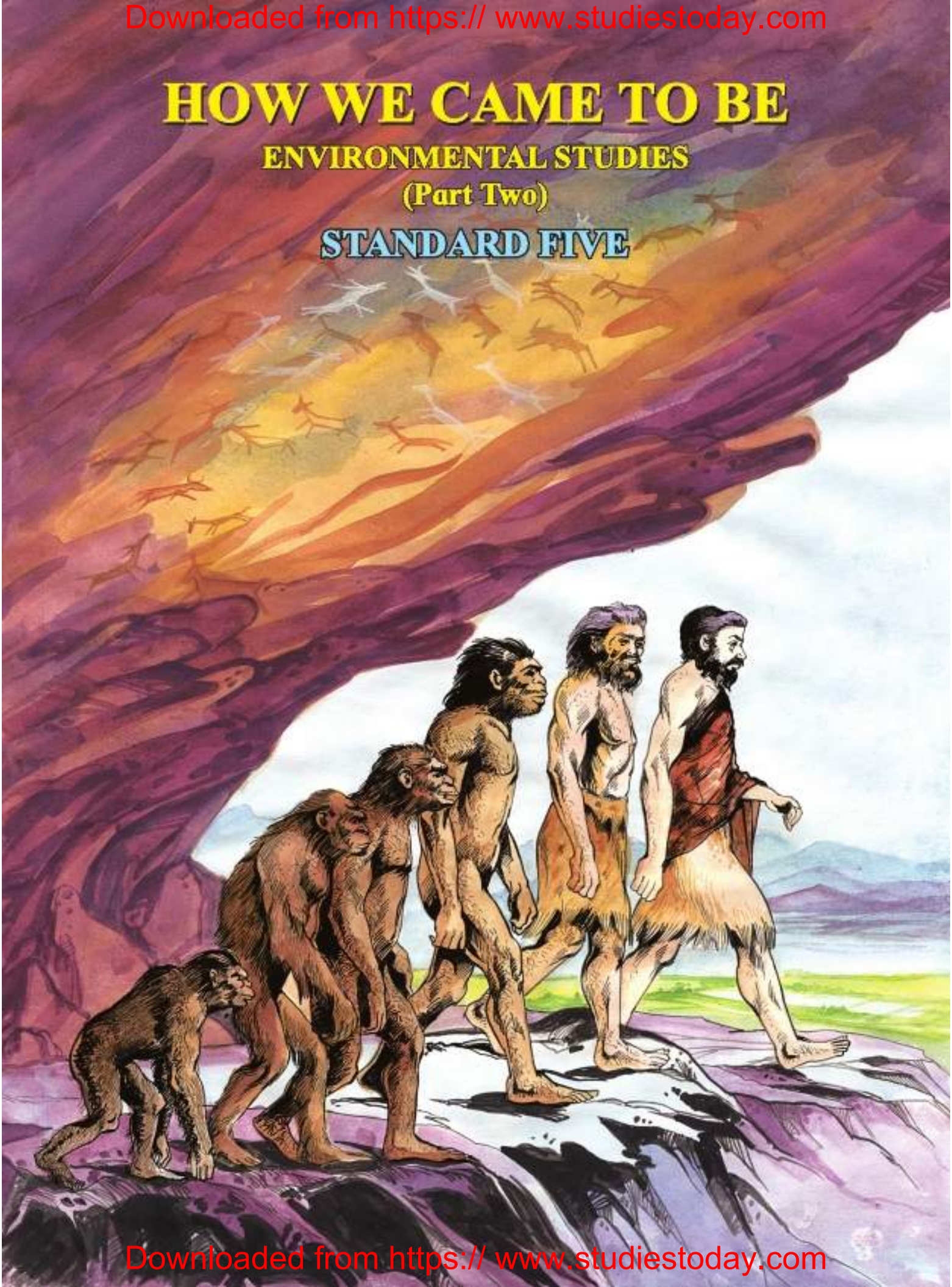
HOW WE CAME TO BE

ENVIRONMENTAL STUDIES

(Part Two)

STANDARD FIVE



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ENVIRONMENTAL STUDIES
(Part Two)

STANDARD FIVE

Maharashtra State Bureau of Textbook Production and
Curriculum Research, Pune.

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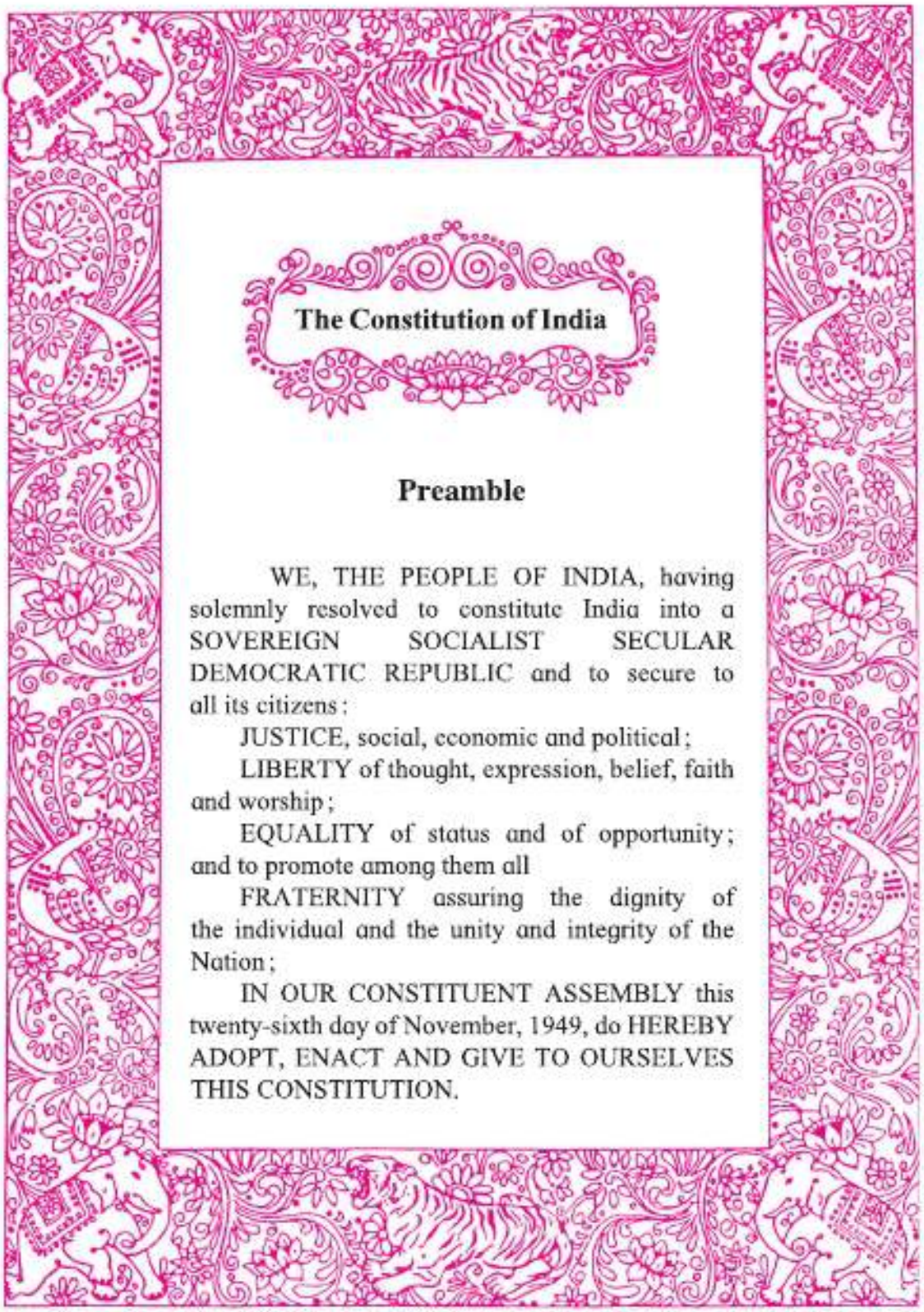


The Constitution of India

Preamble

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

NATIONAL ANTHEM

Jana-gana-mana-adhināyaka jaya hē
Bhārata-bhāgya-vidhātā,

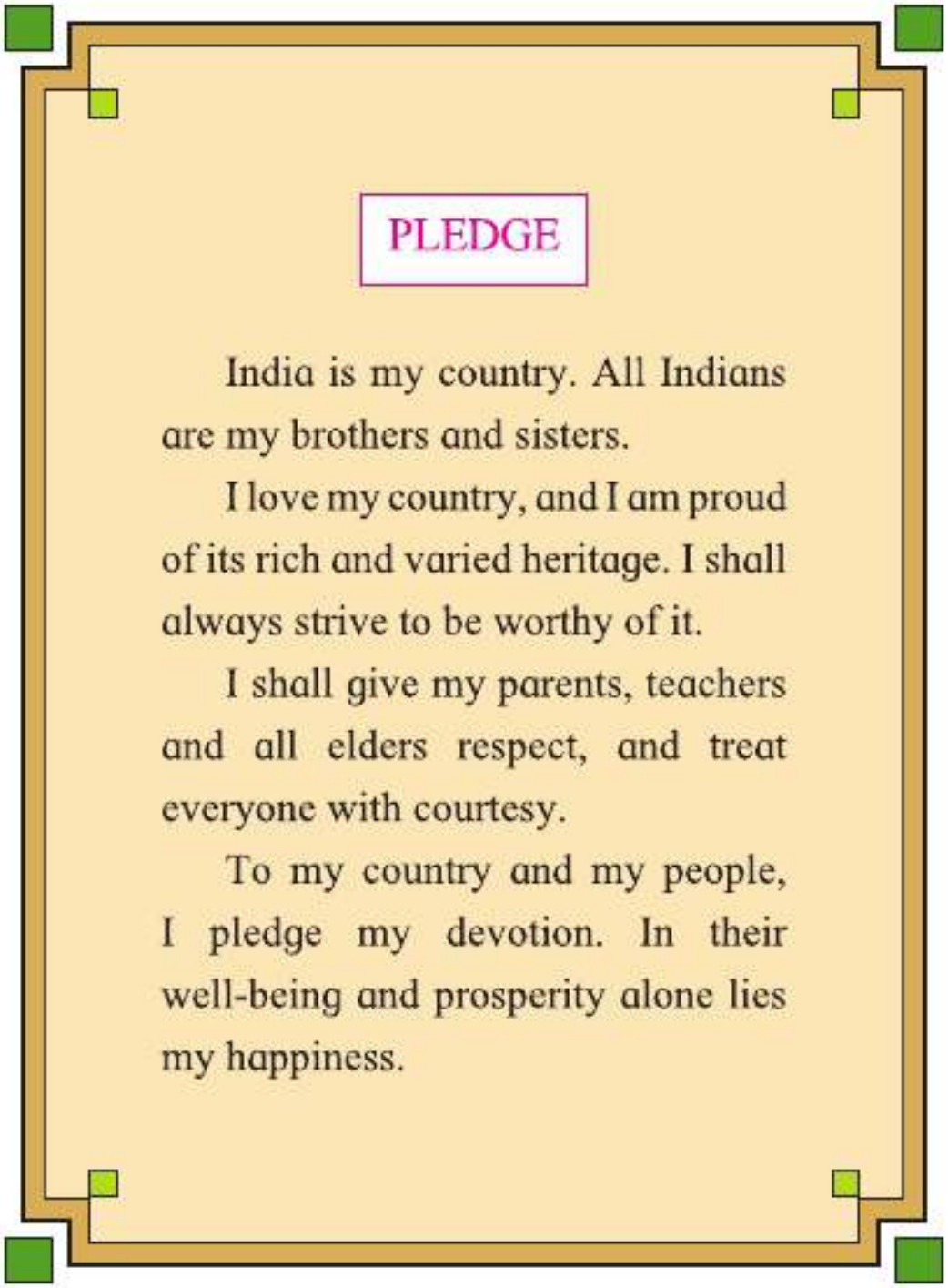
Panjāba-Sindhu-Gujarāta-Marāthā
Drāvida-Utkala-Banga

Vindhya-Himāchala-Yamunā-Gangā
uchchala-jaladhi-taranga

Tava subha nāmē jāgē, tava subha āsisa māgē,
gāhē tava jaya-gāthā,

Jana-gana-mangala-dāyaka jaya hē
Bhārata-bhāgya-vidhātā,

Jaya hē, Jaya hē, Jaya hē,
Jaya jaya jaya, jaya hē.



PLEDGE

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders respect, and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone lies my happiness.

Preface

The **'Primary Education Curriculum - 2012'** was prepared in the State of Maharashtra following the **'Right of Children to Free and Compulsory Education Act, 2009'** and the **'National Curriculum Framework 2005'**. Implementation of this Government approved curriculum began serially from the academic year 2013-14. This curriculum includes the subjects General Science, Civics and Geography under 'Environmental Studies - Part 1' from Standard III to Standard V. It specifies that the subject History will be independent under 'Environmental Studies - Part 2'. The Textbook Bureau has prepared this textbook for 'Environmental Studies - Part 2' for Std V according to the syllabus approved by the State Government. We are happy to place this textbook in your hands.

Our approach while designing this textbook was that the entire teaching-learning process should be child-centred, the method of self-study should receive more emphasis, at the end of Primary Education the students should have attained the desired competencies and the process of education in general should become enjoyable and interesting.

This book has been designed in such a way that right from the start children would realize that history is a scientific discipline. In the journey of mankind from the primitive to the modern man, nature and the environment must be seen as two very important factors. The book begins with the question, 'What is history?' As it is difficult to understand history without an understanding of the concept of time, an effort has been made to give a scientific explanation of the concept in simple words. Humans designed and made tools according to their needs. The environment around them changed with the changing climate. As a result, their needs and the nature of their work changed, too. With these changes, their tools also went on changing. The stage of civilization achieved by *Homo sapiens sapiens* is the pinnacle of the prehistoric period and marks the beginning of the historic period. This is how mankind's progress has been described in this book. The information in the boxes given at the end of the lessons will help to make learning more effective for the students. However, it is not meant for evaluation. Separate instructions have been given for teachers and parents. We have tried to provide a variety of exercises to make them interesting for the students. Activities have been given to promote active learning.

The book was scrutinized by archaeologist Dr M. K. Dhavalikar and many educationists and subject experts from all parts of the State to make it as flawless and standard as possible. The comments and suggestions received from them have been carefully considered while finalizing the book. The History Subject Committee, Panel, author and the artist have taken great pains to prepare this book. The Bureau is thankful to all of them.

We hope that this textbook will receive a warm welcome from students, parents and teachers.

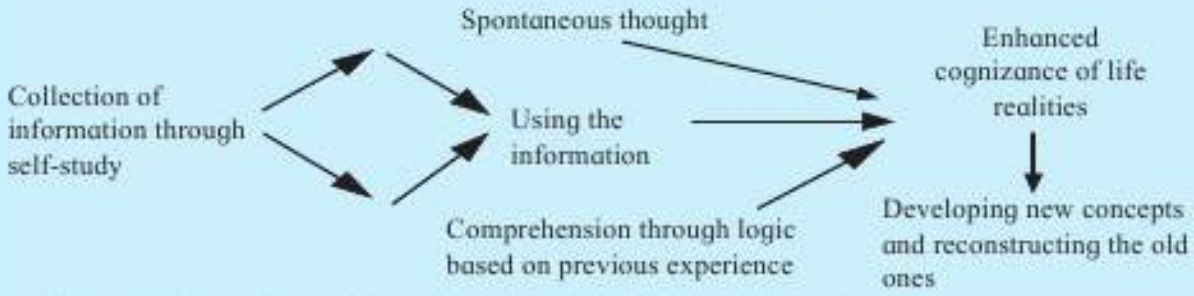
(C.R. Borkar)
Director
Maharashtra State Bureau of
Textbook Production and
Curriculum Research, Pune.

Pune
Date : November 27, 2014
Agrahayan 6, 1936

- For Teachers and Parents –

The guiding principle of the constructivist method of education is 'developing an understanding of life through education'. It is considered important that the learning process is not limited only to gaining information of the given subject with the help of the teacher and the textbook, but that it also enables the student to link that information to his/her own world of experience. Self-study is an essential factor in achieving this. The classroom environment and the design and structure of the textbook also need to be conducive to self-study.

The process of knowledge construction may be presented thus:



This textbook has been designed keeping all of the above in mind.

- An effort has been made to present the subject in such a way that one topic smoothly leads to another and the student is encouraged to probe further.
- In addition, each chapter is linked to the previous one so that children develop an understanding of the history of civilization as the unbroken chain of events that it is. This has been done taking due care to retain the scientific foundation of the subject.
- Separate boxes are used to present information and pictures to facilitate the use of constructivist methods of learning. Students may use them as a source of additional reading matter while teachers and parents will find them useful as reference material. Teachers are not expected to use this matter for setting questions.
- The main subject matter of the textbook and the additional information are arranged so as to underline the processes that shape observable cultural events as also to make the reader aware of the logic behind those processes. Creative thinking on the part of teachers as well as parents will help to make this process as novel as possible. Thereby, the role of teachers and parents would be transformed from uninvolved transmitters of information into that of co-participants and facilitators in the process of learning.
- Dialogue with peers and ample opportunity for self-expression are of great importance in the constructivist method. The activities based on the units in individual chapters would help to make this possible. Each child comes with an independent intellect. However, if they are organized into small groups, with each group being assigned an independent activity and guided to conduct group discussions, children will learn to communicate. Their ability to express themselves will also develop in the natural course of these group activities. In addition, they will, without requiring any extra effort, also develop an awareness that every topic has several aspects.
- Through the lessons in this textbook, students will learn that environment and culture are interdependent. The activities will help to further develop these sensibilities.
- The exercises given at the end of each chapter are by way of examples. To make the process of evaluation continuous and comprehensive, teachers may develop a question bank in line with these examples.

CONTENTS

Name of the Lesson	Page No.
1. What is History?	1
2. History and the Concept of 'Time'	6
3. Life on Earth	12
4. Evolution	15
5. Evolution of Mankind	19
6. Stone Age : Stone Tools	25
7. From Shelters to Village-settlements	30
8. Beginning of Settled Life	34
9. Settled Life and Urban Civilization	39
10. Historic Period	45

1. What is History?

1.1 History : A science that tells us about events in the past

1.2 The scientific method of history

1.3 History and us

1.4 The past and the future

1.1 History : A science that tells us about events in the past

Last year, in Standard IV, we studied the life of Chhatrapati Shivaji Maharaj and his mission of establishing Swaraj. The time before the birth of Shivaji Maharaj was about 400 years before now, or in the other words, the time '400 years ago'.

For our convenience, we divide time in different ways. Often we use words like 'now, some time ago, after some time', or 'today, yesterday, tomorrow', or 'this year, next year', etc. When we use these words, we are actually measuring time in our minds. 'Now', 'today' and 'this year' are terms that indicate the present. 'Some time ago', 'yesterday' and 'last year' are terms that indicate the past. 'After some time', 'tomorrow' and 'next year' are words that indicate the future.

The time that has already gone by is the past. The time that we are in now is the present. The time that is yet to come is the future.

The past includes many events that have already taken place. For example, if you are 10 years old today, it means that the event of your birth happened 10 years ago in the past. Similarly, after 10 years from now, that is, in future you will be 20 years old. The time gone by between today and the day of your birth is your past – the past in the life of a person.

Past
Day of birth
Ten years ago

Present
We are 10 years old.
Today

Future
We shall be 20 years old.
After 10 years

The science that tries to understand past events is called 'history'.

1.2 The scientific method of history

In Stds III and IV, as part of Environmental Studies, we have become acquainted with various sciences. The special characteristic of all these sciences is that their facts or evidence can be tested in experiments which can be repeated anywhere, any time. The method of using a number of different tests to determine whether the evidence is reliable is called the scientific method.

There are many things that happened since our birth that we may not know about. However, our grandparents or parents or others often tell us amusing stories of our childhood. Those stories are a part of their memory. However, when different people tell us about the same event, we find differences in their narrations. It makes us wonder which one is right. We need to examine the details of each narration carefully to decide the correctness of the facts.

It is not possible to conduct experiments to recreate the events that have happened in the past. Therefore, the method of presenting history is different from that of other sciences. Even so, history uses the scientific method at every stage, namely, while looking for and collecting evidence, examining the evidence and while putting it together. When required, help is also taken from other sciences. That is why, history is considered to be a scientific discipline. History is not written solely on the basis of imagination.

Ancient objects, structures, sculptures, pots, coins, inscriptions, copper plates, books, manuscripts, traditional stories and songs remembered

Pots

Coins

A copper plate

Books and manuscripts

The sources of history

over many generations, etc. are the 'sources of history'. The sources of history are of three types : 1. Material sources 2. Written sources 3. Oral sources. In order to find out what happened in the past and how it happened, evidence available from all these sources is collected and thoroughly examined to determine its reliability. With the help of the evidence that stands these tests, past events are put in a proper sequence and a historical account is written. This is the scientific method.

1.3 History and us

The study of science helps us to find the answers to many questions, for example, environmental science studies the problems of degradation of the environment, pollution, etc. and looks for their solutions. In the same way, every science has its own areas of study. History studies events of the past.

Individual or collective actions of human beings have consequences. They result in an environment that may be either favourable or unfavourable for the progress of society. This affects our day-to-day life. For example, if the people of a village work together and help one another, the village makes good progress. However, if the people cannot come together, it puts obstacles in the way of its development.

History attempts to find out answers to many questions by studying the way of thinking of past societies, their actions and the consequences. The study of history makes it possible for us to study what is and what is not favourable for the progress of human society. History thus provides us with guidelines about how we should behave today in order to shape a good future.

By telling us the life stories of great people, history also serves to inspire and to motivate us. By studying history, we get to know about the give and take that took place between our own and other civilizations. We learn about the progress of human civilization. We also understand how people's way of life went on changing.

Every village, city, district, state and country has its own history. Similarly, the earth, its mountains, water bodies, the animal world, mankind all have their own history.

Every science, too, has a history. It tells of the many scientific discoveries that brought about important changes in human civilization and of the scientists who made those discoveries.

1.4 The past and the future

The past, present and future are linked by a continuous chain of events, for example, the Indian people fought against the British government to get Independence. This is a historical action. As a result, India became an independent nation on 15th August 1947. So, we can say that Independence was a consequence

of an action, i.e., the Indian people's struggle for Independence.

In this way, the events of today are linked with past actions. When we understand this, we realize that the future depends on past events. This is what we learn from history. For example, we learn that man began to make tools from materials available in nature, that he learnt how to make use of fire and that he invented the wheel.

The next generations added to these developments. Technology developed further hand in hand with the physical and intellectual development of man. This process is going on continuously even today. Inventions of today are only possible on the foundation of the discoveries and inventions of the past.

Inventions and technology of the past

Inventions and technology of the present

Exercises

1. Fill in the blanks.

(a) The science that tries to understand past events is called ---------- .

(b) History is not written solely on the basis of ---------- .

2. Answer each question in one sentence.

(a) What is the scientific method?

(b) Of which action is India's Independence the result?

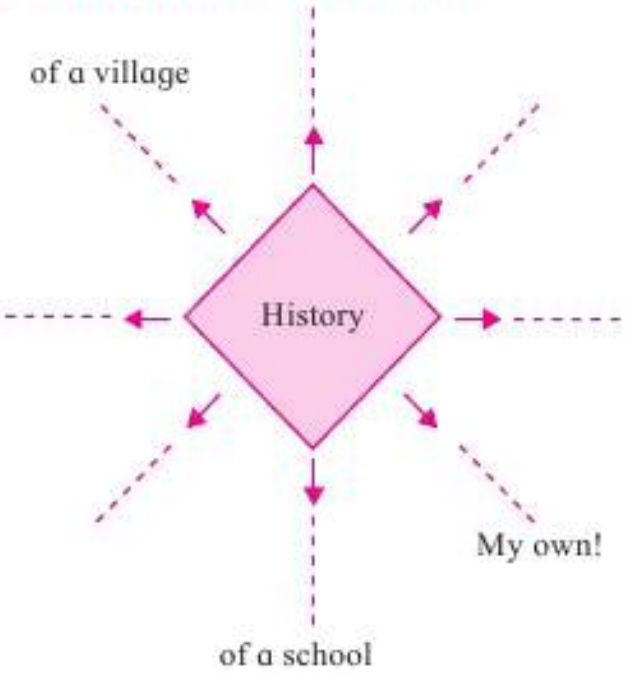
(c) What does the study of history make possible?

3. Answer the following questions in brief.

(a) Why is history considered to be a scientific discipline?

(b) What is it that puts obstacles in the way of village development?

4. Complete the concept chart.



5. Classify the sources of history using the chart given here.

Sources of history – coins, letters, forts, traditional songs, pots, copper plates, old structures, stone inscriptions, folk songs, pillars, biographies, rock-cut caves, folk tales.

Material	Written	Oral

Activities

(a) Collect information and pictures of the historical structures and ancient religious places in your village/city/ neighbouring area.

(b) Make a list of the sources that you would use to find out the history of your school. Write down the kind of information that you could get from each of them, for example, the foundation stone of the school : the date of foundation, the person who inaugurated it, etc.

Do you know this?

Archaeology

In many places, we see remains of objects and structures created in ancient times by human societies of those times. All of those remains are not always found above the ground. Some get buried under layers of soil that floods or strong winds deposit over them in the course of many years. The remains of human and animal skeletons also get buried in the same way. The science that studies past cultures with the help of ancient remains is called archaeology. The Latin word 'archaeos' means 'ancient'.

Archaeologists locate, dig out and study ancient remains. The method of digging the ground in order to bring to light any ancient remains that lie buried there is called 'archaeological excavation'. Such excavations are done very carefully, and each layer of soil that is dug up is examined scientifically.

The first step is to identify and make a careful record of places where such ancient remains may be found. The next step is to plan where to dig and how to go about the digging.

While studying the ancient remains, archaeologists try to find answers to many questions like the following :

1. To which period do the remains belong?
2. To which civilization do the remains belong?
3. What was the daily life of the people of that civilization like?
4. What kind of relations did those people have with people of other civilizations?
5. In what ways did they make use of the natural resources in their surroundings in order to meet their own needs?

2. History and the Concept of 'Time'

2.1 Division of time and the timeline

2.2 Measurement of time and methods of measuring time

2.3 Historical periods

2.4 Scientific methods of measuring time and establishing age (dating)

2.1 Division of time and the timeline

There are different methods of reckoning time. Time is continuous. But, for our convenience, we divide it into periods. The method that we use for reckoning time depends on our purpose for dividing it and the manner in which we do it. For example, at sunrise we say, 'It is morning now; the day has begun!' At sunset we say, 'It is evening now, soon it will be night!' At the end of the day, it becomes dark, and it is night. This means that we divide the day into two parts: day and night.

Our earth rotates around its axis at a certain speed. Similarly, it also revolves round the sun. The sun has its own light. We receive light from the sun. However, we see light only in daytime. Nights are dark. How does this happen?

As the earth rotates around its axis, that part of its surface which turns towards the sun becomes bright. The part that moves away from the sun moves into darkness. The earth takes 24 hours to complete one rotation around its own axis. These 24 hours are approximately divided into 12 hours of daytime and 12 hours of night. A period of daytime and the following night together make one day.

Seven days from Monday to Sunday make one week, two weeks make a fortnight, four weeks make a month. Twelve months make a year. In this manner, we reckon time in bigger and bigger units. One year is followed by another and, when 100 years go by, a century is completed. When ten centuries, i.e., 1000 years are gone, a millennium is completed. Such a method of dividing time is known as a unilinear division of time.

Common Era (Christian Era): In the unilinear division of time, years that follow one after the other are arranged in serial order. In history books also, a chain of events that follow one after the other is presented in a linear and serial manner. For this, usually we refer to the Common Era (Christian Era) written in short as CE or AD. ('*Anno Domini*' which means 'in the year of Our Lord'.)

The calendar we use today is based on the Christian Era, now called the Common Era. This era began in memory of Jesus Christ. The first year of this Era is the year when it began. It is shown with the number 1. The years after that are indicated by the next numbers in serial order. The first hundred years, i.e., the first century of this era is written as '1 – 100 CE' or '1–100 AD'.

The period of the first millennium of this era is written as '1-1000 CE' or '1–1000 AD'.

Time before the Common or Christian Era : The period before the Common Era is known as the time 'Before Common Era' (BCE) or 'Before Christ' (BC). The years of this period are counted and written in reverse order. The first century before the Common Era began at the year 100 BCE and ended with 1 BCE. Similarly, the first millennium before the Common Era began at the year 1000 BCE and ended with the year 1 BCE. So, the first century before the Common Era is indicated as '100 – 1 BCE' and the first millennium before the Common Era is indicated as '1000 – 1 BCE'.

Let us look at some examples of this method of indicating time before the Common or Christian Era. The lifetime of Vardhaman Mahavir is written as 599 BC – 527 BC. The lifetime of Gautama Buddha is written as 563 BC – 483 BC.

2.2 Measurement of time and methods of measuring time

To measure time is to measure the length of time. We know the following units of measuring time: second, minute, hour, day, week, fortnight, month, year, century and millennium. A second is the smallest of these units. There are various methods of measuring time in different parts of the world. Of these, the Common or Christian Era is the most widely used. We generally indicate a particular day by writing the 'date' of that day. The date consists of the serial number of that day followed by the name or serial number of the current month and then the serial number of the current year.

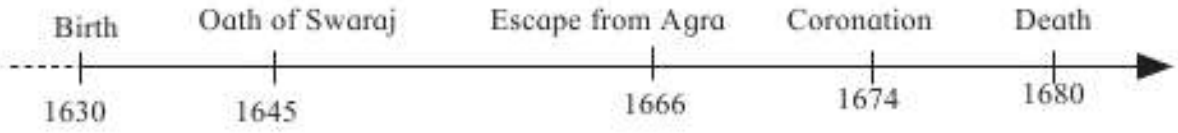
There are other methods too. We have seen that the Christian Era began in memory of Jesus Christ. It is an age-old custom to start a new era to commemorate a special event, as for example, the coronation of a great king. We know that Chhatrapati Shivaji Maharaj had started a new era or shaka known as

'Rajyabhishek Shaka' in 1674 AD to commemorate his coronation.

'Shalivahan Shaka' and 'Vikram Samvat' are two eras that are used in India. The founder of Islam, Prophet Muhammad migrated from Mecca to Medina. The 'Hijri Era' was started to commemorate this event. The Parsi community in India uses the 'Shahenshahi Era.'

1. Prehistoric period 2. Historic period.

1. Prehistoric period : 'Prehistory' simply means 'before history'. The prehistoric period is the period for which no written records are available by which to write its history.
2. Historic period : The historic period is the period for which written records are available using which we can write history.



Important events in the life of Chhatrapati Shivaji Maharaj (1630 AD to 1680 AD)

2.3 Historical periods

We learnt in the first lesson that History is a science that tells us about events that happened in the past. We also learnt that every bygone moment makes up the past. The past is the subject matter of history. In a broad sense, the period of history goes back to the time of the birth of our solar system. Our solar system came into being about 4.5 billion years ago. Our earth is a planet in the solar system. So it is presumed that the earth was also formed 4.5 billion years ago.

The span of 4.5 billion years since the earth's formation is a vast period of time. It is not easy to grasp this entire period all at once. It is necessary to divide it into a number of stages in order to understand it better. Therefore, the time in history is divided into two main periods–

2.4 Scientific methods of measuring time and establishing age (dating)

We are actually measuring time when we talk about today's date, or day of the week, etc. We have seen that there are various methods of measuring time. These methods allow us to identify a particular day, month or year with respect to an earlier or later day, month or year. For example, if it is June, then we know that the earlier month was May and the next one will be July. If today is the 10th of June, then we can tell that tomorrow will be the 11th of June and yesterday was the 9th of June. Thus, when we measure time, we actually measure its length.

The events before the beginning of the Common Era are mentioned as having occurred before the Common Era. Information about some of these events can only be obtained with the help of

evidence buried under the ground. This evidence is usually in the form of broken man-made artefacts and fallen structures. With the help of these remains, and using scientific methods, we can determine the time of the events that took place thousands of years ago.

There are many layers of soil deposited one above the other under the surface of the ground. The period of these layers and of the remains found in them cannot be stated definitely in terms of dates. However, a rough estimate of how many years ago they existed can certainly be made using scientific methods such as Carbon-14 analysis, Tree-rings analysis (Dendrochronology), etc. These methods are known as 'dating techniques'.

By using these dating techniques, we learn how old the layers of soil and the remains found in them are. Then we can determine their period approximately. For example, if an earthen pot is estimated to be five thousand years old with the help of dating techniques, we can say that the earthen pot dates back roughly to 3000 BC. Then we can conclude that the period of the culture to which the pot belongs must be around 3000 BC.

Exercises

1. Fill in the blanks.

(a) The calendar we use today is based on the ---------- .

(b) The period before the Common Era is known as the time ---------- .

2. Answer each question in one sentence.

(a) Which scientific methods are used to estimate the age of the layers of soil and the remains found in them?

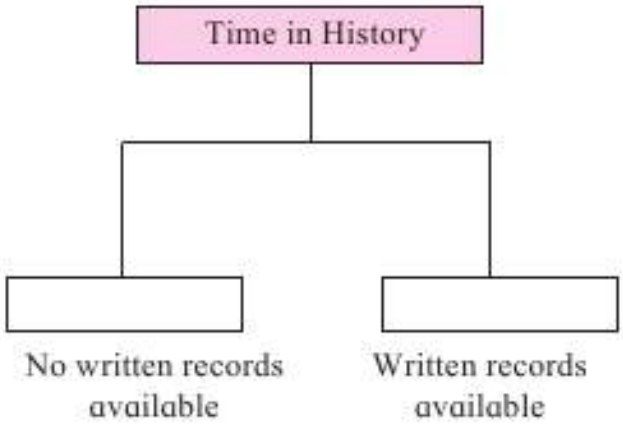
(b) How is the first century of the Common Era written?

3. Answer the following questions in brief.

(a) What is meant by the unilinear division of time?

(b) What are the units of measuring time?

4. Complete the chart given below.



Activity

- Prepare a monthly plan for yourself on the lines of the one given below.

February

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5 Cricket match	6	7	8 Music class
9 Friend's birthday	10	11 Receiving Aunt	12	13	14	15
16	17	18 Maths test	19 Birth anniversary of Shivaji Maharaj	20 Visit to Grandma	21	22 Music class
23	24 Village fair	25	26	27 Marathi Day Programme	28	

Do you know this?

One billion or one abja : Do you know how many years make one billion years? We know that the number we get by writing three zeros after 1 is 1000 and the number that we get by putting four zeros after one is 10000. We also know the mathematics behind it. $100 \times 10 = 1000$ and $1000 \times 10 = 10000$. Let us see how the numbers increase further in the same manner.

$100 \times 10 = 1000$

(One hundred) × (Ten) = (One thousand)

$1000 \times 10 = 10000$

(One thousand) × (Ten) = (Ten thousand)

$10000 \times 10 = 100000$

(Ten thousand) × (Ten) = (One hundred thousand / One lakh)

$100000 \times 10 = 1000000$

(One lakh) × (Ten) = (Ten lakh / One million)

$1000000 \times 10 = 10000000$

(Ten lakh) × (Ten) = (One crore / Ten million)

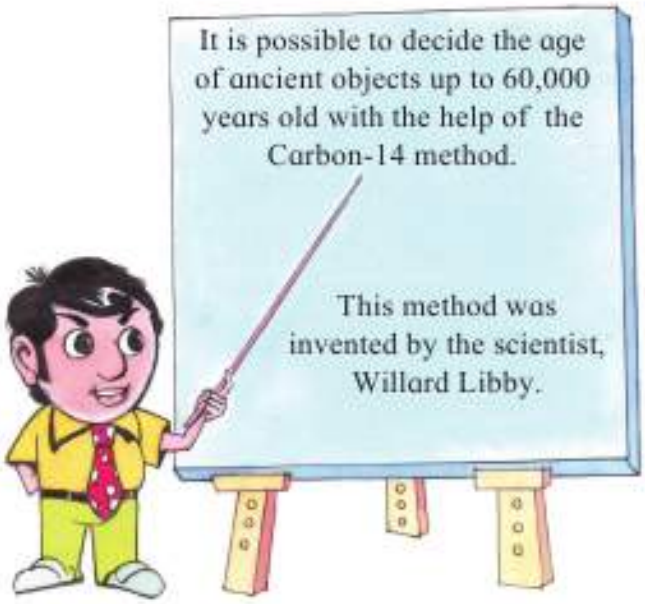
$10000000 \times 10 = 100000000$

(One crore) × (Ten) = (Ten crore / Hundred million)

$100000000 \times 10 = 1000000000$

(Ten crore) × (Ten) = (One abja / One billion)

Willard Libby
(1908 – 1980)



Dating methods : Carbon-14 is a radioactive element that is found in the bodies of all living organisms. After the death of an organism, the Carbon-14 in the body begins to decrease. When pieces of wood, charcoal, bones, fossils, etc. from the prehistoric period are found, it is possible to measure the remaining C-14 in a laboratory. By measuring the remaining C-14 in the object, we learn how old that object is. This scientific method of determining the approximate age of an object is known as the C-14 dating method. There are a few other dating methods, but the C-14 dating method is the one most frequently used. Once the age of an ancient object is determined with the help of this and other dating methods, it is possible to determine the period of the culture to which these objects belonged. Then it can be placed on the unilinear timeline.

As the tree grows in height, the trunk also grows in girth. A new ring appears for every year of the growth of the girth. The rings can be seen when the tree is cut. If we count the rings, we come to know the age of the tree. This can also be used to determine the age of a wooden artefact. This method is known as the Tree-ring method. (Dendrochronology).

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3. Life on Earth

3.1 Formation of the earth
3.2 Beginning of life on the earth
3.3 The animal world on the earth

3.1 Formation of the earth

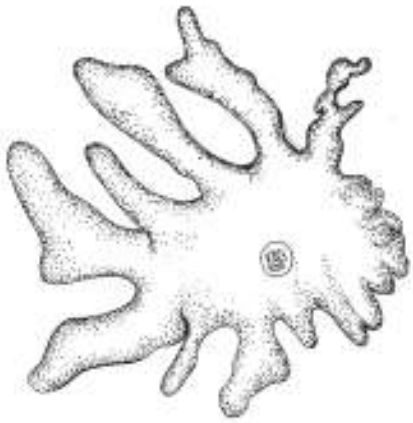
There are some questions we all wonder about. For example, how did the earth on which we live come to be? When did that happen? Was it always the way we see it today or has it undergone changes? If it has changed, what exactly are those changes?

The earth

On the basis of scientific research, it is now believed that around 4.5 billion years ago, an enormous cloud of very hot gases and dust spinning at a great speed was formed in space. Its circular motion and great speed caused it to divide into several portions thus creating the sun and the planets which revolve around the sun. The names of these planets are: 1. Mercury 2. Venus 3. Earth 4. Mars 5. Jupiter 6. Saturn 7. Uranus and 8. Neptune.

3.2 Beginning of life on the earth

Among these planets, the earth is the only planet where life is known to exist. After the formation of the earth, it took about 80 crore years for its surface to cool down and for water bodies to be formed on it. It is believed that various kinds of unicellular organisms or living things first appeared in water. They are known as 'protozoa'. Gradually, multicellular living things developed from these unicellular ones. The protozoa are so tiny that they cannot be seen with the naked eye. We need a microscope to see them.



A unicellular organism seen through a microscope

A microscope

3.3 The animal world on the earth

The living world on the earth consists of plants and animals. Here we shall take into account the animal world. The following are some of the main characteristics of animals :

1. Animals breathe.
2. Animals move in order to get food or for other purposes.
3. Animals of some species lay eggs and their young ones are born out of eggs. Animals of some other species give birth to their young ones.

The animal world

Exercises

1. Answer each question in one sentence.

(a) What instrument do we need to see a unicellular organism?

(b) Where did the protozoa appear first?

2. Answer the following in brief.

(a) How were the sun and the planets in our solar system created?

(b) Write any two characteristics of animals.

3. Find the names of the planets in the box below.

M	E	R	C	U	R	Y	J
M	A	V	S	R	M	A	U
V	R	S	E	A	A	R	P
E	T	S	U	N	R	N	I
N	H	A	N	U	S	V	T
U	S	A	T	S	R	N	E
S	A	T	U	R	N	P	R
N	E	P	T	U	N	E	O

4. Arrange the events given below in chronological order.

(a) Water bodies appeared on the earth's surface.

(b) The sun and the planets revolving around it were created.

(c) Protozoa appeared in water.

(d) An enormous cloud of hot gases and dust was formed in space.

Activity

Make a model of the solar system using balls of different sizes.

Project

Visit a zoo or make a list of animals which are seen in your neighbourhood and note their characteristics.

Do you know this?

Some scientists feel that there is a possibility of life on Mars. However, no evidence regarding this has been found so far. Like our earth, Mars too has volcanoes, valleys, and deserts. It also has polar regions covered with ice sheets. 95% of its atmosphere contains carbon dioxide. It also has oxygen in very small quantities, as also other gases and water. Hence, it was thought that life may exist on Mars. The soil on Mars is found to contain some components that are essential for the growth of plants. More research is being carried out in the light of all these facts. However, the existence of water in its liquid form is essential for life to exist. It is true that the polar regions of Mars are covered with ice but there is no liquid water.

The idea of a 'Man from Mars' has become popular through literature and cinema but scientific research has not confirmed it.

India launched a spacecraft 'Mangalyaan' to Mars on 5th November 2013 and the mission was successfully accomplished on 24 September 2014. This is a historic event.

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4. Evolution

4.1 The concept of evolution

4.2 The stages of evolution of animals

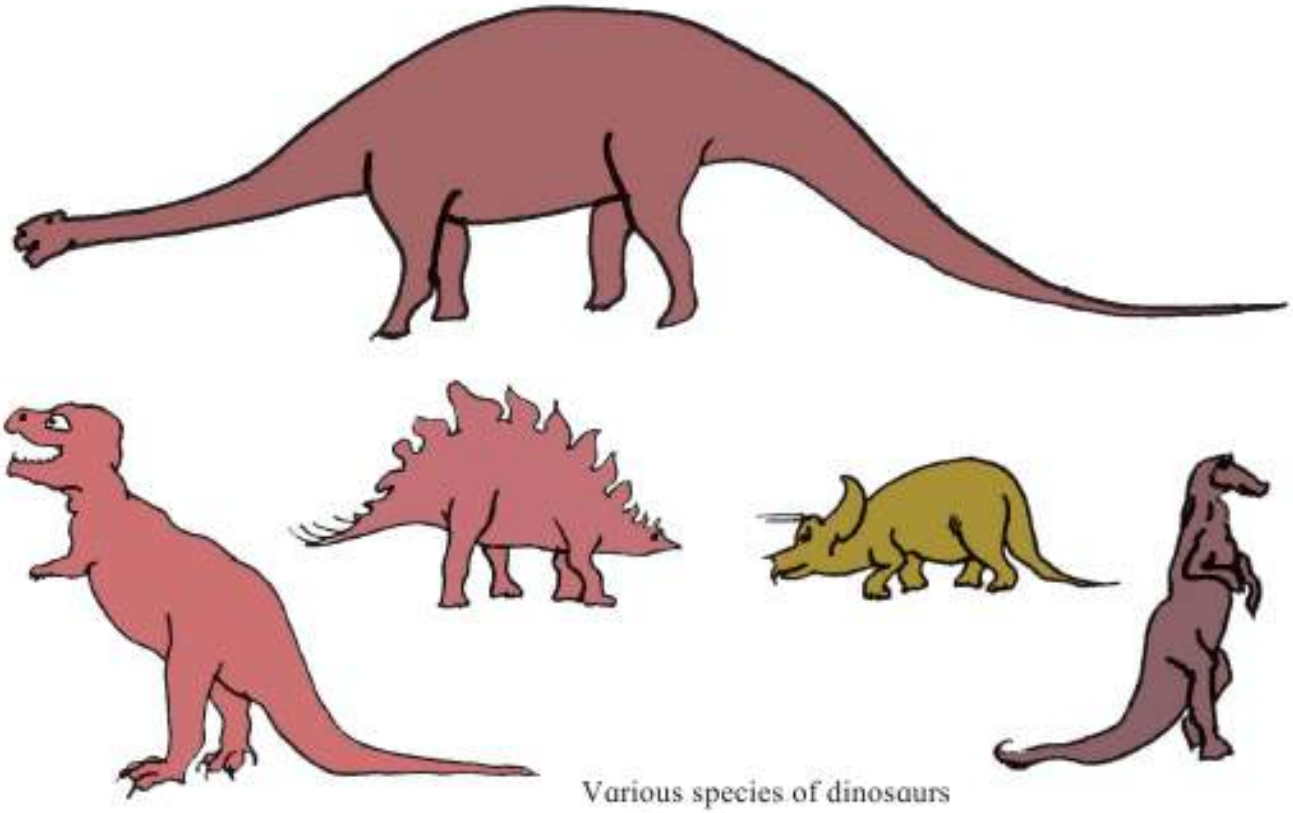
4.3 Apes

4.1 The concept of evolution

The word 'evolution' is generally understood to mean 'gradual and continuous change'. Evolution in the plant and animal world can be explained in the following manner: In the process of survival by adapting to environmental changes, certain internal physical changes occur in some animals of a species. Over a period of time, these internal changes become inherited characteristics seen in all following generations. Thus, a new species with characteristics different from the original may be created. Such a species is usually more evolved than the original one. Sometimes, the original species dies out or becomes extinct. Sometimes, more than one species evolve from the original one. The first scientist to give us a systematic explanation of the concept of evolution was Charles Darwin.

Species which are capable of adapting to environmental changes are able to survive. The ones that cannot do so, become extinct in the process of evolution.

In ancient times, there were many species of a type of animal called dinosaur. 'Deinos' in Greek means 'terrible' and 'sauros' means 'lizard' or reptile. Dinosaur means a 'terrible lizard'.



Various species of dinosaurs

Some of these dinosaurs were enormous in size. It appears that these species of enormous dinosaurs suddenly became extinct. Some sudden natural disaster or environmental change is believed to be responsible for their extinction. Fossils of dinosaurs with wings have been discovered. It is believed that some species of two-legged and winged dinosaurs evolved into birds.

Skeleton of a dinosaur

A reconstructed picture of a dinosaur with wings

4.2 The stages of evolution of animals

We have learnt in the previous lesson that life on earth began with unicellular organisms known as protozoa. These unicellular organisms gave rise to multicellular living things. The multicellular organisms evolved gradually and various classes of plants and animals came into being.

The following are the stages of evolution of animals:

1. Invertebrates : Animals without a backbone are called 'invertebrates', for example, a snail.

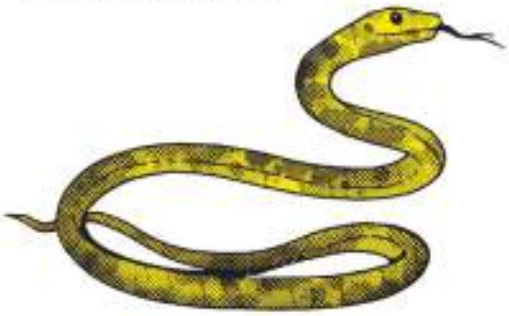
2. Vertebrates : Animals which have a backbone are called 'vertebrates'. Look at the ones given below :

- Aquatic animals : Example, fish.

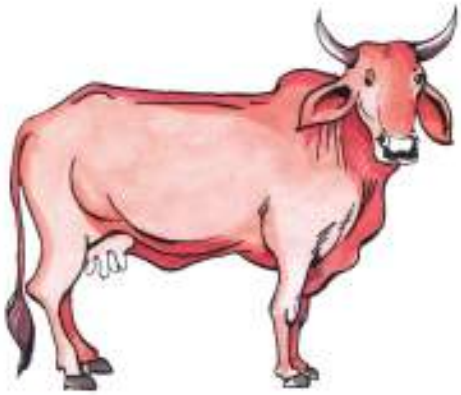
- Amphibians : Animals which live in water and also on land, for example, a frog.

- Birds

- Reptiles : Animals which crawl, for example, a snake.



- Mammals : Example, a cow.



Mammals : Mammals are the most evolved animals among vertebrates. The following are the characteristics of most of the mammals: 1 Growth of the baby in the mother's womb for some time before birth. 2 The baby is fed on the mother's milk for some time after birth.

The platypus and some species of anteater are exceptions to this. They are considered mammals because even though they lay eggs, they suckle their young ones.

A platypus

An anteater

4.3 Apes

Apes are somewhat like humans in appearance. They mostly lived on trees. Those species of apes which continued to live on trees retained their original apelike form. However, in grasslands, some ape species were forced to move around on the ground. These species evolved gradually and in time, gave rise to the human species. This happened first on the African continent. The first human species is called the 'primitive man'. 'Primitive' means 'the first'. In the next lesson, we shall learn more about the evolution of the human species.

Exercises

1. Fill in the blanks.

(a) The first systematic explanation of the concept of evolution was given by ----------.
(Charles Darwin, Willard Libby, Louis Leakey)

(b) ---------- are the most evolved animals among vertebrates.
(Aquatic animals, Amphibians, Mammals)

2. Answer each question in one sentence.

(a) What do we call animals which live in water and also on land?

(b) Where did the first humans appear?

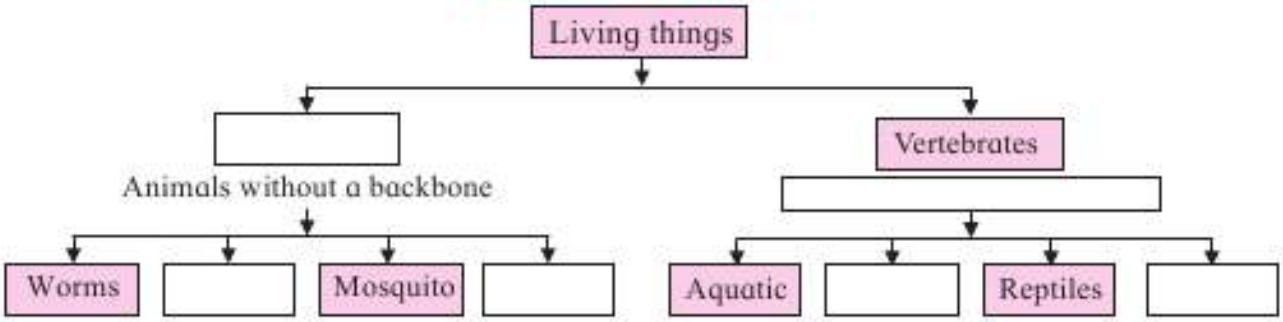
3. Give reasons for the following :

(a) The species of dinosaurs, which were enormous in size, suddenly became extinct.

(b) In the course of time, a new species with characteristics different from the original species is created.

4. Fill in the blanks in the concept chart given below.

Evolution of animals



Activity : Make a model of a dinosaur.

Project : Collect pictures of invertebrates and vertebrates.
Stick them in a notebook and write down their characteristics.

Do you know this?

Charles Darwin
Birth 1809 – Death 1882

In the year 1859, Charles Darwin proposed his theory of evolution in his book 'On the Origin of Species'. Before Darwin, the scientist Carl Linnaeus had introduced his method of classifying animals. He had expressed the opinion that going by the structure of the body, the human species and some ape species appeared to be related. In his first book, Darwin had not expressed any definite opinion about this relationship. In 1871, he published his second book, 'The Descent of Man'. In this book, he drew attention to the fact that even though humans do not have tails, the last bone of their spine is a vestige of a tail. He also noted that some other non-functional or unnecessary structures in the human body, such as the wisdom teeth, are indicators of the process of evolution. He accepted the inference that humans had evolved from tailless apes like the gorilla and the chimpanzee that lived in the jungles of Africa. However, no evidence had been found till then in support of his theory. The necessary evidence became available only in the twentieth century.

5. Evolution of Mankind

5.1 From *Homo habilis* to *Homo sapiens sapiens*

5.2 *Homo sapiens sapiens* and civilization

In the previous lesson, we learnt that the primitive man evolved from apes. The next step for humans was learning to use their hands effectively to make tools.

5.1 From *Homo habilis* to *Homo sapiens sapiens*

The skilled human : The species of humans who could use their hands skilfully is known as 'the skilled human'. The first evidence of this species was found in the border region between Tanzania and Kenya in the continent of Africa. The scientist Louis Leakey, who discovered this species, named it *Homo habilis* because beside their fossilized remains, he found some tools made by them. In Latin, 'homo' means man, and 'habilis' means 'the one who uses his hands skilfully'. *Homo habilis* could stand on two feet and walk. His spine was slightly bent and not quite erect. His brain was bigger than that of the apes, although his face and limbs were somewhat similar to theirs.

A reconstructed picture of *Homo habilis*

Stone choppers made by *Homo habilis*

The stone tools made by *Homo habilis* were not useful for hunting big animals. They had limited uses such as scraping meat from the skin of dead animals or breaking bones to get the marrow. We can infer from this that *Homo habilis* was a forager. He ate the leftovers of animals that had been hunted by other animals. It is possible that he hunted small animals and gathered eggs, wild fruits and roots to eat.

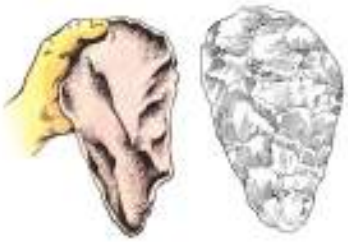
***Homo erectus* :** *Homo erectus* marks an important stage in human evolution. 'Erectus' means 'the one who stands erect', hence the name *Homo erectus*. Compared to *Homo habilis*, he had a more developed brain. Humans of the *Homo erectus* species lived in groups.

Having seen wildfires, humans knew about fire. It is likely that *Homo erectus* had learnt the technique of fetching the burning branches of trees to use that fire. During his time, most of the earth was covered with ice sheets. Therefore,

the climate was extremely cold. *Homo erectus* could survive in that extremely cold climate because he had learnt to use fire. However, he had not yet mastered the technique of making fire.

Tools made by the *Homo erectus* were more developed and symmetrical compared to those made by *Homo habilis*. *Homo erectus* made tools like the hand-axe. Remains of *Homo erectus* have been found along with his tools in the continents of Africa, Asia and Europe.

A reconstructed picture of *Homo erectus*



A stone hand-axe made by *Homo erectus*

***Homo Neanderthalensis* (Neanderthal Man) :** One more stage of development in human evolution is *Homo Neanderthalensis*. He was physically big and strong. He is commonly known as the Neanderthal Man because his remains were first found at Neanderthal,

Neanderthal Man

a place in Germany. His brain was more developed than that of *Homo erectus*.

The Neanderthals primarily lived in caves. They made tools out of big pebbles as well as from the flakes scraped off from them. Such tools were fixed on a bone or wooden shaft to make weapons like the spear, axe, etc. The Neanderthals hunted big animals. They used scrapers made from stone flakes to scrape meat from the hide of dead animals. They used leather clothing. They were mainly meat eaters. They ate meat roasted on fire. They knew the art of making fire by rubbing sticks of hard wood on each other or by striking one flintstone on another to obtain sparks.

It is likely that the Neanderthals had developed some artistic skills. Some scientists believe that they also communicated with each other by producing grunts and other primary sounds. However, it is not known whether they had a developed language system to express their thoughts with the help of words.

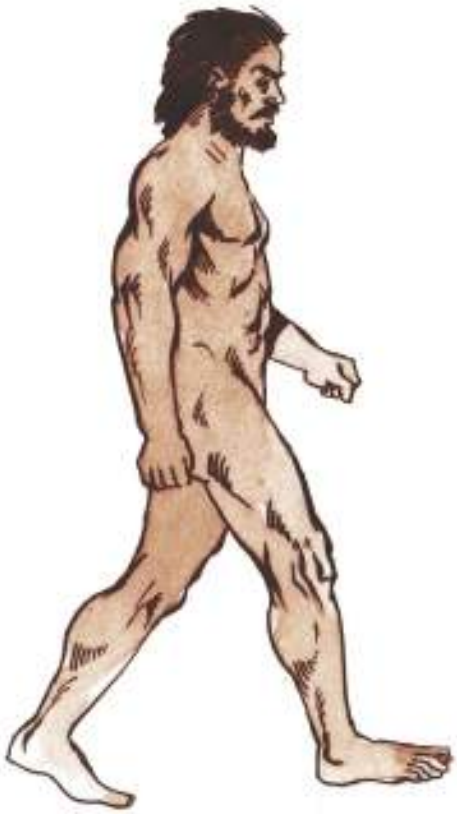
When a member of the group died, the Neanderthals buried tools, horns, etc. along with the dead body. Also, they applied red ochre to the dead body before burying it. It indicates that the Neanderthals had established some rituals of burying the dead.

In the course of time, some groups of Neanderthals left Africa and migrated up to the continents of Europe and Asia. Naturally, they had to face a different environment. They had to adopt new ways of living and finding food. Therefore, they went on modifying and improving the tools that were essential in their life. However, the improvements in tools took place over thousands of years.

'*Homo sapiens*' is the name used for humans that were more advanced than the Neanderthals. '*Homo sapiens*' means Intelligent or Intellectual Man. We shall learn more about him later. The Neanderthals and the *Homo sapiens* were neighbours for some time in Europe. It is believed that due to reasons like their conflict with *Homo sapiens* and inability to adapt to environmental changes, the Neanderthals became extinct. On the basis of C-14 dating, it is estimated that the Neanderthals became extinct about 30,000 years ago.

Homo sapiens : The human species that was more intelligent than any of the earlier species was named '*Homo sapiens*'. In Europe *Homo sapiens* is also known as 'Cro-Magnon Man'. Their remains have been found in the continents of Europe, Asia and Africa. *Homo sapiens* made different kinds of tools and implements to suit the tasks they needed to do. They used to make stone blades and fix them in grooves and notches made in wood or bone handles.

Homo sapiens had evolved to the



Homo sapiens

stage of having a fully developed larynx which could produce a range of sounds with subtle differences. Their jaws and the muscles inside the mouth were well-developed and the tongue was flexible. Hence, *Homo sapiens* could use them to produce a variety of sounds and modulate his voice the way he liked. Using his imagination, he could give names to the different things he saw and could put his thoughts and feelings into words. Using these words, he could speak and communicate. In short, he had a well-developed language system. He could draw pictures on the basis of actual observation as well as imagination. He

A cave painting

even began to make artistic objects. That is why, he has been named '*Homo sapiens*', i.e., 'Intelligent Man' or 'Thinking Man'.

5.2 *Homo sapiens sapiens* and civilization

Homo sapiens sapiens : *Homo sapiens sapiens* is the name given to the humans as their capacity to think developed even further than that of *Homo sapiens*. The capacity of their brain and their grasping power also developed further with time.

We, the modern humans, are *Homo sapiens sapiens*. The appearance and health characteristics of human beings indicate their similarity to their ancestors. This is known as heredity. Genetics is a science that studies heredity. Genetic research has shown that we have inherited some traits of the Neanderthal Man. Thus, it can be said that the Neanderthal Man and *Homo sapiens* are both ancestors of the modern humans. Around 11000 – 10000 BC, *Homo sapiens sapiens* developed the technique of cultivating land and keeping animals. Because of their well-developed capacity to think, the speed at which they improved their technology increased with time. They began to live a more settled life. They began to grow foodgrains in the fields. As a result, the amount of carbohydrates in their food increased.

The changed lifestyle and diet affected the appearance of humans. Their body and face grew smaller than they had been in the earlier generations.

The name *Homo sapiens sapiens* reflects their intellectual and cultural rather than their physical prowess. All animals must necessarily meet their basic need for food. However, modern humans are not satisfied with only doing that much. Through their efforts to enrich their lives using their creativity, intelligence and skills, human beings acquired a culture

and continue to develop it. The technological and cultural progress achieved by modern humans after the beginning of agriculture and domestication of animals has been extremely rapid.

The history of the evolution of humans that began from apes can be divided into various stages. In the following lessons, we shall learn about various facets of human culture at these different stages.

Exercises

1. Fill in the blanks.

(a) Homo is a Latin word which means ---------- .

(b) The Neanderthals primarily lived in ---------- .

2. Answer each question in one sentence.

(a) Who is said to have first made tools like the hand-axe?

(b) What is heredity?

3. Give reasons for the following.

(a) The Neanderthals became extinct.

(b) Humans could produce subtle and varied types of sounds.

4. Read the clues given below and find the words hidden in the box.

H	O	M	O	H	A	B	I	L	I	S
G	R	G	H	A	N	D	A	X	E	M
R	O	R	O	G	E	R	M	A	N	Y
A	A	U	R	F	L	A	K	E	S	Q
I	S	N	N	I	Z	W	F	E	E	T
N	T	T	S	R	K	E	N	Y	A	O
H	O	M	O	E	R	E	C	T	U	S

- Humans who stood upright.
- A sound that Neanderthals could make.
- Humans who used their hands.
- *Homo sapiens sapiens* began to grow this in fields.
- Pieces of stone used to make tools.
- It kept *Homo erectus* warm although they could not make it.
- A country in which remains of *Homo habilis* were found.
- A way of preparing food that Neanderthals used.
- A tool made by *Homo erectus*.
- *Homo sapiens* could do this to make pictures.
- Humans could use their hands because they learnt to stand on two of these.
- The country in which remains of Neanderthals were first found.
- These were buried with them when Neanderthals died.

Activity

Prepare a chart to show the progress of Man at the various stages from *Homo habilis* to *Homo sapiens sapiens*.

Do you know this?

The history of human evolution has been reconstructed solely with the help of the fossilized human bones discovered so far. An animal's body decomposes after death. The bones get dispersed. They gradually get buried in the soil. Over a period of thousands of years, the minerals in the soil get deposited inside the pores of these bones. In the course of this time, the bone disappears but the minerals which take the shape of the bones are left behind. These are actually rocks in the shape of bones. Such rocks are known as the 'fossilized remains of animals' or simply 'fossils'.

Such animal fossils have been found in a number of countries in Asia, Africa and Europe. Using these, it is possible to work out the sequence of human evolution but we have not yet discovered all the necessary fossil links. The evidence that we have till today indicates that human evolution has not been unilinear, that is, with only one ancestor species evolving into the next species one after the other. It is likely that during evolution, many branches originated from the same ancestor species. It is also likely that some of these branches became extinct.

At the present moment, it is not possible to tell exactly how the various branches of the human species were related to each other in the process of evolution. However, it is important to study some of these species as the markers of important stages of human evolution. The tools and other objects made by them provide the evidence for reconstructing the history of human culture. In this lesson, we have included four such human species: *Homo habilis* → *Homo erectus* → *Homo Neanderthalensis* (Neanderthal Man) → *Homo sapiens*.

Characteristics of the structure of the human body : The structure of the human body is different from that of other vertebrate animals in certain aspects. These differences set man apart from the other vertebrates. The most important of these characteristics are as follows:

1. Humans could stand upright. It enabled them to walk on two feet. Other vertebrate animals cannot stand upright. Hence, they walk on four limbs.

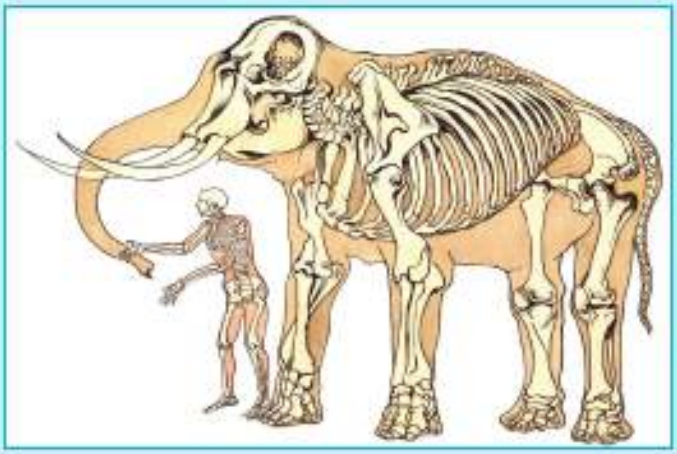
2. As humans learnt to stand erect and walk on two feet, it became possible for them to use their two forelimbs as hands. The structure of human hands came to be different from that of the forelimbs of other animals.

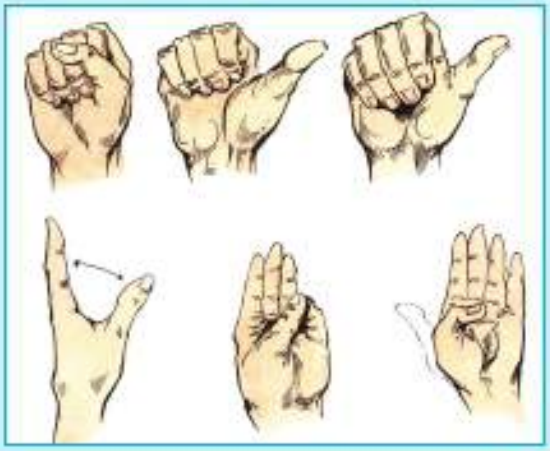
3. Humans have an opposable thumb. That is, they can move their thumb against the other four fingers of the hand. It allows them to have a firm and flexible grip on various objects in various ways. It enables them to perform various tasks that require manual skills, which other animals could not do. They could make various tools and other articles. Hence, humans are known as 'makers' of devices, tools and implements.

4. The capacity of the human brain is much greater than that of other animals. Therefore, humans have a greater capacity to think.

5. The muscles of the human face are such that it can express their feelings.

6. The structure of the larynx, the muscles of the mouth and a very flexible tongue together enable humans to produce a variety of sounds. However, this system, which enabled humans to speak took thousands of years to develop.





6. Stone Age : Stone Tools

6.1 Types and forms of tools according to the type of task

6.2 Stone Age tools

6.1 Types and forms of tools according to the type of task

If we saw a shiny object buried in the ground, what would we do to take it out? Perhaps, we would scrape it out with our fingers. If that did not work, we might try to dig it out with a twig or stick. If that too did not work, we would have to look for a pointed stone. That should do the job. But, if it still doesn't, then we would have to get an iron rod to dig that shining object out. This shows that we need to choose the tool according to the demand of the task.

The following four factors determine our choice of tools :

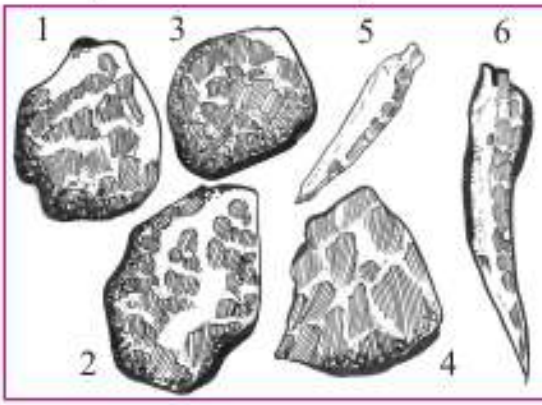
1. Availability of resources.
2. Minimal use of time and energy.
3. Maximum efficiency.
4. Skill of handling tools which is acquired through practice.

Apes like the chimpanzee also use stones to break seeds and nuts. They use sticks to stir the ants out from ant-hills to catch them. Humans, too, have always been using tools such as bones, stones, dried twigs and sticks as tools.

With continuous and minute observation, experimentation and their inborn imagination, humans learnt that they could sharpen rods, bones, sticks and stones into tools to carry out their tasks more efficiently. They also learnt that they could give these objects any shape they desired.

In the previous lesson, we saw that stone tools were found with the remains of *Homo habilis*. We can say that he made them because they were found near his remains. But, did he make only stone tools? The answer to this question is 'No'! Because he made tools from other materials as well.

However, of the tools made by humans thousands of years ago, only the stone tools can be found today. Tools made from bone are rarely found. But since twigs and sticks decompose easily, we do not find any tools made from them.



Tools made from stones and bones –

1. A chopper made from a pebble
2. A scraper
3. A circular hammerstone
4. A chopper made from a flake of stone
5. A borer made from a bone
6. An antler used as a pick

6.2 Stone Age tools

The period from which mainly stone tools are found is called the Stone Age. The Stone Age is divided into three periods on the basis of the shape and the type of tools found.

1. Old Stone Age or Palaeolithic Age ('Palaeo' means 'old' and 'lithos' means 'stone'.)
2. Middle Stone Age or Mesolithic Age ('Meso' means 'middle'.)
3. New Stone Age or Neolithic Age ('Neo' means 'new'.)

Old Stone Age (Palaeolithic Age): *Homo habilis* and *Homo erectus*, who belong to the Old Stone Age, both made their tools using the 'percussion technique'. This technique involves beating or striking one large pebble against another to obtain stone flakes.

The first tools made in the Old Stone Age with this technique were crude. Only one side of those tools had a sharp edge. Such tools are known as choppers. They could only be used for breaking nuts or bones. The tools made by *Homo habilis* were of this kind. They indicate that *Homo habilis* had not yet learnt to hunt. Flakes of stone would be produced while shaping his tools. He used the flakes for scraping meat from hide, for chopping meat and other foodstuffs, for sharpening wooden sticks, etc.

Tools like the hand-axe and cleaver made by *Homo erectus* are more proportionate and symmetrical than the choppers made by *Homo habilis*. A proportionate and symmetrical tool has to be mentally visualized first. Only then it is possible to make it. *Homo erectus* could mentally visualize his tools even before he actually shaped them. To obtain stone flakes, he used things like antlers as hammers. He further sharpened the edges of those flakes by scraping off smaller pieces to make scrapers with very sharp edges. It means that *Homo erectus* was using different tools for different tasks according to the demand of the task.

Removing minute flakes from bigger flakes

A stone hammer

An antler used as a hammer

Removing minute flakes from smaller flakes

A chopper

A hand-axe

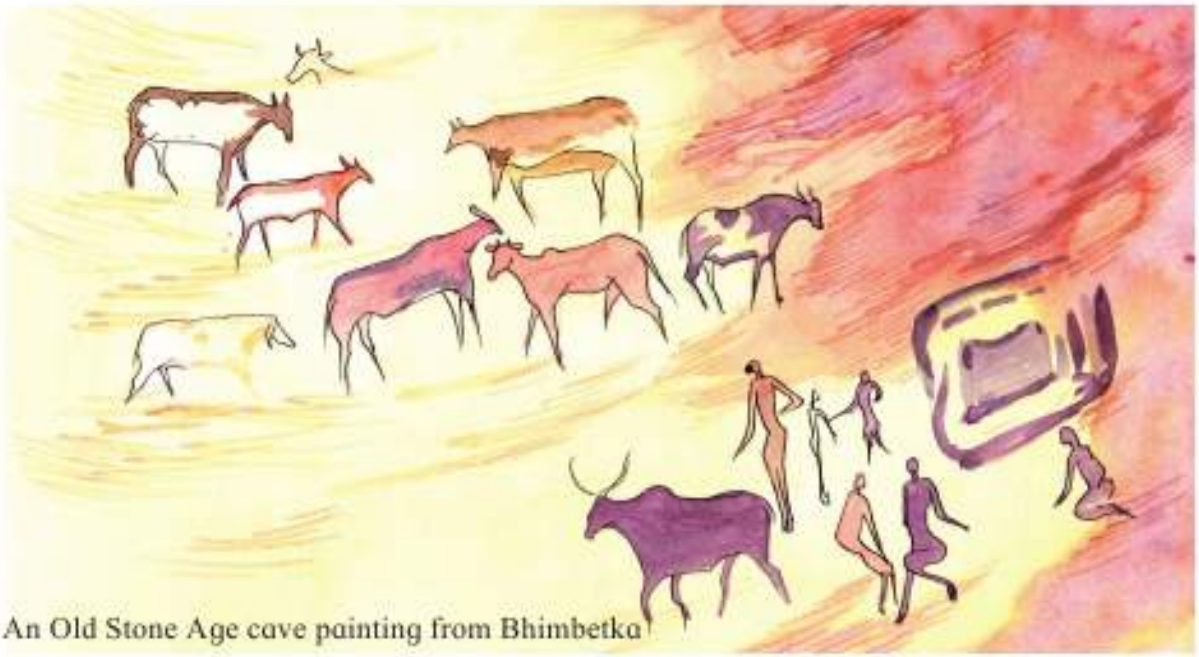
With his improved tools, *Homo erectus* could have a greater variety of food because he could now hunt a variety of big and small animals. These included mainly the deer, bison, rabbit, etc.

The Neanderthal Man made further progress in tool-making techniques. He began to make smaller tools.

Homo sapiens brought about a revolution in the technique of making tools. He devised a technique of obtaining long and narrow blades of stone. He made various implements like the knife, scraper, borer, chisel, etc. from these long blades. He also began to use ivory and rare stones of the quartz variety for making tools and other articles.

Homo sapiens had made significant progress in gaining knowledge of his environment and in the techniques of making tools and obtaining food. This enabled him to stay in one place for a longer period of time. Groups of *Homo sapiens* had begun to build huts and live in them. They had also started celebrating social festivals. Many artistic objects and cave paintings created by *Homo sapiens* were possibly meant for these festivals. *Homo sapiens* had started using ornaments to adorn themselves. Beads from the time of *Homo sapiens*, made of shells, bones and animal teeth have been found. Thus, the beginnings of human culture go back to the Old Stone Age.

Remains of tools from the Old Stone Age have been found in India at various places, from Kashmir to Tamil Nadu. However, not many human fossils from the Old Stone Age have been found in India. Fossils of a human skull and the collar bone of an Old Stone Age woman were found on the banks of the Narmada in the vicinity of Hathnora, a village near Hoshangabad in Madhya Pradesh. Besides that, the fossilized skull of a child from the Stone Age was found at a village near Puducherry. Some remains of Old Stone Age humans



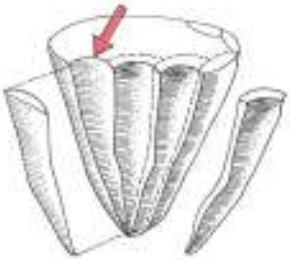
An Old Stone Age cave painting from Bhimbetka

have also been found in Afghanistan and Sri Lanka. Gangapur near Nashik and Chirki-Nevasa near Nevasa are among the well-known Old Stone Age sites in Maharashtra. Gangapur is on the banks of the Godavari river and Chirki-Nevasa is in the Pravara basin.

Middle Stone Age (Mesolithic Age) : *Homo sapiens* in the Middle Stone Age continued to make progress in many different ways. They domesticated the dog. Due to changes in the climate and the environment in the Middle Stone Age, the way of life of humans had begun to change. Besides hunting, *Homo sapiens* had started to harvest foodgrains that grew in the wild and to domesticate animals. Their diet now included various plant foods. They also began to settle in one place for a part of the year. Domestication of sheep and goats also goes back to this period. Taking all this into account, it appears that *Homo sapiens* now needed several different types of tools that were light in weight and durable for a variety of tasks such as hunting, fishing, harvesting, cutting of trees, etc. He used to make implements like the knife and the sickle by firmly fixing a row of blades as small as fingernails into a groove in a bone or a piece of wood.

Many sites of the Middle Stone Age have been found in India. Among them Bagor in Rajasthan, Bhimbetka in Madhya Pradesh, Langhnaj in Gujarat and Patane in Jalgaon district in Maharashtra are the well-known ones.

In Middle Stone Age, the stone blades used to make implements were removed from the stone by the 'fluted core' technique. Flute means a long, parallel sided depression on the stone, and core means the original stone from which the blades are removed. After the blades were removed from the stone from all sides, the remaining core had such flutes on all sides. Blades removed with this technique are very minute – the size of a nail or slightly bigger. Hence, they are called as 'microliths'. 'Micro' means very small and 'lithos' means stone. In the Middle Stone Age, arrows were made by fixing a microlith at the tip of a stick.



A fluted core

Microliths – Middle Stone Age

Arrows with Microliths as tips – Middle Stone Age

A knife with an edge like a saw made by fixing microliths – Middle Stone Age

Fish-hooks of bones – Middle Stone Age

New Stone Age (Neolithic Age) : In this period, stone tools that were polished to give a smooth, shiny finish were made for the first time. As this was a new type of tool-making technique, this period was named the 'New Stone Age'.

By the time of the New Stone Age, agriculture and domestication of animals or animal husbandry had become a routine way of life. Hunting was no more the major means of obtaining food. It became secondary to agriculture and animal husbandry.

There are many sites of New Stone Age culture in India, especially along the Ganga river and in South India.

Exercises

1. Fill in the blanks.

(a) That period, of which the tools that we find are mainly made from stone, is called the ..... .

(Copper Age, Iron Age, Stone Age)

(b) ..... near Nashik is a well-known Old Stone Age site in Maharashtra.

(Gangapur, Sinnar, Chandwad)

2. Find out the odd pair from the following.

(a) Rajasthan – Bagor

(b) Madhya Pradesh – Bhimbetka

(c) Gujarat – Langhnaj

(d) Maharashtra – Bijapur

3. Answer the following questions in brief.

(a) How did man use the percussion technique?

(b) What revolution was brought about by *Homo sapiens* in the tool-making technique?

4. Compare the tools from all the three periods of the Stone Age.

5. Which of the following modern machines has stone grinders?

(a) Mixer

(b) Flour mill

(c) Juicer

6. Show the following places on the map of India.

(a) A site of the Old Stone Age in Maharashtra.

(b) A river basin with New Stone Age sites.

(c) A site of the Middle Stone Age in Madhya Pradesh.

Activity

Visit various industries in your locality and collect information about the tools used there. Make a chart by classifying those tools.

A polished stone axe – New Stone Age

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7. From Shelters to Village-settlements

7.1 Shelter

7.2 Seasonal camps

7.3 Village-settlements

7.1 Shelter

In the fifth lesson, we saw that the Neanderthals lived mainly in caves. At that time, the climate in Europe was extremely cold. The Neanderthals could protect themselves from the freezing temperatures because they wore leather clothing and made use of fire. Perhaps, that was not enough. That is why they used animal hides to erect tents inside the caves for warmth. Wherever necessary, they also built huts in the open.

7.2 Seasonal camps

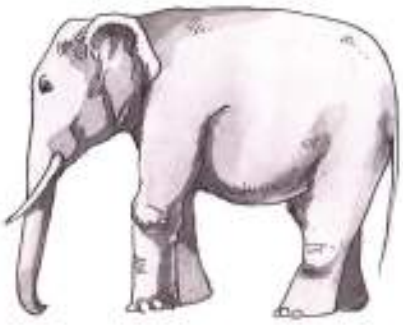
In the Middle Stone Age, groups of *Homo sapiens* had established camps all over the world. At that time, the climate was getting warmer. Everywhere the environment was changing. And with it, the diet of *Homo sapiens* was also undergoing change.

By the time of the Middle Stone Age, big animals like mammoths were on the way to extinction due to the changing environment and also because they were hunted on a very large scale. That is why, *Homo sapiens* had largely turned to fishing. He also began to depend more

A warm two-room tent erected by Neanderthal Man inside a cave - France

The mammoth was an ancestor of the elephant. However, he was much bigger in size compared to the elephant.

A mammoth



An elephant

on hunting smaller animals like the wild boar, deer, mountain goat and sheep.

The changed diet pattern enabled the groups of *Homo sapiens* to roam to faraway regions. They moved their camps to different places according to seasonal changes. There they harvested seasonal wild grains and gathered seasonal fruits and roots. They would find out the best seasons for fishing and use the knowledge to their advantage. By observation, they discovered the best hunting grounds. For these reasons, they stayed in one

A reconstruction of a seasonal camp – Middle Stone Age

A reconstruction of a village-settlement – New Stone Age

place for longer periods. They cleared jungles by felling trees and set up their seasonal camps in the clearings.

7.3 Village-settlements

The way of life of humans in the New Stone Age was completely different from that of humans in the Old Stone Age and Middle Stone Age. During this period, humans became producers of foodgrains. The beginning of cultivation is a characteristic of the culture of the New Stone Age. In the hunting and gathering way of life, it is necessary to keep moving all the time. However, agriculture makes it possible to store food and use it over a longer period. Hence, there is no need to keep moving constantly. Moreover, the nature of agricultural work made it necessary to stay in one place. Therefore, people established permanent village-settlements and lived in them generation after generation. In the next lesson, we shall review the social organization and the culture of these village-settlements.

Exercises

1. Answer each of the following questions in one sentence.

(a) Which animals did the *Homo sapiens* mainly hunt?

(b) What is the characteristic of the New Stone Age?

2. Give reasons for the following.

(a) The diet of *Homo sapiens* underwent a change.

(b) *Homo sapiens* needed to stay in one place over longer periods of time.

3. Observe the reconstructed picture of a Middle Stone Age seasonal camp and answer the following.

(a) Describe the structure of the houses in the picture.

(b) What materials are used to construct the houses?

(c) What kind of jobs could the people in the seasonal camps have been doing?

4. Write about the effects on your life, of the seasonal changes in weather.

5. Compare the New Stone Age village with a modern village.

Activities

(a) Construct models of different types of houses.

(b) Visit agricultural farms and collect information of the various agricultural tasks that farmers have to do.

(c) Visit five different types of houses in your locality and collect information about the materials used in the construction of those houses.

(d) With your teacher's help, observe the continents shown on a world map or a globe and write short notes about them.

Do you know this?

The earth is subject to cycles of glacial and interglacial periods. In the glacial period, most of the earth's surface is covered with ice sheets and the climate is extremely cold and dry. The level of water in the sea falls because a lot of it is converted into ice. An interglacial period is the period between two glacial periods. During the interglacial period, a large part of the ice on the ground melts. Sea levels rise. The climate becomes warmer and more humid. When some regions in the world experienced a glacial, Asia and Africa experienced heavy rainfall. On the other hand, when some regions experienced an interglacial, Asia and Africa experienced poor rainfall.

About 25 lakh years ago, that is, in the times of *Homo habilis*, the climate had started becoming extremely cold and dry. During the period from 18 lakh years to 11 thousand years ago, there have been four major cycles of glacial and interglacial periods. This is also the period when the history of human culture from Old Stone Age to Middle Stone Age took shape. About 11,000 years ago, the last glacial period came to an end and the current interglacial began. The climate started to become warmer and more humid again. Agriculture and the New Stone Age also began at about the same time.

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8. Beginning of Settled Life

8.1 Beginning of domestication of animals and agriculture

8.2 Special skills and various occupations

8.3 Community life based on mutual co-operation

8.4 Structure of houses

8.5 Village-settlement, kinship and family

8.1 Beginning of domestication of animals and agriculture

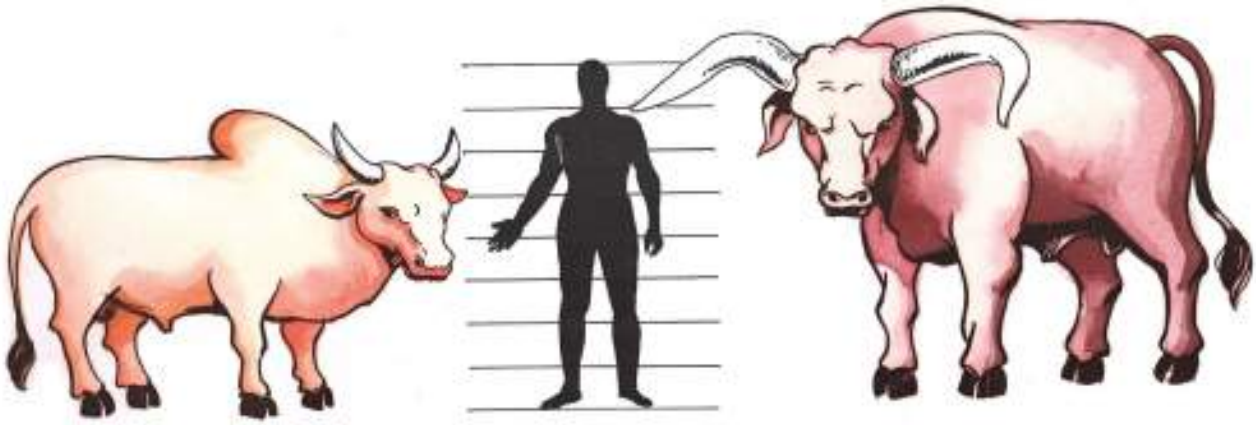
Domestication of animals :

Domesticated animals like the dog, goat, sheep, cattle, buffalo, etc. are useful to man in many ways. There are three main steps in the domestication of a species of any animal.

1. Capture of the wild animals.
2. Taming the captured animals; that is, training them to live with humans.
3. Obtaining useful materials like milk, etc. from them and training them to work for humans as beasts of burden.

When the third step is achieved, the animal is supposed to be completely domesticated. Domesticating animals and keeping them for our own use is called animal husbandry.

In the sixth lesson, we have seen that the dog was domesticated in the Middle Stone Age. The dog is the first animal to have been domesticated. Dogs were used to help with hunting. The goat and sheep were domesticated next.



A modern bull

A reconstruction of the ancestor of the modern bull – the wild bull

Agriculture : Archaeological evidence is available to show that agriculture first began about 11,000 years ago in Israel and Iraq. Women are credited to have started cultivation. They

Pointed stick and perforated stone used for sowing

might have used pointed sticks to sow seeds. Women in some tribes still sow seeds by this method. In order to help dig deeper into the soil, the stick was weighted using a perforated stone.

Plough pulled by bullocks - Egypt

In the previous lesson, we have learnt that people had to stay in one place because of the nature of agricultural work. Agricultural production increased considerably after the plough pulled

Women using pointed sticks to sow seeds

by animals came into use. Agriculture became the main source of livelihood. Now people began to worship nature and various deities for good crops. Essential things like sharing of agricultural tasks and water resources and the security of the village-settlement gained importance. People in the village-settlements established some rules and customs to manage these things. Thus, a social system based on agriculture came into existence.

8.2 Special skills and various occupations

In the times before agriculture, people obtained food such as meat, fruits and roots by hunting and gathering, but could not store it for a long time. Therefore, all the men and women in the community were continuously engaged in getting food. In the agricultural system, it became possible to store foodgrains for long

periods. There was more food available than was needed by the community. Some women and men thus began to get spare time for experimentation and for using their natural creativity to develop special skills.

A woman potter with handmade pots

Members with such special skills were given work based on those skills. Thus arose crafts like making earthen pots, beads, etc. It is believed that in the New Stone Age women made earthen pots and other earthen objects by hand.

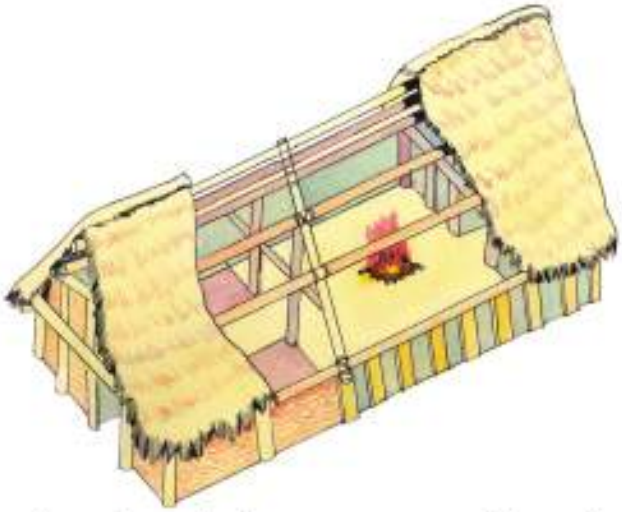
8.3 Community life based on mutual co-operation

The farmers in the village-settlement were now producing surplus food. They needed skilled craftsmen for tasks like making agricultural implements and repairing them. Such craftsmen were paid in the form of foodgrains or other articles. The craftsmen needed to obtain their raw material from long distances. The price of this raw material was also paid in the form of foodgrains, articles, etc. Thus the barter system of buying and selling was established. The barter system also began to be used when there was a need to obtain raw materials, finished objects, other articles of daily use, etc. from other places. Salt is an essential item. Most of the village-settlements needed to obtain it from faraway places. Salt traders also traded articles they received in exchange of salt. The salt trade helped the expansion of trade in the New Stone Age.

The village community made rules for mutual co-operation in order to keep this system of trade and distribution of resources running smoothly. People responsible for the implementation of these rules became the chiefs of village-settlements. The chiefs were also entrusted with the protection of the village. This is how the village administrative system came into being. Evidence of protective walls and moats around the village-settlements of the New Stone Age has been found in excavations. These walls were built to protect the village-settlements from floods, wild animals and outsiders who stole the village cattle.

8.4 Structure of houses

The houses at the beginning of the New Stone Age were made of wattle and daub. The walls were screens woven from sticks or bamboo, plastered with mud or cow-dung. Later, the population of the village-settlements grew because food was available in plenty. The village-settlements became permanent and expanded. Still later, people began to



A quadrangular house reconstructed from the traces of round posts and other remains in the ground.

A New Stone Age village-settlement at Mehergarh, Baluchistan

build quadrangular houses of sun-dried bricks. Some houses appear to have had more than one room. The houses were built very close to each other. Regional differences are seen in the styles of constructing houses, depending on the local climate.

8.5 Village-settlement, kinship and family

It appears from the plans of the houses and the village-settlements that people staying there belonged to a single clan. It means that they were all related to one another. Thus the entire village-settlement was an extended family. People living in one house were close relations but they were also members of the extended village family.

A dead person was buried either in the house or in the courtyard. Perhaps, the idea was that the person's bond with the family should not get cut off even after death. Families would also bury various articles with the dead person for them to use even after death.

Exercises

1. Fill in the blanks.

(a) Archaeological evidence shows that, agriculture first began about 11,000 years ago in Israel and -------- . (Iran, Iraq, Dubai)

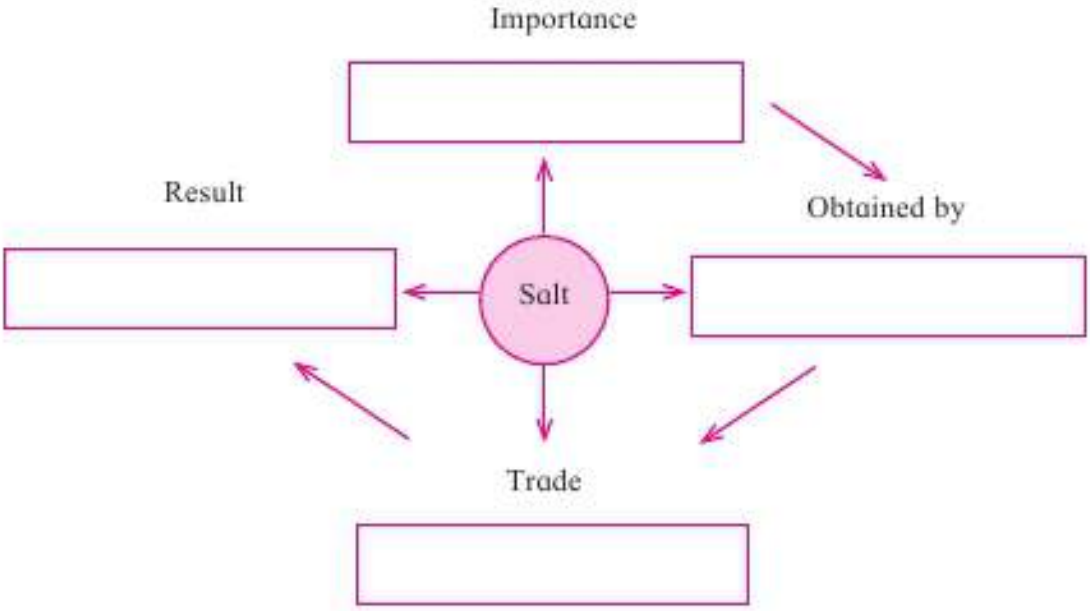
(b) The houses at the beginning of the New Stone Age were made of ---- . (earth, bricks, wattle and daub)

2. Answer the following questions in brief.

(a) What are the three main steps in the process of domesticating a wild animal?

(b) How did some people in the community become skilled craftsmen?

3. Complete the following concept chart.



4. Write about the usefulness of any five domesticated animals.

5. Which animal is used by the modern police? In what way?

Activity

Visit people in your locality practising five different occupations and collect information about their work.

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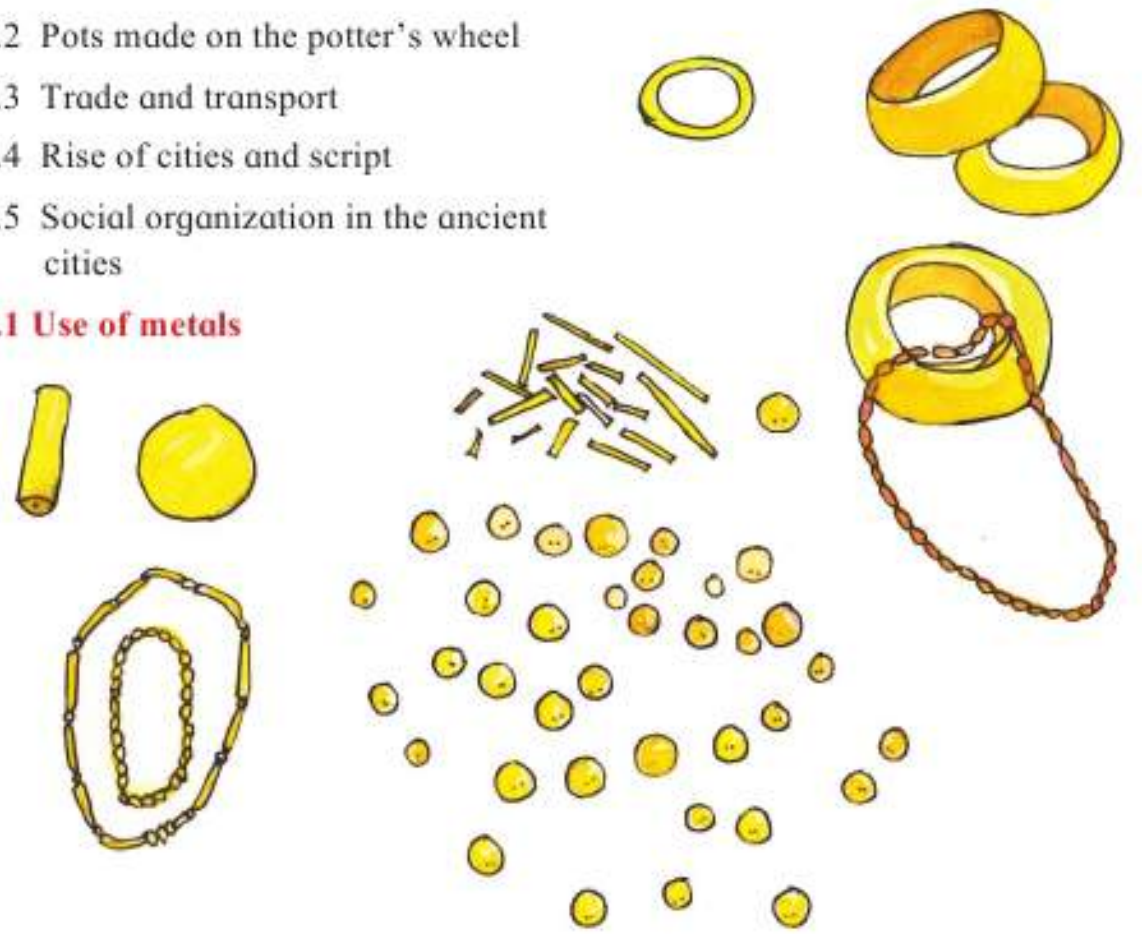
9. Settled Life and Urban Civilization

9.1 Use of metals
9.2 Pots made on the potter's wheel
9.3 Trade and transport
9.4 Rise of cities and script
9.5 Social organization in the ancient cities

9.1 Use of metals



Ancient gold objects found in burials grounds – Bulgaria

You may have wondered about the first metal that humans used. Museums in Europe had large collections of pre-historic artefacts and antique objects. A scholar named Christian Thomsen introduced a method for classifying them. It is called the 'Three Age System'. Thomsen classified the objects into three groups.

1. Stone tools – Stone Age
2. Copper tools and other copper articles– Copper Age
3. Iron tools and other iron articles – Iron Age

Thomsen established with the help of evidence that stone tools were the earliest. The period of copper tools and articles was next. It was followed by the period of iron tools and articles. Accordingly, the three periods were named the Stone Age, Copper Age and Iron Age respectively. This gave rise to the belief that copper was the first metal to come into use.

Actually, gold was the first metal to be used. Gold is a soft metal. So it could not be used for making tools and implements. Humans then discovered another metal which could be used for these purposes. That metal was copper. The period when copper came into use is known as the 'Copper Age'.

numbers. In this period, people started making symmetrical and colourful pots with beautiful designs on them. Potters and other craftsmen began to live close to each other in the village-settlement so as to manage their work more easily. We can say that this became the industrial area of that village, where skilled craftsmen had their settlements and centres of production. This happened mainly in those village-settlements where the raw material was easily available and in those which were conveniently situated for trade. Such village-settlements expanded rapidly.

To make it easy to turn the pot while shaping it, a rotating plank was probably used at first. The pot was shaped with one hand, while the other was used to turn the plank. It is possible that the potter's wheel originated in the efforts to modify the rotating plank. Till recent times, tribal women in the north-eastern regions of our country shaped the pots by using a rotating plank.

A pointed quartz pebble fixed at the bottom of the potter's wheel. This pebble is known as a 'pivot'. When the potter's wheel is put in motion, it is balanced on this pivot and revolves with a great speed.

A potter in ancient Egypt working on a rotating plank or turntable.

9.2 Pots made on the potter's wheel

The Copper Age was the age of many new inventions and rapid changes. The invention of the wheel is the most important among them. It is generally agreed that the wheel was first used by potters. Its use in carts and chariots probably began a little later.

9.3 Trade and transport

Once the potters began to use a wheel, it became possible to make pots in large

As the scale of production increased, trade too expanded with it. Therefore, there was a need to change the old systems of transport. It was in this period that wheeled vehicles like carts and chariots were first brought into use.

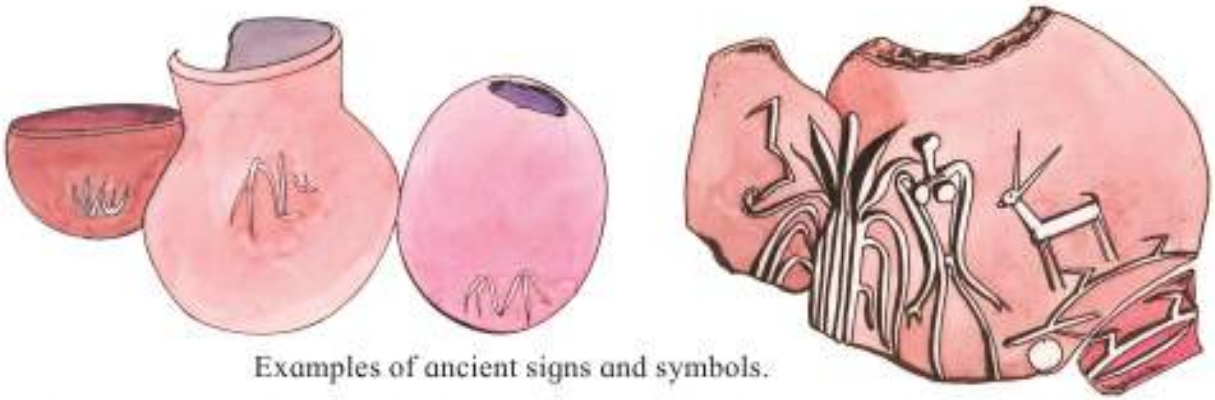
9.4 Rise of cities and script

Long distance trade, rapid transport of goods and centres of large scale production are factors that brought together people engaged in different types of work. It became necessary to keep permanent records of the expanding trade and growing production. By now, signs and symbols had already come into use for the purpose of record-keeping.

Broken pieces of clay pots (potsherds) with such signs have been found in large numbers during excavations. The increase in trade and production and the growth in the volume of records to be kept resulted in much modification and improvement in the signs and symbols used for these purposes. In this way, each culture developed its own script.

Wheeled carts and chariots were first used in Mesopotamia.

Harappan civilization (Indus civilization) was the earliest civilization on the Indian subcontinent. Wheeled toy-carts of that civilization.



Examples of ancient signs and symbols.

9.5 Social organization in the ancient cities

It is true that rise in trade had been the major factor that contributed to the emergence and development of cities. However, the culture of those cities had its roots in the culture of village-settlements of the New Stone Age. The faith system rooted in the agricultural way of life continued in the urban way of life too. The social life and festivals based on agricultural faith systems became more elaborate in cities that had prospered because of the rise in trade. Grand temples were built in many cities. Chiefs of those temples became chief administrators of those cities. Later, the positions of the temple head and that of the king went to the same individual. This was the beginning of the ancient urban civilizations of the world. We will learn more about them in the next lesson.

Exercises

1. From the chart below, find out the names of the three periods into which ancient objects are classified and use them to match the three classes given below.

S	I	G	P	M	I
C	O	P	P	E	R
A	E	C	O	L	O
S	T	O	N	E	N

(a) Stone tools : ---------- Age.

(b) Copper tools and other copper objects : ---------- Age.

(c) Iron tools and other iron objects : ---------- Age.

2. Arrange the following in chronological order.

(a) (1) Copper (2) Gold (3) Iron

(1) -------- (2) ------- (3) --------

(b) (1) Copper Age (2) Iron Age (3) Stone Age

(1) -------- (2) ------- (3) --------

3. Write about the consequences of the following events.

(a) Discovery of copper : ---------

(b) Invention of the wheel : ---------

(c) Use of script : ---------

4. Write notes.

(a) Use of metals

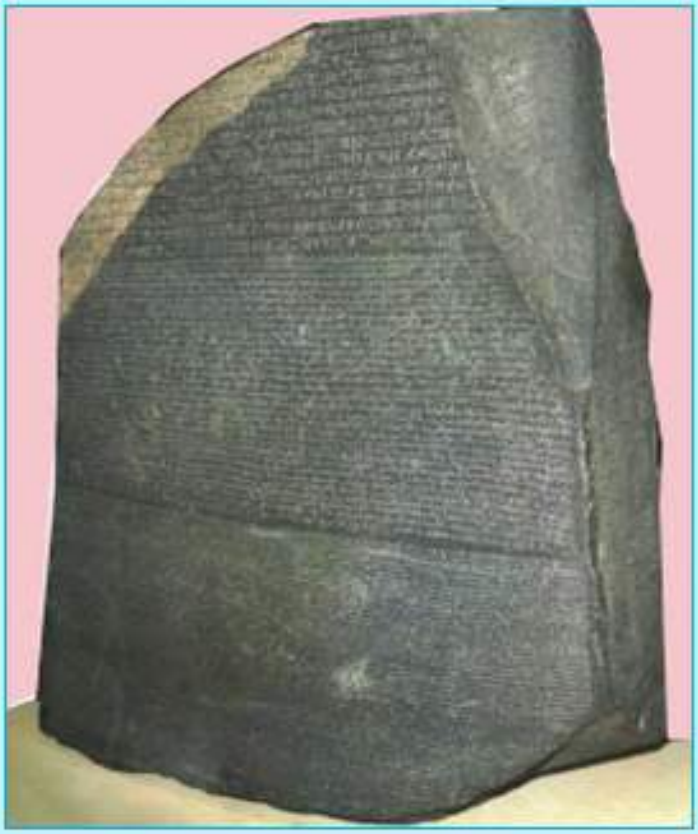
(b) Social organization in the ancient cities

Activities

(a) Make a list of various objects in your house mentioning the material they are made of.

(b) Collect passages from magazines in various languages, paste them in a notebook and make a note of your observations about the various scripts used.

Do you know this?



(1)

(2)

(3)

The Rosetta Stone

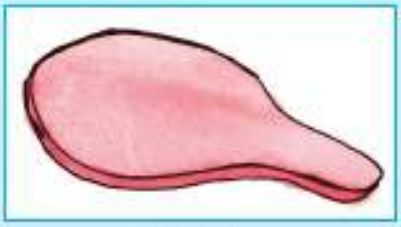
The inscription known as the 'Rosetta Stone' was discovered in 1799 AD. As the stone is broken, only a section of the original inscription is seen on it. The inscription is in the Egyptian language. Today, the Rosetta Stone is kept in the British Museum in London. At first sight, it appears to have three different inscriptions in three sections. But actually, the inscription consists of the same matter in three different scripts. The script in the topmost section is ancient Egyptian script known as 'hieroglyphs'. It means 'the script of gods'. The script in the middle section was used for routine documents and is known as the Demotic script. It was a simplified form of the Egyptian hieroglyphs. The script in the bottom section is Greek.

This inscription announces the ascension of the new king Ptolemy V to the throne. This inscription has special importance as a source of Egyptian history because it became possible to read the forgotten Egyptian hieroglyphic script with the help of the other scripts on it. The name ' Ptolemius' written in the Demotic script was read first with the help of the Greek script. Later, a French teacher, Jean Francois Champollion was able to read the entire inscription. On reading the word Ptolemius, he realized that other names in the inscription from foreign countries or cultures could also be read in the same way. Hence, he first read all foreign names in the inscription and based on that work, prepared a chart of all the hieroglyphic letters. Thus, Champollion succeeded in reading the forgotten Egyptian hieroglyphic script.

There is evidence that copper was in use even 7000 years ago. In regions where copper was rare, it was not possible to use copper in large quantities. Therefore, people in such regions kept using mainly stone tools and implements even though they knew how to use copper. Copper objects are found at the ancient sites in such regions but only in very small numbers. Therefore, such sites are called 'Chalcolithic' sites and not as 'Copper Age' sites. 'Chalcos' means 'copper'. 'Lithos' means 'stone'. Thus the age of copper and stone is the Chalcolithic Age.

Although copper is harder than gold, it is still too soft for making objects from it. However, when tin is added to it, it becomes sufficiently hard. The mixture or 'alloy' of copper and tin is known as bronze. As people in the New Stone Age had begun to use bronze in the making of various objects, the New Stone Age is also known as the 'Bronze Age.' Metals must be melted to make an alloy. Knowledge of how to melt zinc and tin dates back to almost 1000 years before the making of bronze.

A pitcher



A mirror

A plate

Articles made from Copper - Indus Civilization

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10. Historic Period

10.1 What is 'culture'?
10.2 Ancient civilizations in river valleys
10.3 Ancient riverine civilizations: Mesopotamia, Egypt, China, Harappa
10.4 Sports and entertainment

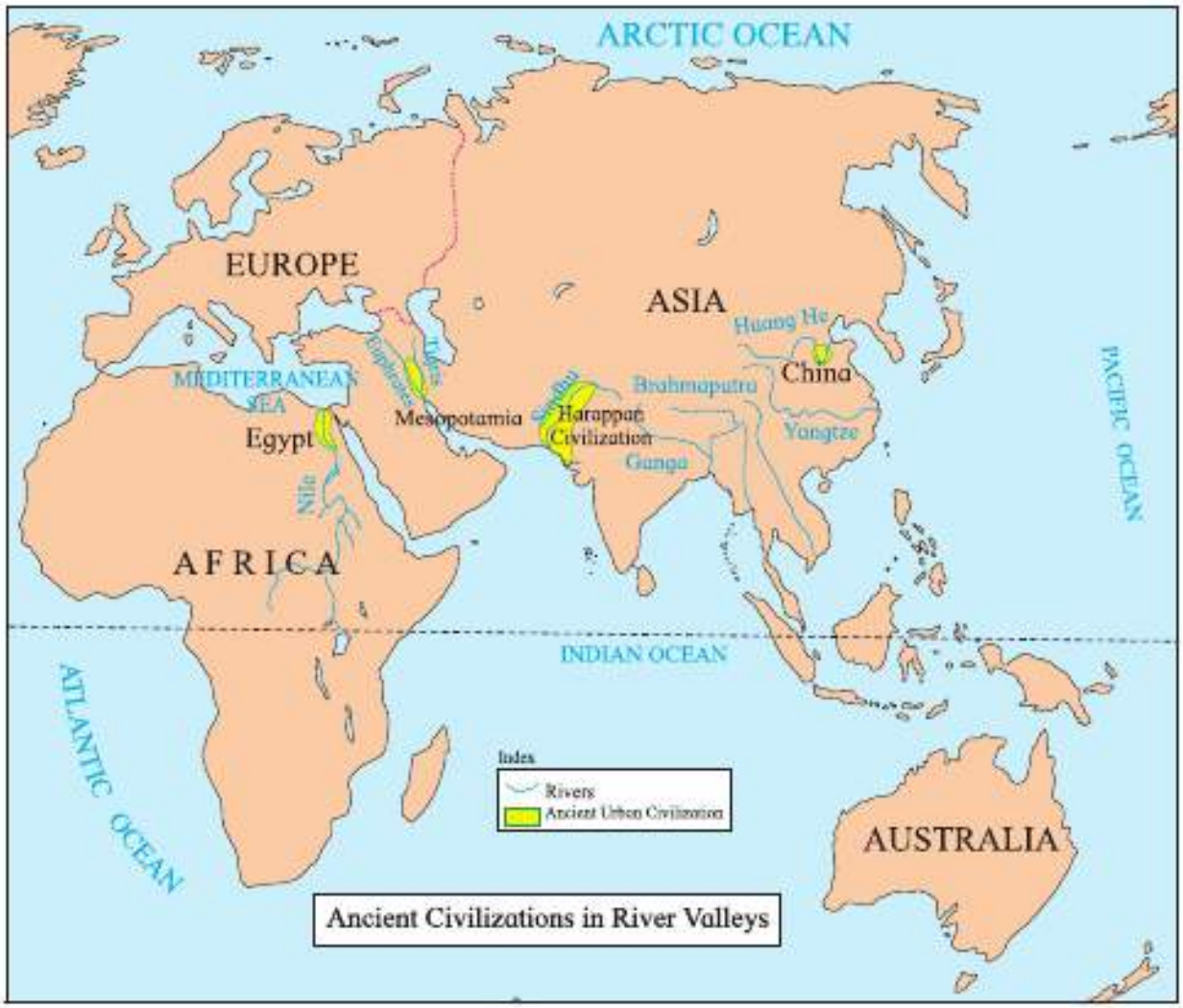
We have seen in lesson two that written records are available in the form of inscriptions, manuscripts, books, etc for the historic period. In all ancient civilizations, the art of writing was developed. They used fully developed scripts. In other words, with the rise of ancient civilizations, the New Stone Age came to an end and the Historic Period began.

10.1 What is 'culture'?

Humans and all other animals are dependent on their environment and nature for satisfying their needs. However, other animals do not cause any significant change in their surroundings. For example, bears live in caves and monkeys live on trees, but humans build houses. It means that we humans change the natural character of our surroundings to some extent. Humans do not eat their food in its natural form as other animals do. They roast or cook the food. Or, in other words, they process foodstuffs before eating them. They process many substances in a similar manner. They work on stone, metal, etc. to make tools and various objects. They make pots, bricks and many other things from clay. They obtain yarn from cotton and weave cloth from the yarn. In short, according to their needs, they change the form of materials available in nature. They need skills to do this. They need to think and plan before they shape an object. Then they have to put in efforts to actually shape it. The tradition of thought, skills and efforts gave rise to various arts. Every generation handed over the knowledge of the artistic skills and traditions to the next generation. With this exchange of thoughts and ideas, language was enriched. The knowledge of various arts, skills and traditions inherited from generation to generation and the way of life founded on that knowledge is what we call 'culture'.

10.2 Ancient civilizations in river valleys

Cultures which flourished in the New Stone Age were based on an agricultural way of life. Fertile soil and constant water supply are essential for growing good crops. Naturally, people in the New Stone Age established their village-settlements on the banks of various rivers. The New Stone Age cultures flourished along the river banks.



Ancient Civilizations in River Valleys

In the course of time, New Stone Age cultures gave rise to early civilizations. Increase in production due to various skills, the use of the wheel, flourishing trade, use of well-developed scripts, etc. were the major factors responsible for the rise of the early civilizations. These civilizations came into existence in roughly the same period, that is, around 3000 BC in four regions of the world. They are : Mesopotamia, Egypt, the Indian subcontinent and China. The civilizations in these four regions developed in river valleys, hence they are known as 'Riverine Civilizations'.

10.3 Ancient riverine civilizations : Mesopotamia, Egypt, China, Harappa

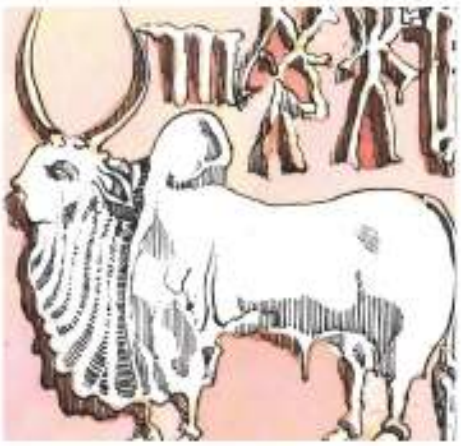
Mesopotamia : 'Mesopotamia' is the name of a region and not of any particular country. It means 'the land between two rivers'. Ancient Mesopotamia was the land between the two rivers Tigris and Euphrates. These two rivers mainly flow through Turkey, Syria and Iraq. Ancient Mesopotamia had great cities like Ur, Uruk, Nippur, etc. These cities were home to very prosperous cultures.

Egypt : The river Nile flows through the eastern part of the Sahara desert, in the north of Africa. One of the ancient civilizations flourished along its banks. It is known as the 'Egyptian Civilization'. The Nile gets flooded every year. The land along her banks has become very fertile because of the flood deposits. Also, Ancient Egyptians used to build small embankments on the river to store the flood water. After the soil in the flood water settled to the bottom, the water was used for irrigation.

China : The ancient civilization of China developed and flourished in the valley of the Huang He River. According to the Chinese tradition, a king named Huangdi introduced agriculture, animal husbandry, wheeled carts and chariots, boats, and clothing in China. Chinese people believe that his queen invented the technique of silk production and silk dyeing. Luoyang, Beijing and Chang'an were among the important cities of ancient China.

Harappa : The earliest civilization on the Indian subcontinent is known as the 'Harappan Civilization'. It flourished in the Indus valley. Indus is the English word for the name 'Sindhu'. Harappa in Punjab and Mohen-jo-daro in Sind are the two sites of Harappan Civilization to be discovered first. Now they are in Pakistan. Lothal and Dhola Vira in Gujarat and Kalibangan in Rajasthan are among the famous sites of Harappan Civilization in India.

Cities of this civilization are well-known for their systematic town planning. The houses were built in blocks created by parallel roads that crossed each other at right angles. Huge granaries and spacious houses were the special features of these cities. There were bathrooms and latrines in every house and a covered drainage system which indicates a concern for public hygiene. There were carefully constructed private and public wells. The cities were divided into two to four parts, each with a separate fortification.

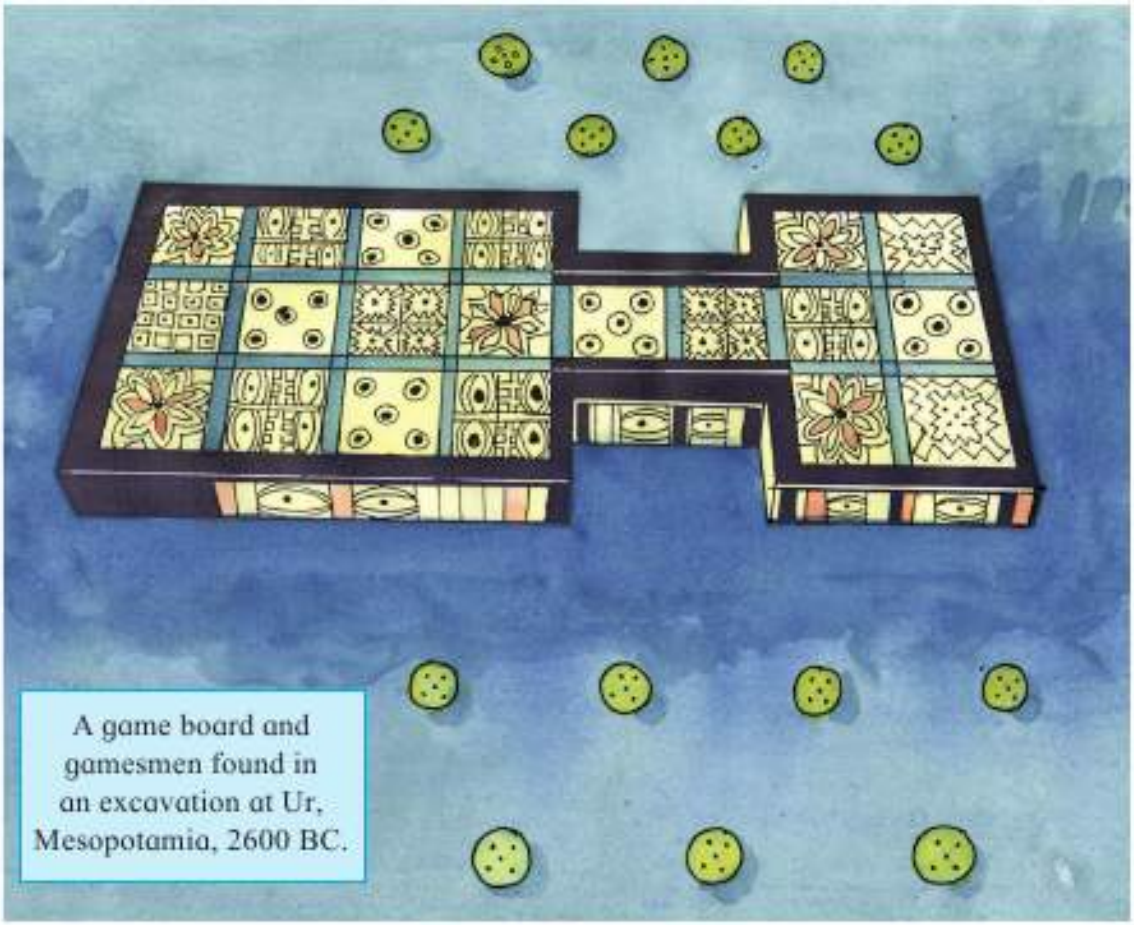


A Harappan seal and clay figurine

The characteristic earthen pots of the Harappans are well-baked, red in colour and with beautiful designs like pipal leaves and fish scales. When tapped, these pots produce a metallic sound. The Harappan craftsmen were highly skilled in making bronze objects and beads from semi-precious stones of various colours.

A king hunting a lion

Wrestling



A game board and gamesmen found in an excavation at Ur, Mesopotamia, 2600 BC.

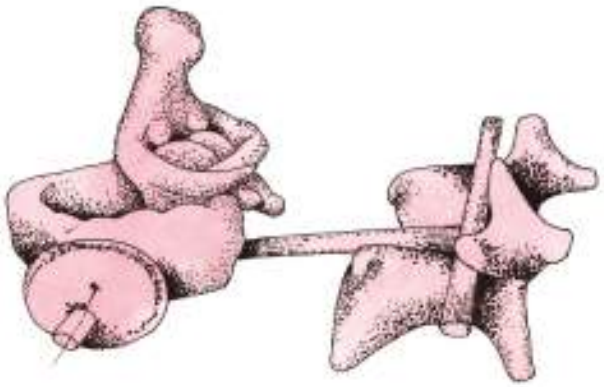
These things were in great demand in Mesopotamia. The names of Harappan gods and goddesses are not yet known. However, we know with the help of the Harappan seals and clay figurines that they worshipped 'Pashupati' (Lord of all living animals) and a Mother Goddess.

Archaeologists feel that these clay objects found in excavations of Harappan sites were used as gamesmen.

10.4 Sports and entertainment

There were a variety of sports and means of entertainment in the ancient civilizations. Hunting and wrestling were the important ones. Games played with the help of game boards and gamesmen were also popular.

In ancient Egypt, people played a game that was similar to chess.



A Harappan toy

A Harappan toy

This game was played with a game board and gamesmen. It was known as 'Senat'. In ancient China also, there were many games played with boards and gamesmen. Similar games were popular in Mesopotamia and Harappan Civilization, too.

Many toys are found in the excavations of Harappan sites. They include whirls, whistles, rattles, bullock carts, animals and birds on wheels, etc.

Music and dance were also very important in early civilizations. They were an essential part of celebrating a festival. Ancient people used many types of musical instruments. In Mesopotamia, a stringed instrument known as 'Balag' was very popular. Besides, instruments like cymbals, rattles, flutes, drums, etc. were also played. The Egyptian kings were known as 'Pharaohs'. On the occasion of certain festivals, the Pharaoh himself used to participate in the celebrations and dance. The bronze image of a dancer found in the excavation at Mohen-jo-daro is evidence that dance was important in the Harappan Civilization as well.

Till now, we have learnt in brief about the history of human civilization from the Stone Age to the early civilizations. Next year, we shall study in detail the Harappan Civilization that developed in the Indian subcontinent. We shall also study the ancient history of India.

A Balag

A musical string instrument made of gold, named 'Balag' found in the excavations at the city of Ur, a Mesopotamian site.

The Balag has 11 strings. Its height is approximately 2.1 metres. It dates back to about 2650 BC. It was found in the burial of a Mesopotamian queen. Her name was Puabi.

Exercises

1. Answer each of the following questions in one sentence.

(a) Where did the people in the New Stone Age establish their village-settlements?

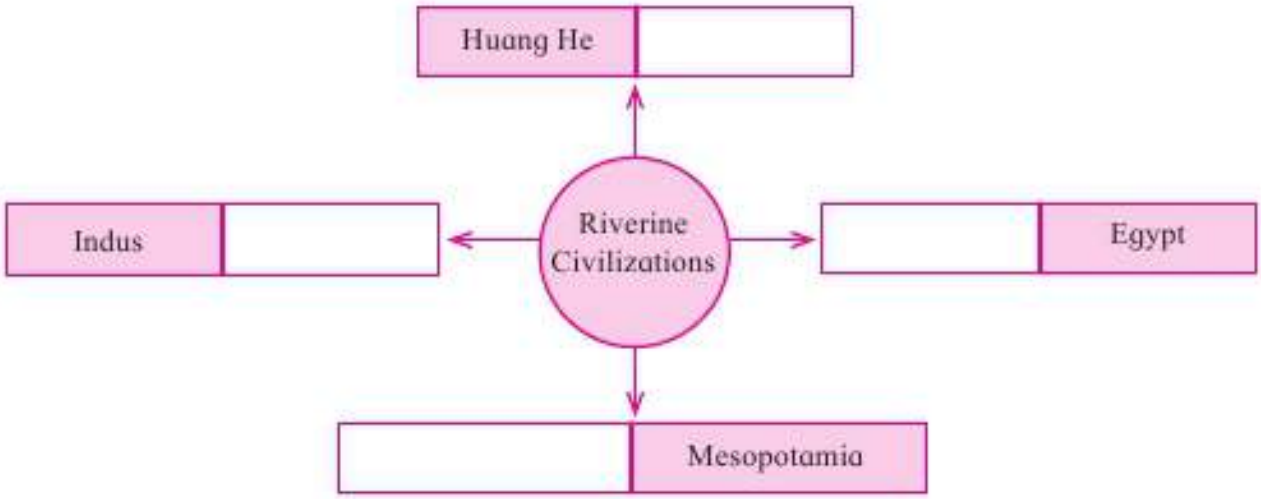
(b) What articles were the Harappan craftsmen skilled at making?

2. Answer the following questions in brief.

(a) What are some of the well-known characteristics of Harappan cities?

(b) What made the soil on the banks of the Nile fertile?

3. Complete the following chart.



Activities

(a) Show the sites of Harappan Culture in an outline map of India.

(b) Visit various artistes in your locality who play musical instruments. Collect information about their instruments.

(c) Visit some senior citizens in your locality and collect information about the traditional sports and games of their times.

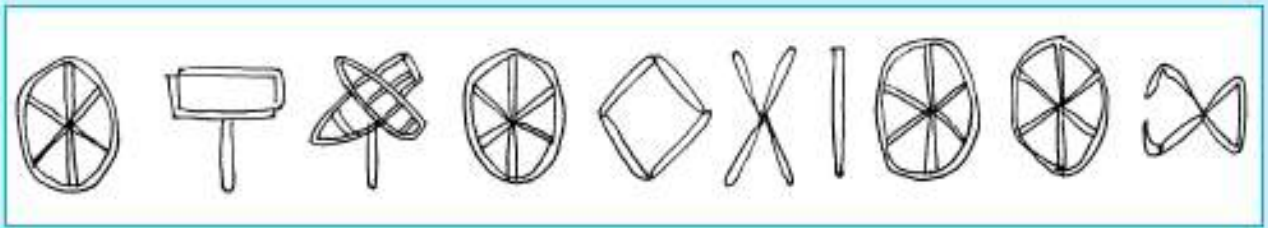
Do you know this?

The names of the four ancient civilizations in Mesopotamia are as follows: 1. Sumerian 2. Akkadian 3. Babylonian 4. Assyrian. The Akkadian empire arose around 2350 BC. In the reign of the Akkadian emperor, Sargon, trade between the Harappan Civilization and Mesopotamia flourished to a great extent. Hammurabi, the king of Babylon (1792 – 1750 BC) was the first to give a written law code to his subjects.

A unique achievement of the ancient Egyptians was their science of architecture. The grandeur of the ancient Egyptians pyramids and temples are ample evidence of it. Ancient Egyptians mainly used unbaked stone and bricks for construction. They had made great progress in the fields of mathematics, medicine and irrigation. Egypt was known for building ships of excellent quality. They had also made significant progress in the fields of production of faience objects (ceramic objects with a blue glaze), and in making paper from a plant called papyrus.

Excavations at Harappa and Mohen-jo-daro began in 1921-22 AD and the Harappan Civilization came to light. Harappa was the place where the civilization was first discovered. Therefore, it is named as 'Harappan Civilization'.

Inscriptions in the Harappan script are found at various sites of the Harappan civilization. Scholars have tried to read those inscriptions. However, so far, efforts to read them have not been successful. Therefore, those inscriptions cannot be used to learn more about the history of the Harappan Civilization. Considering that the Harappans used a developed script and that the Harappan Civilization is contemporary to other ancient civilizations, its period is called the 'Protohistoric period' of the history of the Indian subcontinent.



Inscription in the Harappan Script

Characteristics of early civilizations :

1. Permanent agricultural settlements established along river banks. 2. Use of copper and bronze. 3. Developed technology and craft specialization based on special skills. 4. Centrally controlled distribution of water and a developed irrigation system. 5. Surplus production of agricultural and other products. 6. Art of writing based on a well-developed script. 7. Long distance trade and a developed transport system – wheeled vehicles and use of waterways. 8. Planned cities – protective enclosure walls, paved roads, separation between settlements of administrators and common people. 9. Developed science of architecture and sculptural art. 10. Development of sciences like mathematics, astronomy and medicine.

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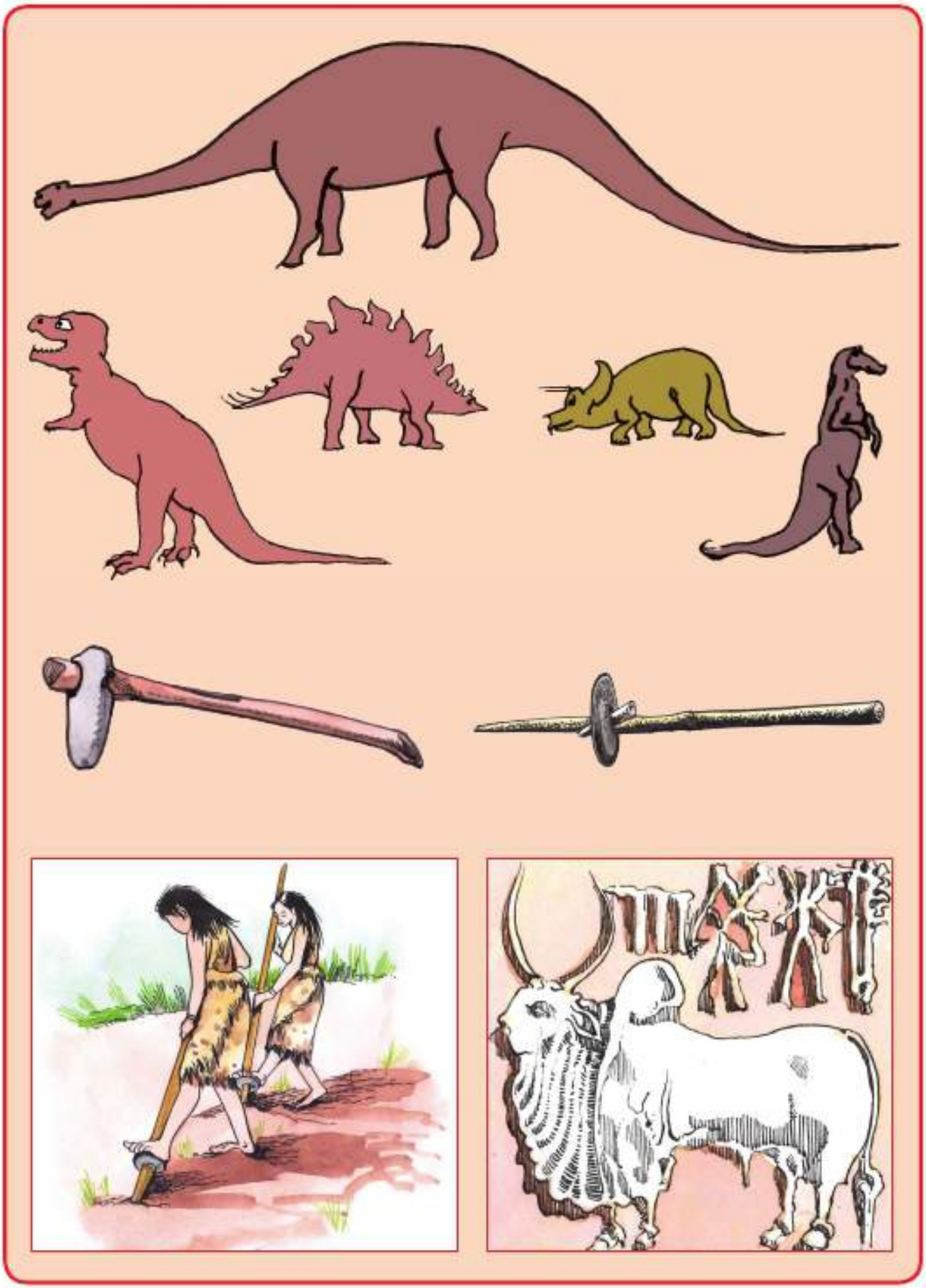

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