



✎ As you all know, plants release oxygen into the air through photosynthesis. At that time there were no plants as we know them, but there were micro-organisms like bacteria. And through evolution, chlorophyll-containing cyanobacteria (pictured as cyanobacteria) emerged over time. Due to the presence of chlorophyll, they can photosynthesize like plants. Cyanobacteria were the first to release oxygen into Earth's atmosphere through photosynthesis. They are the first to make the world green. As a result, at one point in time, animals first appeared in water. Later, oxygen atoms combine to form the ozone gas layer in the atmosphere, and protect the Earth from the sun's ultraviolet rays; And as a result, a favorable environment is created for survival in the


Science


water as well as in the river. This resulted in the gradual development of land animals.


 Now we need to know, how does this process of photosynthesis happen? This will be discussed in detail in the next few sessions.





Sessions Five, Six, Seven and Eight

 Read and discuss in groups how this process occurs in detail from the photosynthesis chapter of the Inquiry Textbook. If you have difficulty understanding, take help from the teacher.

 Now read and discuss how solar energy is converted into chemical energy in the process of photosynthesis.

 In which case energy conversion and transfer occurs in photo dependent and photo independent phases, identify them through group discussion.

 Do you understand how energy transfer and conversion takes place in photosynthesis? Write the answers to the following questions.

 Explain from the process of photosynthesis that the total amount of energy remains the same in translocation and conversion events. Is the energy constant formula at work here?

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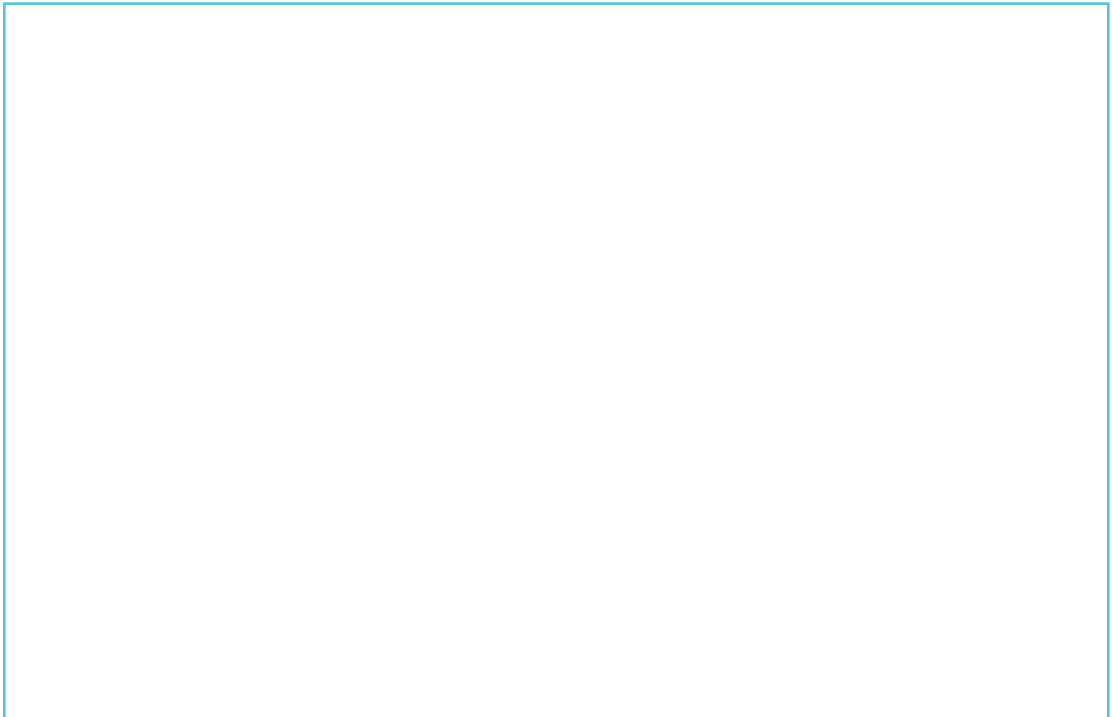
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-  Now note in which part of the plant the process of photosynthesis takes place. Can you explain which part of their body takes place in which stage of photosynthesis?
-  Draw in the blanks below. Explain the entire process to other team members.



-  Ask them to explain in which part of the body which step of photosynthesis takes place. What are the characteristics of green plants or microorganisms that can successfully produce food through the process of photosynthesis? Think about it and write your answer below.




Science


 Discuss the importance of photosynthesis in groups.



Sessions Nine and Ten

 Look carefully at the picture 'Emergence and Development of Life on Earth' given in the Inquiry Textbook. What important events are seen in the picture? At what time did the incident occur? Discuss in groups and write the answers to the questions below.

 What important events are seen in the picture?

 At what time did the incident occur?

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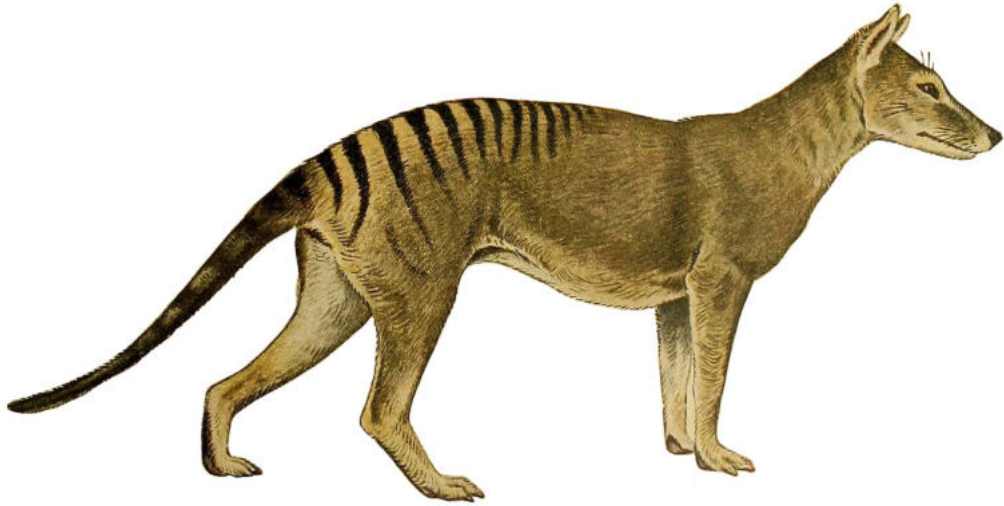
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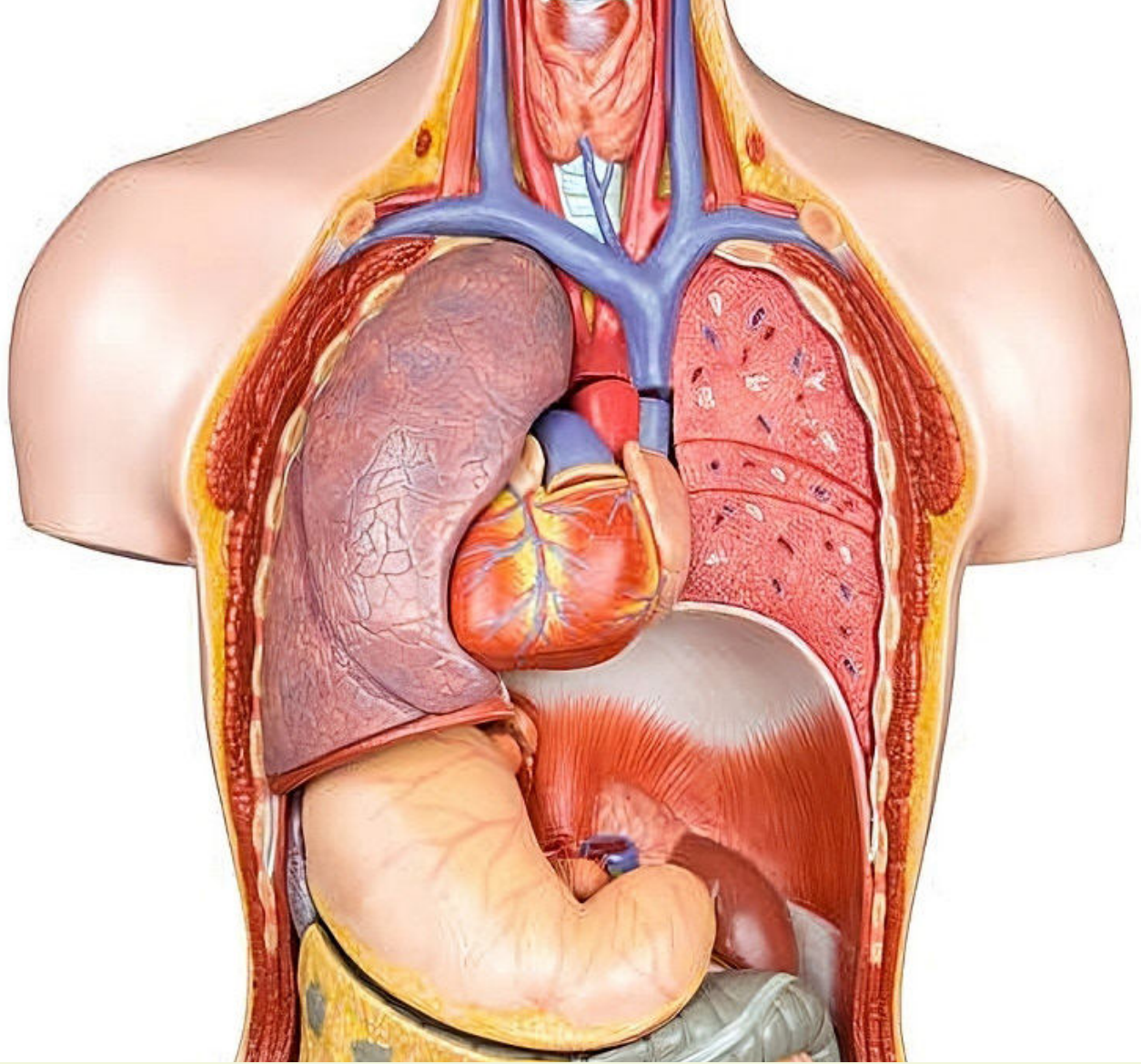
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- ✎ Now let's do something. Can you show the entire time since the creation of the world in a 24 hour clock? As before, it should be shown in 24-hour clock. If you want, you can show it on a big size paper. This is called the geological timeline.
- ✎ Work together with teammates. When the work is done, put the 24-hour clocks made by your different groups on different walls of the classroom. Go through the work of all groups and give feedback.



Session Eleven

- ✎ Can you name the following animal? Have you ever seen this animal? Surely not?



The Body as an Incredible Machine

Our human body can be compared to a big machine, just as the parts of a machine perform a whole by doing different things separately. Different systems or organisms of the human body keep our whole body functioning through specific functions. In this learning experience we will discuss some important organisms of the body.



Step-1



Session One










- ✎ You listen to each other for so long, speak yourselves, read books, write; different parts of your body do different things, all of which are controlled by a particular organism. You know that, the nervous system. Before we get into the details of the nervous system, let's do something fun.
- ✎ Names of different colours are written below. You must say the correct colour regardless of the colour name. For example, instead of saying the word 'red', the colour of the letter should be said as 'green'. Count how fast you can finish with a stopwatch.

Red	Blue	Yellow	Black
Orange	Purple	Blue	Green
Brown	Sky Blue	Red	Yellow
Parrot Green	White	Orange	Green

- ✎ The game you just played is called the 'Stroup Effect.' It is the psychologist J. Ridley Stroup who discovered this strange phenomenon in the 1930s. Here the words themselves have a strong influence on your ability to name colours quickly.
- ✎ Think about it now, during this game you have to read, see and finally say. How is the brain controlling these things must have come to your mind.
- ✎ Then this time read the section 'Structure of the nervous system and brain' from the investigative text book.
- ✎ Ask the teacher if any new question comes to mind. Clarify concepts through class discussion.





Session Two



-  You did something interesting during the last session. Let's start this session with another fun activity.
-  First, understand the instructions carefully. The one who can understand the instructions well and memorize them will do well this time.
-  The teacher will give you some instructions. You have to do the opposite. That is, from your position - if the teacher asks you to sit, you will stand, if you are asked to stand, you will sit. If you are asked to look forward, you will look back. In this way, the one who follows the instructions the longest is the winner.
-  Now the game begins...
-  Tell me how you feel? You are the winner today because you have been able to combine so many activities. This coordination is done by the brain. So it is foolish to think that the brains of those who have lost do not always coordinate properly!
-  So you have learned by reading the structure of the brain, the nervous tissue receives all kinds of sensations and stimuli from our body and creates appropriate reports according to the stimuli by transporting them. This nervous tissue is composed of 'neurons' which are the structural and functional units of the nervous system.
-  Now let's know a little better about the structure of neurons and how they work.
-  Read the "Structure and Function of Neuron" section of the Investigative Text Book carefully.
-  Now draw a picture of a neuron in your science book and identify its different parts.



Session Three

-  If your fingers are suddenly pricked or something hot is there on your hand, quickly remove your hand from the site of stimulation. You must have experienced such incidents. But do you know that if you move your hand quickly, you don't move it yourself willingly. It happens automatically. It's up to you! You can't keep your hand on the hot spot any longer.
-  This function has a name, 'reflexive action'. We cannot control the reaction even if we want to.

Science

-  Let's learn a little more about reflexive action, from the Investigative Textbook.
-  You have already known a lot about the nervous system. Now you can guess what can happen if the nervous system is disrupted? Make a list below by discussing with the next classmate.

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-  Match the list you have made with the symptoms of various neurological disorders written in the investigative text book.
-  Listen to the necessary instructions for the next session.




Home Task

-  Before the next session, we should come up with a list of what long-term diseases are seen around us by discussing with everyone in the house or by asking questions from known doctors or anyone.
-  If the name of diabetes comes up among the common long-term diseases, you will have another task. That is to identify diabetic patients in family or acquaintances and list the symptoms of this disease and take notes in the practice book.
-  At the same time, a local doctor will know why diabetes occurs and what are the ways to cure and prevent this disease.

Step-2



Session Four

-  Make a list of other long-term illnesses that are commonly seen in addition to neurological disorders-
-  The name of the disease 'Diabetes' must have appeared in the list.
-  Under the guidance of the teacher, in groups or as a single task, identify diabetic patients in the family or among acquaintances and write down the symptoms of this disease.

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-  From a local doctor, you will write below knowing why diabetes occurs and what is the remedy and prevention of this disease.

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-  You may have heard a few words from local doctors and diabetic patients, these two words 'glucose and insulin' are closely associated with diabetes. Insulin is a type of hormone that regulates the metabolism of sugar (glucose) in the body. If the pancreas does not produce enough insulin, the amount of glucose in the blood rises permanently, glucose is excreted in the urine. This condition is called polyuria or diabetes mellitus.

Science

- ✎ Before knowing more details about diabetes, let's know a little better about 'hormones'.
- ✎ Complete the table below by reading the section 'Hormones' and 'Introduction, function and secreted hormones of some major ductless glands of the human body' from the investigative text book.

Gland Name	Location	The main secreted hormone	Work

- ✎ Hormones have a special role in managing the biological functions of the human body properly. In a healthy body, hormones are continuously secreted

from the glands on demand. However, if more or less than the required amount of hormones are released, various unwanted reactions are created in the body.

- ✎ Read in pairs from the investigative text book what abnormalities can be caused by life or hormones.
- ✎ Now be divided into groups as directed by the teacher, each group will list the good habits needed to lead a healthy life to avoid hormonal abnormalities or diseases (common diseases related to endocrine glands) and make posters/banners/festoons/placards/comic books to make others aware.
- ✎ Things that must be in the work of each of you - 1. Why is the disease? 2. Disease symptoms 3. Diagnosis and treatment 4. Ways of prevention.

Step-3



Session Five

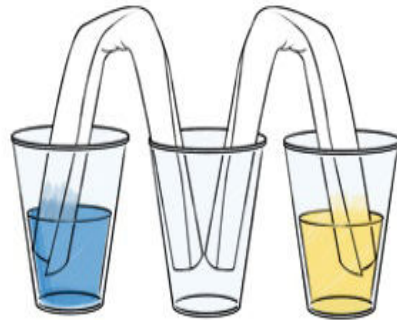
- ✎ Blood is the source of vitality. Blood flows throughout the body through the blood vessels and supplies oxygen and nutrients to the cells. As a result, all the cells of the body are alive and active. The system through which blood moves to different organs and parts of the body is called circulatory system. Blood-flow in the human body is limited to the heart and blood vessels, it never comes beyond this.
- ✎ Before we know more, let's listen to the heartbeat. If possible, try to listen to your own and a friend's heartbeat using a stethoscope. And if this stethoscope is not available, then gently listen to the chest of a friend! Many say it is the sound of life! Isn't that so!
- ✎ So, you hear the sound of the heart, it is one of the main organs of the circulatory system. In this research lesson, learn more about the structure of the heart and how it works.

Science

- ✎ Read 'Structure of Heart and Blood Circulation System' carefully. Ask the teacher if you have any questions.
- ✎ Be divided into groups of convenient members as directed by the teacher. In the next session, you will build a model of the circulatory system. So discuss what materials will be needed and make a plan today.
- ✎ Make a list of materials in the notebook of one of your team members. As always, the work should be done using readily available, inexpensive and reusable materials.




Home Task

- ✎ Take three glasses (glass/plastic clear glasses are better). Place the glasses next to each other. Fill the 1st and 3rd glass half full with water and mix two different colours of food colouring or water colour. Now fold two tissue papers or cotton cloths as shown in the picture below and put one end in the 1st glass and put the other end in the 2nd glass and insert one end of the tissue paper/cloth in the 3rd glass and keep the other end in the 2nd or middle glass for some time.
- ✎ After a few hours, write down what you observe in the notebook.






Sessions Six and Seven

- ✎ Observe the test you did yesterday as homework and discuss it in class. Does it have anything to do with blood circulation?
- ✎ Try to find the answers to the questions by reading the section “Blood Vessels” from the Investigative Textbook.
- ✎ You must have found a match with the capillary grid! It is then necessary to prepare a model of the heart to understand how the other two types of blood vessels - arteries and veins - work.









-  Now sit in groups and make a model of the heart and circulatory system.
-  After making the model, each group presents their model and explains how the heart works, how the arteries and veins carry oxygenated and carbon dioxide-rich blood to the heart-lungs-throughout the body.
-  Read in pairs about blood pressure, cholesterol, leukemia, heart attack etc. causes, symptoms, treatment and prevention of circulatory system diseases from the Investigative textbook.

Home Task

-  We use many medicines to prevent and treat patients. You will collect information from your family or a pharmacy worker about whether these medicines are taken according to the doctor's advice or not, what kind of medicines are taken. Particular emphasis should be placed on information on antibiotic use.
-  Be divided into groups of 5 or 6 to conduct a survey to collect information on antibiotic use from different pharmacies in the area. So make the question paper/questionnaire in your book/notebook.
-  Some sample questions are given below. You can run the survey by adding more questions as needed.

Name of the Pharmacy / No of Shop	
What antibiotics are sold here?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Is there a license to sell antibiotic drugs?	<input type="checkbox"/> Yes <input type="checkbox"/> No
What types of antibiotics are sold the most?	1. 2. 3.
Does the buyer buy the full course of medication?	<input type="checkbox"/> Yes <input type="checkbox"/> No
What do you know and aware about the irresponsible use of antibiotics?	<input type="checkbox"/> Yes <input type="checkbox"/> No

 **Session Eight**

-  Antibiotics are used to prevent bacterial infections. Do you know the name of any antibiotic? Or how does it work?
-  How does the immune system work in the human body? Read the 'Immune system of the human body' section of the investigative text book and spot the concept.
-  When the immune system of the body does not work, we resort to drugs. Antibiotics are one of the different types of drugs. Now the task is, what problems are arising as a result of the irresponsible use of antibiotics?
-  Have you ever had a fever? Then tell me how you were taken care of. What can you tell why the fever comes? Discuss in class.
-  Is fever a disease or a symptom of disease? What do you think? Do you know about our body's immune system? Let's check it out.
-  Participate in active discussions with the teacher and other classmates.
-  Also read the “Immune system in human body” section of the investigative text book.
-  Also discuss which system of the body develops which type of immune system. Think about how to keep your immune system working and write below.

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Agriculture and Environment

There are thousands of species of plants, animals, microorganisms around us. Many of them evolve naturally and come up with new traits, while we consciously or unconsciously help perpetuate the lineage of many species through artificial selection. And the best example of this is agriculture. These are the topics discussed in this experience.



Session One

-  Have you heard the name of Haripad Kapali? Haripad Kapali was an ordinary farmer of Jhenaidah area. He planted IRI paddy in his field. While checking the paddy in that field, he suddenly noticed that some plants were relatively big and the yield of paddy was high. Haripada Kapali wisely separated those paddies without mixing them with other paddies. After separating his seeds and replanting them, he wanted to see if they were still high-yielding. It turned out that they are quite big. And much more paddy yielded. After that, Haripad Kapali let others sow his rice seeds and soon all the farmers in that area started getting high yielding rice!
-  After the scientist Haripad Kapali's discovery, others came to know about it. Various institutions started analysing it; the rice he discovered was named Hari rice.
-  This case of Haripada Kapali is a good example of artificial selection. Have you ever wondered how new varieties are created in agriculture or how it is determined which crop varieties will survive? Think about it and write your answer below.

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-  Now it's time to look at a little history. Many of you may know that humans were once nomads and lived by hunting and gathering food. Once from there they settled



Science

in one place and started producing food and that through agriculture. In the field of agriculture also, by selecting the types of crops which yield more, they planted them in a certain land and slowly from there, those with high yield were selected and more high yielding varieties were created.

-  Can you see any similarities between the invention of agriculture in the early days of human civilization and the phenomenon of Haridhan production?
-  Is there any student in your class whose father is somehow involved in agriculture? Then you can hear from him about his farming experience. He can share his experience with you on how seeds are selected, how the weak or the diseased plants are removed and healthy plants are kept alive.
-  Now another question. In agriculture, people are cultivating beneficial crops by selecting varieties for specific purposes. Now if humans do not make such selections, do not make any decisions, then how it is determined which plants will survive and which plants will not survive in a natural system? Think about it.



Session Two

-  Do you remember the previous day's discussion? The question was, the number of certain organisms in a certain area depends on what factors?
-  Read the section on intensive coexistence of different organisms from the Ecosystems chapter of the investigative text book. Discuss in groups. Now think whether he can see in his nature any examples of the three types of symbiosis process mentioned. Discuss in groups and write answers in the blanks below.

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-  Tell others your answer, listen to others' answers and give your own opinion.
-  In any natural system there are living elements as well as several inorganic elements. A system survives through the interaction of these types of elements. What organic and inorganic elements can an environment contain? As organic matter is clearly understood, what can come of non-living and physical matter? What is the relationship between these different living and non-living things?
 - Read about ecosystems and ecosystem components from investigative textbooks. Discuss in groups, engage in open discussion with the teacher and the rest of the class.



Session Three

-  How is the population of living things determined in a natural system? How is this number determined in a natural system, such as in agriculture where we keep selected organisms or high-yielding plants alive and increase their numbers? What is the distribution of different living things in a natural system? In this session, let's find answers to these questions.
-  Read the Population Ecology section from the Investigative Textbook in groups. Discuss with group members and write down the answers to the questions below.
-  How is the population of living things determined in a natural system?

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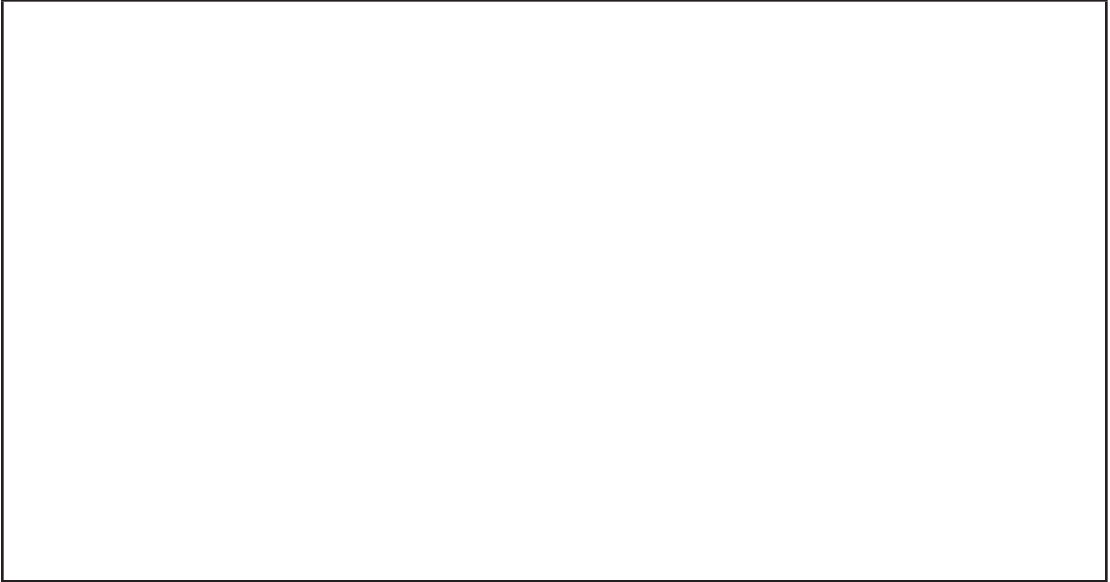
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-  Show others your ecosystem diagram. Get everyone's opinion including the teacher.
-  Let us now come to the topic of nutrient and energy flow in ecosystems. Read how natural energy flows in ecosystems from the Investigative Textbook. Can you explain the concept of the energy pyramid based on this formula?
-  Discuss with everyone in the class, take teacher's help if necessary.



Session Five

-  The discussion is about how the population of the living elements of the ecosystem is determined. Now the question is, how are the non-living elements of the ecosystem in balance?
-  What elements can be found in non-living things? As many of you know, water, oxygen, nitrogen etc. are among the main elements of our environment. How do elements such as water, nitrogen, oxygen cycle through the atmosphere? And find out from the investigative book that their sum is in a balance.
-  After reading, the task of each group is to show and explain these cycles through diagrams. All parties have to work with all three elements in this case. But each team will present any element cycle and its active processes by lottery.



Session Six

✎ Look at the pictures below. Can you guess how their physical characteristics help them adapt to their own environment and survive? Write your answer in the space below each picture.



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✎ Organisms are adapted differently to different environments. What characteristics do those in your area have that help them adapt to their environment and survive?


 Write down the different organisms found in your area and their adaptation strategies.

Name of the organism	Adaptation techniques



Session Seven

 In natural systems, population ecology, ecosystem, food chain, etc. were discussed a lot. Now think about it, where is the position of people in this food web? How are humans different from most of these organisms?

 Write your answer below.

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Science

-  Man keeps different species of organisms alive for his own needs and even creates new species of organisms with the development of gene theory. How can its effect be on nature?
-  It is undeniable that humans are the most powerful creatures on the planet Earth right now. For this reason, just as man has to ensure food security to sustain his own species, he also has the responsibility of maintaining the balance of other living and non-living elements of the environment. When we grow a particular crop for our own food security, we should consider the long-term impact of this agricultural process on other elements of the environment. What are the steps or what is the role of people that can fully fulfil this responsibility towards the environment?
-  Discuss in groups and write down some effective steps in the space below.

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-  Discuss with everyone in the class including the teacher. What measures can be taken to communicate your suggestions to everyone in the school?

Universe from a Dot


Where did this universe begin? What is our physical world made of? For which invisible thread do all the particles dance? People have been looking for answers to these questions for many years. The world of creation has caught a lot of curious people, and the answers to many questions are still out of reach!


The insatiable curiosity of people is the greatest capital of science, and this learning experience is to introduce you to this modern meditation concept of science.



Sessions One to Twelve

- ✎ This learning experience is quite different from other learning experiences of Class IX. In various learning experiences throughout the year, you have gone through a hands-on experience or applied science knowledge to solve a real-world problem.
- ✎ However, this experience is not meant to solve a real problem, that is, you will not actually go through a real experience in this learning experience. The main purpose of this experience is to introduce you to modern physics. You must have some idea about the pattern of formation of the universe in the light of personal experience or in the light of scientific knowledge so far, the purpose of this experience is to verify that idea.
- ✎ What is the use of modern physics in our daily life? Do we usually see the examples of these? It is quite difficult to answer. An example is modern physics, a branch of particle physics – which is highly abstract, but at the same time it provides the most comprehensive description of the structure of the universe that science has given us so far. For this reason, you will be introduced to quantum mechanics, the theory of relativity and the standard model of particle physics in this learning experience..
- ✎ The biggest thing is that, as a result of the infinite curiosity of people to know the unknown, for hundreds of years, scientists have tried to penetrate the mysteries of this universe. It is on that path that science has progressed so far, people have tried to understand the mysterious world like quantum mechanics which is in no way less important than worldly needs.
- ✎ Many of you may pursue higher studies in science, many may have an interest in something else. However, this learning experience aims to give everyone a basic introduction to these concepts of modern physics. For those who are more curious, the future holds a vast world of knowledge.
- ✎ In this learning experience, your work will be a little different. In almost all cases, you will have to read different concepts from the research textbook yourself and discuss them in pairs or groups. The teacher will guide you in this regard in time. In each case, when everyone in the group has finished reading and discussing, everyone in the class, including the teacher, will join in the free discussion. This will give someone a chance to clear up their confusions if they are having difficulty understanding things or if someone is stumped due to being too unfamiliar with such content.

 Here are some questions to sharpen your thinking at different times. In between learning experiences, jot down answers to brainstorming questions during relevant discussions.

 Since there is mostly empty space inside the atom, why does it not bend?

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 Is time-travel possible? Can people ever go to the past or the future?

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Science

 Why is it not possible to run faster than the speed of light?

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নিরাপদ সড়ক: দায়িত্ব আমারও

আমি পথচারী, চালক অথবা শৃঙ্খলা রক্ষাকারী যখন যে অবস্থানে থাকি না কেন, নিরাপদ সড়কের দায়িত্ব আমারও। আইন মান্য করা, সচেতনতা আর দায়িত্বশীলতাই পারে নিরাপদ সড়ক উপহার দিতে।

পথচারীর দায়িত্ব: রাস্তা চলাচল ও পারাপারে ফুটপাথ, জেব্রা ক্রসিং ও ফুটওভার ব্রিজ ব্যবহার করা। ফুটপাথ না থাকলে রাস্তার পাশ দিয়ে চলা, পাশাপাশি কয়েকজন না হেঁটে লাইন ধরে ঝুঁকিমুক্তভাবে হাঁটা, রাস্তা পারাপারের নিয়ম মেনে চলা।

চালকের দায়িত্ব: নিয়মানুসারে নিয়ন্ত্রিত গতিতে গাড়ি চালানো, বৈধ লাইসেন্সসহ গাড়ি চালানো, নিবন্ধিত গাড়ি চালানো, সড়ক আইন ও ট্রাফিক সংকেত মেনে গাড়ি চালানো।

Academic Year 2024

Class Nine Science | Exercise Book

সমৃদ্ধ বাংলাদেশ গড়ে তোলার জন্য যোগ্যতা অর্জন করো
— মাননীয় প্রধানমন্ত্রী শেখ হাসিনা

মিতব্যয়ী 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 সেন্টার
১০৯ নম্বর-এ (টোল ফ্রি, ২৪ ঘণ্টা সার্ভিস) ফোন করুন



Ministry of Education

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